

EX-Post Evaluation of the Introduction and Promotion of Grain Amaranth Program in Eastern Africa (1998-2008)



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INTRODUCTION

World Renew's (formerly Christian Reformed World Relief Committee or CRWRC) work on introduction and promotion of grain amaranth in East Africa began in 1999 in 2 villages, Ngaamba and Kalonzoni, in the semi-arid part of the Machakos District of Kenya. World Renew staff, Tom Post and Francis Muthoka, received training and amaranth seed lines from Dr. Davidson Mwangi, a Kenyan agronomist who had been working on selecting amaranth lines for some twenty years. Amaranth's drought resistance and drought avoidance, its requirement of about 50% of the water required by maize, its high protein/high lysine content with a good balance of amino acids and other nutrients, and its taste acceptability---particularly when mixed with other staples such as maize and millet, wheat, cassava, ---- led World Renew to begin experimenting with grain amaranth in the semi-arid circumstance of these villages. These were also villages located in a region that had repeatedly sought CFGB-World Renew food relief during drought years.

During the years after 2000, World Renew's amaranth promotion expanded to include Western Kenya and other better watered sections of Kenya, Uganda and Tanzania. Dr. Mwangi was contracted to provide training and seeds to World Renew partners in Kenya and to a Ugandan church group in Iganga, Uganda. Many reports arose from people living with AIDS, that daily consumption of amaranth enabled them to enjoy a greatly increased measure of health, and better tolerance of the anti-retroviral medicines. Seeing the promising reports World Renew sought to expand and deepen the impact of grain amaranth with financial support by CFGB: during 2006, 2007, and part of 2008. The financial support that CFGB approved for year 1 was \$91,175 and for year 2 was \$116,300 (\$207,475 total), with an extension of unused funding into 2008. This support enabled the focused amaranth promotion work of Sid Kramer (experienced agriculturalist) and his wife, Audrey Kramer (nutritionist). They visited many of the World Renew partners, teaching growing methods and how to use amaranth for improving family nutrition. The 2008 extension enabled their work with the Sengerema area in Tanzania and the Kabale Pentecostal Assemblies of God (PAG) partner in South Western Uganda. At the end of 2007, Sid and Audrey Kramer reported that they and the CRWRC partners were tracking a total of 2603 new amaranth growers and an estimated 750 who had started in previous years.

The scope of the work by the end of 2007 is partly indicated by the specific partnering organizations and collaborating institutions that are indicated in the reports of the Kramers, as shown in [Appendix VII](#). Their work expanded amaranth use among World Renew partners in Uganda, and had begun a small start in Tanzania. The work had also included demonstrations with health clinics and village training in nutrition and amaranth culture.

This ex-post evaluation was discussed and envisioned with CFGB's Alden Brault and World Renew's Wondimu Kenea and Thomas Post to shed light on the long-term effects of both World Renew and CFGB programming and thus begin to meet a need within CFGB and World Renew to document longer-term sustainability concerns such as adoption of project ideas by farmers. In the end, after several years of waiting for approval of funding, World Renew was able to fund it from its own resources. However the budget had to be reduced from about \$27,000 to \$13,000. This reduction forced the elimination of several potentially valuable aspects envisioned in the original TOR: follow up with clinics/hospitals, and visits to several areas where past or present World Renew partners and the Kramers had promoted amaranth. Other factors that played a role in the de-selection of sites for this evaluation were: the phase down of some former World Renew partnerships such as Church of Uganda Bunyoro-Kitara Diocese in Hoima-Uganda and the Reformed Church of East Africa-Eldoret. In addition, the Good Friday-Easter holiday and the May 1st Labor Day holiday dates coincided with the period of the evaluation and eliminated the Mount Kenya partner visit.

I. PURPOSE:

The goal of this evaluation was to determine the impacts and lessons from the grain Amaranth promotion work of World Renew, CFGB and the World Renew partnering organizations in East Africa. More specifically, the evaluation sought:

1. To verify the relevance, effectiveness and sustainability of introducing and promoting amaranth in the target communities, particularly after the withdrawal of World Renew support for the program.
2. To assess the level of adoption of amaranth by project participants and other non-participating smallholder farmers in the communities.
3. To identify the challenges of amaranth producers, traders and consumers and suggest ways of addressing issues that hinder production, consumption and marketing of amaranth.
4. To study and document the process of change in rural communities using introduction and promotion of amaranth as a case study and use the result as a lesson in future similar interventions in rural communities.
5. To assess “unfinished business” related to introduction and promotion of amaranth such as marketing and dietary integration of the grain and recommend ways of maximizing the benefits of Amaranth for addressing household food security (nutrition and income security).

II. SCOPE OF THE EVALUATION:

The evaluation focused mainly on the work of World Renew in the introduction and promotion of grain amaranth in certain communities in Kenya, Uganda and Tanzania. It focused on discovering lessons learned concerning effective and ineffective promotional methods and factors of relevance and sustainability that affect the adoption or non-adoption of the grain among the communities. The evaluation also included considerable input from Dr. Dorothy Nakimbugwe, food scientist at Makerere University in Kampala, who contributed information and insights on the scope of amaranth work in Uganda beyond the World Renew sphere of influence. Finally, the evaluation included input from Mr. Francis Ssenyonjo, who worked with Partners World Wide on commercial marketing of amaranth in Uganda from 2006 through 2010. The evaluation sought lessons that could be used by World Renew and other organizations to increase the nutritional-food security impact of amaranth within a region that is plagued by malnutrition and food insecurity.

III. EVALUATION TEAM:

World Renew set up a multi-disciplinary evaluation team consisting of: Dr. Thomas Post, Agronomist and Evaluation team leader, Dr. Dorothy Nakimbugwe, food scientist at Makerere University in Uganda, Stephan Lutz, agronomist and World Renew staff in Kenya, Jim Zylstra former World Renew Uganda country team leader, Joseph Mutebi World Renew Uganda program consultant, Edward Okiror, World Renew-Uganda Program consultant, and Allen Ankunda, World Renew-Uganda monitoring and evaluation Specialist. Sara Sytsma, volunteer agricultural developer with World Renew in Uganda joined us for the Lango focus group activity. Naomi Makau, World Renew monitoring and evaluation specialist in Kenya assisted in analyzing the data from the farmer survey questionnaires.

IV. EVALUATION METHODS:

Partner Staff Interviews: Partner staffs were interviewed before each of the farmer focus group activities using the partner interviews guide format in [Appendix VI](#) as a rough guide. The partner organizations interviewed were: Anglican Development Services (ADS) of Western Kenya, Church of Uganda Diocese of Lango in Lira, Uganda, and Pentecostal Assemblies of God (PAG) of Kabale, Uganda. Findings of these partner staff interviews are presented along with the focus group findings.

Survey-census questionnaire: A questionnaire, [Appendix IV](#), was designed to better understand adoption vs. non-adoption of grain amaranth. It was administered during the period of April 1-15, 2014 with help from World Renew partner staff. Farmers were selected from seven sites: two in Western Kenya, three in Uganda, and two in Tanzania. In Tanzania, the questionnaire was translated from English to Kiswahili and back to English during the data entry process. Findings are presented in a separate report.

Locations of Farmer Survey Work and Farmers Sampled

Location	Country			Total
	Kenya	Uganda	Tanzania	
Sengerema	0	0	11	11
Magu	0	0	50	50
Aduku	0	48	0	48
Kabale	0	49	0	49
Oyam	0	50	0	50
Western Region	191	0	0	191
Mt Kenya	81	0	0	81
Total No. Farmers Per Country	272	147	61	480

Focus group discussions (FGDs): Participatory evaluation activities were developed based on the evaluation objectives and questions ([Appendix III](#)). The activities were intended to involve community members in sharing information in ways that respected their dignity and created an atmosphere of mutual learning. Each focus group discussion took approximately 2 hours.

A. The FGDs were conducted during the period of April 19 to May 1, 2014 in the following 6 communities, located in four distinct regions.

1. Kenya: Machakos District: Yoani postal area, Ngaamba Village: This was one of the two villages in which World Renew staff Francis Muthoka and Thomas Post first introduced grain amaranth, along with Dr. Davidson Mwangi, in 1999.

2. Kenya: Western Kenya, Kakamega area, Anglican Development Services (ADS): where World Renew sponsored Dr. Davidson Mwangi to introduce grain amaranth in 2000.

- Lugari Village
- Amairo Village

3. Uganda: Diocese of Lango, Church of Uganda Development Arm: where the Kramers introduced grain amaranth in 2008.

- Aduku Village
- Oketo Bilo Village

4. Uganda: Pentecostal Assemblies of God (PAG) Kabale, Katuna Village--near the border with Rwanda, southwestern Uganda, where the Kramers introduced amaranth in 2008.

Findings Summary:

Findings: From Focus Groups in Kenya and Uganda and Farmer Surveys in Kenya, Uganda and Tanzania

Executive Summary:

This evaluation found evidence that the introduction and promotion of grain amaranth that World Renew and others began in the late 1990s and early to mid-2000s were sustainable. In view of the promising evidence of health and nutritional impact World Renew and other organizations should consider further promotional work on seed selection, soil fertility restoration, nutritional promotion, marketing linkages, and research into the interaction of amaranth with the human immune system.

Key Findings:

1. Amaranth promotional work that was begun in 1999, and further promoted from 2006-8, has continued to spread among farmers in Kenya, Uganda and Tanzania. As of 2014, amaranth use seems well established in the original target areas, spreading to other areas.
2. Given the relative newness of grain amaranth to most farmers in East Africa, the special training effort that was enabled by funding to World Renew from the Canadian Food Grains Bank from 2006-8 has proven effective in promoting its use and spread as a nutritional supplement food crop. The persistence and support of key leaders among the World Renew partner staff has been crucial in the spread of amaranth.
3. Amaranth production and utilization, previously promoted by NGOs and churches, continued to spread from farmer to farmer.
4. Understanding well-being to include both health and income, farmers ranked amaranth as a highly important crop for their well-being,
5. Consumption of grain amaranth has had a positive impact on the health status of adults and children living with AIDS, as well as those who are not.
6. As human food in the East African context, consumption of both amaranth grain (flour) and amaranth leaves provide culturally acceptable alternatives.
7. Consumption of amaranth flour within a porridge mixture of one part amaranth flour to three parts maize or millet flour is common in East Africa and may be providing sufficient intake to have impact on nutrition and health.
8. Farmers with limited land holdings are willing to dedicate small areas to growing amaranth as a nutritional supplement crop. A typical parcel of amaranth constitutes about ¼ acre.
9. As a plant species amaranth fits well with a range of elevations and rainfall regimes within the East African region: from the semi-arid to sub-humid
10. Grain amaranth cropping could worsen the already fragile soil fertility status of many areas in East African, unless soil fertility restoration techniques are used.
11. Seed degeneration due to crossing with wild types seems to be a greater challenge in some areas than in others. The original amaranth lines that World Renew introduced were selected by Dr. Davidson Mwangi in Kenya. The Kenya Ag Research Institute sells amaranth seed at 1000 Kenya Shillings/kg (about USD 11).
12. In addition to eating amaranth, farmers strongly desire to earn income from it as a market cash crop. However facilitating this process within the capacity of NGOs and church-based organizations has proven challenging.
13. Challenges for commercialization include:
 - Harvesting, threshing and drying when amaranth grain has matured just past milk stage reduces losses via seed shattering, and can be accomplished by hand threshing when plot

sizes are small. However this presents a heavy labor demand at harvest, unless mechanization of threshing and drying are introduced.

- Clean tarps or plastic sheets are needed for keeping the grain clean during threshing and harvesting.
- Government hygienic certification is required processing amaranth on commercial scale.
- Achieving sufficient quantity, quality, and timeliness of grain, collected from various small farmers, so that buyers in urban centers find it economic to transport the grain.
- In many places, consumers and processors are not yet aware of the nutritional value of amaranth or may perceive it as a food used by people living with HIV/AIDS.

Key Recommendations:

1. World Renew and other organizations should experiment with amaranth promotion as a nutrition supplement for mothers and children in the first 1000 days of life and should reinforce training on the nutritional benefits of amaranth for mothers and children of all ages. This seems particularly relevant for populations suffering chronic malnutrition and high rates of child stunting as does SW Uganda.
2. World Renew's successful experience with amaranth as a drought resistant, multi-purpose nutritional supplement crop should be shared with the CFGB members in East Africa and beyond.
3. World Renew should produce accurate promotional materials on amaranth and make them available to its partners.
4. World Renew and other organizations should promote soil fertility restoration methods, e.g., crop rotations, legume cover crops, fertilizing trees: simultaneously with amaranth or before its introduction.
5. World Renew and its partners should provide farmers training on seed selection and provide quality amaranth seed from Kenya where the degree of crossing with black-seeded wild types merits this.
6. That NGOs and church-based organizations should be careful to avoid promising markets, but can be helpful in organizing farmers to collectively market amaranth to businesses. Unless a market is ensured grain amaranth should be introduced to new areas as a nutrition supplement for home consumption first, i.e., before raising expectations about cash cropping.
7. The case of the Anglican Development Services (ADS) of Western Kenya in helping farmers organize themselves and set up collection centers for the marketing of their production to amaranth millers should be considered for lessons learned. World Renew should continue to monitor the learning of ADS in marketing.
8. World Renew should share this evaluation report with research organizations because research is needed to understand the dynamics of the nutritional and health effects that occur when amaranth is consumed, particularly the effects on the human immune system. Records kept in hospitals and health centers in amaranth growing regions could provide useful data for research. Data from the "Community Connector" project in Uganda could also provide research information. More research is also needed on the agronomic and production aspects of amaranth.

Findings on Relevance of Amaranth to the Context of Small Farmers in the Target Communities:

Introduction:

Findings of this evaluation point to the relevance of amaranth to the situation of small scale farmers in East Africa. [Appendix I](#) contains the results of focus group activities and [Appendix II](#) contains the records of the individual farmer surveys. Both appendices will be cited frequently in the findings that follow.

Overall Relevance: Farmers revealed several key reasons for ranking of amaranth as highly important to their well-being, with income generation, rapid maturation and nutrition cited most frequently ([App II, Table 42](#)), and grain amaranth ranked as their most important livelihood endeavor in the focus groups ([App I, Table 3](#)). Farmers emphasized the positive impact of amaranth on both their family health ([App II, Table](#)

40) and income as their two main reasons for growing it. Farmers in Western Kenya appreciated the relatively high and stable price of grain amaranth (cited as 60 Ksh/Kg or about \$US 0.72/Kg) and also that it gives them returns in a shorter time frame, 65 to 75 days, as compared to maize. (The shortest maturation maize in East Africa is a 90-day maize). Being fast maturing fits well within their growing seasons so that they can achieve up to three crops in one year. They said it was ideal for their small plot situations. Two weeks after planting they can harvest leaves as vegetables. The fact that farmers in semi-arid Ngaamba continue growing and using grain amaranth highlights its drought resistance, which they described as better than millet, and also its drought avoidance due to its rapid maturation. They see it as their most nutritious crop. They appreciate the fact that it is easy to mix with other cereals, that it's marketable (sometimes), that it has both medicinal value and nutritional value. They named the healing of skin rashes, and improvements in vision, thinking ability, male virility, improved resistance to sicknesses and improvement of general energy level as medicinal effects of amaranth. Farmers in both Kenya and Uganda cited nutritional-health reasons and income generating hopes as the two main reasons they rank amaranth as highly important to them ([App I Table 4](#); [App II Table 30](#), [App I: Timeline narratives](#)).

Nutritional Relevance: Nearly all farmers surveyed highlighted the nutritional benefits of consuming amaranth (App II Table 39) and focus groups repeatedly emphasized this. Given the predominance of starches in the maize, millet and cassava-based diets of Uganda, the repeated focus group testified of improved health due to nutritional benefits of amaranth consumption, pointing to its relevance in the East African diet as a flexible nutritional supplement crop. It is particularly relevant to the most nutritionally vulnerable: children, people living with AIDS, mothers of child-bearing age. In both Kenya and Uganda, people living with AIDs testified of remarkable improvements in their CD-4 counts (a reflection of the strength of their immune systems), and of regaining weight and energy upon eating amaranth in combination with the anti-retroviral drug therapy. Similar testimonies are commonly told to Makerere University researchers and VEDCO workers by communities in Kamuli District in Eastern Uganda (Dorothy Nakimbugwe, personal communication).

Testimonies by People Living With AIDS

Two Testimonies from Aduku Village in Uganda: Testimony #1: "I was so sick I could barely drink water, and then I started eating amaranth. My CD-4 count was only 98, but now it is 604!"
*Aduku Testimony #2: "Eating the leaves of wild amaranth used to make me have diarrhea.*But, this does not happen when I eat the leaves of grain amaranth..... When I started eating amaranth I gained strength and got pregnant. My baby would play inside of me (gestures of a baby kicking and dancing inside the mother!) The baby was so active that I went to the hospital to see if the baby was normal. I took amaranth throughout my pregnancy. My child has been more vigorous and more resistant to illnesses than my previous children."*

World Renew staffs in East Africa have heard many testimonies from people living with AIDS on the benefits of amaranth. For example See: <https://www.youtube.com/watch?v=SFF2wVvRxGw>

Notes: Amaranth researcher, Jason Avent states that simply using hard water to soak and rinse greens and a spritz of something acidic after cooking makes all amaranth palatable and safe (unless they were grown in chemically contaminated soil). Magnesium and/or calcium supplementation of the water used to pre-soak or cook will eliminate any concerns about oxalate and kidney stones. Distasteful compounds are made when you damage a raw leaf, so cook and then chop. (Communication via iastate.edu amaranth list serve).

“The lysine content of amaranth grain protein is very high and in terms of the total protein is among the highest of any vegetable protein. One has to be careful, however, not to confuse the lysine content of the protein with the overall lysine content of the whole flour.

If we take an average value of about 16% protein in amaranth flour this would give an overall value of almost 1% lysine in amaranth flour or 1000 mg/ 100 gms. This may be a little high, but I wouldn't expect it to be any lower than 800 mg/100 gms of flour.

If one is looking strictly for lysine, it is hard to beat properly processed soybean meal or flour. Actually, properly processed soy flour also contains about 6% lysine in the protein and considering its 50% protein, it has about 300 mg/100 gm of flour.

What makes amaranth flour so valuable is that it is balanced with other essential amino acids and contains many other minerals and vitamins, making it probably the best overall nutritional supplement for so many nutritional conditions in the developing world.” Ray Heinicke’s (Ph.D.) Food Scientist and member of the Amaranth Institute, Personal Communication, September 2008

These testimonies on the health of effects of consuming grain amaranth are understandable in the light of the comments by food scientist, Ray Heinicke, in the text box below. He compares amaranth favorably with soybean, another vegetable source of high quality protein. A Food Scientist’s View of Grain Amaranth as an Ideal Nutritional Supplement for Developing Countries

Farmers shared various ways in which amaranth fits well with their traditional foods. Focus group participants commented that amaranth flour mixes easily with maize, millet, wheat and cassava flours to improved traditional foods, such as porridge, *mandaazi*, *chapati*, etc. ----and meets taste preferences of East African cultures. At the same time, amaranth is a nutritionally balanced crop that is also relevant to urban middle class dietary issues such as over-weight, obesity and other diet related non-communicable diseases. The amaranth grain flour adds a well-balanced protein to the diets in culturally acceptable ways (ibid). Approximate total protein was measured at 12% at Makerere University and a well-balanced mix of amino acids, including high lysine content recorded, but the overall protein content of amaranth is often cited at between 14 and 16% (ibid). Farmers repeatedly mentioned that the leaves of amaranth can be harvested, starting at two weeks after planting. These leaves thus become available during times of food scarcity and farmers cite them as very palatable.

The most frequent form of consuming grain amaranth mentioned was as breakfast porridge, with amaranth flour mixed at a ratio of 1 part amaranth to 3 parts maize or millet flour. The amaranth flour is dissolved in a little cold or warm water, then added to the boiling mix of maize or millet flour followed by 5 to 10 minutes of cooking time remaining, i.e., after they have already cooked for approximately 10 minutes. On average, about 66% of the farmers surveyed had consumed grain amaranth at least one time in the preceding week and more than 70% consumed the leaves at least once in the preceding week ([App II, Tables 1 and 2](#)). However, it should be emphasized that the findings of this evaluation show that amaranth is primarily being used by farmers as a nutritional supplement crop for nutritional food security, not a crop that produces bulk of carbohydrates. The farmer survey showed more than ½ of the farmers grow amaranth on ¼ acre or less

and also harvest 30 Kg or less per growing season (Appendix II, [Tables 16 and 18](#)). Farmers considered this nutritional role of amaranth very significant to their well-being.

Given the high population land pressure and small size of land holdings in some parts of Uganda, the fact that a relatively small parcel of amaranth can produce enough to provide the recommended 40 grams of flour per adult per day (20 grams/day/child), or 15 kg per adult per year---is an additional advantage of amaranth as a nutritional supplement crop. (Dr. Benito Lara, Nutrisol Mexico, and Peter Noll, Puente a la Salud, Mexico personal communications). Most farmers surveyed and in focus groups were indeed growing amaranth on ¼ acre or less for household consumption ([App II Table 16](#)).

In summary, the findings of this evaluation show that the objective of introducing grain amaranth as a nutritional and health-enhancing supplement crop has been achieved but that there is great potential to further develop amaranth as a nutritional supplement in the diets of young children and mothers.

Ecological Relevance: Amaranth has found a good fit with the ecological context of East Africa. The drought-resistance and rapid maturation provide key advantages are highly relevant for farmers in the East Africa environment. That Ngaamba farmers have continued growing amaranth for home consumption since 1999 is promising for its use in other semi-arid areas.

Much of the East African area is between 1000 and 1500 m above sea level, with intense sunlight and sharp cut-offs between wet and dry seasons---similar to the Mexican context in which several lines of grain amaranth originated, but with East Africa having shorter day lengths at the equator (personal observation). The rapid production of food that is harvestable while other crops are not yet mature, and the ability of the crop to withstand dry periods within rainy seasons that often have interruptions, or may start late, is key advantages that provide some adaptability to farmers' observed trend of increasing unpredictability of the onset of rainy seasons. Also, when some other crops fail due to short rainy seasons, amaranth is likely to produce at least some harvest. The relatively constant day lengths of 12 to 13 hours in the East African equatorial region induce amaranth's photoperiodic flowering response and grain maturation at 65 to 80 days and also make it a good fit.

Western Kenya and much of Uganda enjoy more regular rainfall than the semi-arid areas of Kenya. Farmers and partnering organizations in the zones we visited stated that rains usually start in March and continue into December, with a dry period in July and December to February. The short time span for focus group interviews permitted only one visit to a semi-arid site, i.e., Ngaamba in Kenya, while the visits to focus groups in the sites confirm amaranth's adaptability to better watered zones within East Africa. World Renew's staff observations, from Madi West Nile in the North to Kabale in the South West, show that it is spreading across cultures and ecological zones of Uganda.

On the other hand, the main environmental concern farmers shared in respect to amaranth is that its nutrient requirements are high, i.e., "it's a heavy feeder." Some farmers thus grow amaranth in small plots close to their homes where the fertility tends to be higher. This high nutrient requirement, within the context of soils that are generally low in fertility is confirmed in farmers' observation that when amaranth is grown two consecutive seasons on the same parcel, yield of the second crop is low. The small size of land holdings and low soil fertility, in combination with the rather heavy nutrient requirements of amaranth mean that soil fertility enhancement via crop rotations and legume cover cropping should be emphasized in combination with amaranth growing. Peter Moody, director of ADS in Western Kenya, has worked with amaranth since the year 2000 and concurs that amaranth is a heavy feeder and that the farmers need to replenish their soils. He stated that farmers have tried crop rotations using lablab bean, pumpkins and watermelon. He stated that ADS staff encourages farmers to leave the amaranth stalks and leaves in the field to maintain soil organic matter, but that farmers often feed their animals the amaranth residues.

The text box below shows a laboratory analysis of a grain amaranth sample from Kenya whose crude protein content was estimated at 16.4%. The guidance from this analysis is that farmers should seek to

replenish amaranth plots with both nitrogen and phosphorus. Based on this analysis it would be worthwhile to experiment with the non-legume phosphorus-concentrating green manure plant *Tithonia sp.*, in combination with legume cover crops, and animal manures---as was to replenish soil fertility in amaranth plots.

On the soil fertility issue farmers stated that if they grow amaranth on the same plot in two successive seasons the growth of the plants is considerably reduced, even when they add animal manure. This is a clear indication of the fragility of the soil fertility in some areas. For farmers with very small land holdings edible legume cover crops such as *Dolichos lab lab*, and *Vicia faba*, Faba bean, for high elevation zones should be tried. Thus the evaluation team recommends that soil fertility restoration, e.g. with *Tithonia* as green manure, with legumes in crop rotation, legume cover crops or fertilizing trees, or use of planting spots that focus the use of animal manure---be used in combination with amaranth .

Nutrient Analysis of a Grain Amaranth Sample Sent from Kenya by Tom Post, ---by George Lubberts, Agronomist

Nutrient	Dry matter basis (%)	As fed (%)
Crude Protein	16.4	14.8
Nitrogen	1.025	0.925 (calculated from protein)
Phosphorus	0.64	0.58
Potassium	0.55	0.49
Sulfur	0.19	0.17
Calcium	0.23	0.21
Magnesium	0.23	0.27
Sodium	0.02	0.02

Interpretation: Crude protein is estimated at 16.4%. Assuming nitrogen is 6.25% of protein the amaranth grain is about 1.025% Nitrogen. This would be quite similar, maybe a little higher than wheat and about 50% higher than maize. So producing 1000 kg of amaranth seed it would remove about 9.25 kilograms of nitrogen, 5.8 phosphorus (equivalent to 13 kilograms of P₂O₅ (phosphate fertilizer – each kg of phosphate fertilizer contains about .4 kg of phosphorus)) and 4.9 potassium (equivalent to 5.9 kilograms of potassium chloride – each kg of potash fertilizer contains about 0.8s kg of potassium.) So to put it in agronomic terms, 1000 kg would remove about 9-13-6 in NPK.

So 100 kg of 15-15-15 would supply nitrogen in excess by about 6 kg, would satisfy the phosphate requirement and supply potassium in excess by about 9 kg to produce about 1000 kg of amaranth. If one only had 15-15-15 and 18-46-0 as fertilizers, one could blend together a mixture of 70% 15-15-15 and 30% 18-46-0 and apply about 57 kg to an area that would produce 1000 kg of amaranth. This would match almost exactly the fertilizer required to replace

Pests and seed degeneration were sometimes mentioned by farmers ([App II, Table 43](#)), with seed degeneration seeming to be the more serious challenge for farmers. Peter Moody stated that most farmers in Western Kenya have not found it necessary to use pesticides in growing amaranth. Given the newness of amaranth to most of the areas where it is presently grown problems with pests have been relatively few. ([App II, Tables 27, 43.](#)) Stem borers have been mentioned occasionally by farmers as a pest problem. However, during focus group discussions, seed degeneration, i.e., the crossing of black-seeded wild types of amaranth with the golden or white-seeded grain types seemed to be more of a problem in Uganda than in Kenya. In Kenya, the Ngaamba farmers told us that the Kenya Agricultural Research Institute (KARI) sells good amaranth seed at 1000 Ksh/Kg (\$12/Kg). In Lango, Uganda, farmers stated that they see cross pollinated progeny after about 3 growing seasons. However, Ugandan farmers don't yet have a source of quality grain amaranth seed. Therefore we recommend that World Renew and its partners teach farmers simple seed selection methods such as: 1) weeding out black seeded plants from their fields, 2) identifying

the best plants in their fields and keeping these robust white or golden grain heads for seed. Secondly, we suggest that World Renew staff could facilitate the importation of KARI's selected amaranth seed from Kenya to Uganda.

Relevance to the Extension and Marketing Capacities of NGOs and Churches: Although it is a relatively unknown, new crop to most farmers in East Africa, the findings of this evaluation show that it is within the capability of NGOs and churches to extend amaranth nutrition and agricultural training effectively. However, although the Anglican Development Services of Western Kenya is proving that a church-based NGO can effectively organize farmers to cooperatively collect their grain for marketing to outside businesses, the World Renew's partners in Uganda have not been as successful. The secretary of the Church of Uganda Lango Diocese related the disillusionment that set in when farmers were promised a market for their amaranth grain by one of the church leaders and it did not materialize. At that point, many farmers were not aware of amaranth's value as human food, and fed their unsold grain to their chickens. The leadership of the Church of Uganda sees the "hunger" of farmers for a cash crop that could take the place of cotton, a cash crop that they once had. But, to date both the Church of Uganda in Lango and the Pentecostal Assemblies of God in Kabale have not been able to link farmers to substantial markets.

Both farmers and World Renew partner organizations repeatedly emphasized their desire to acquire reliable markets for selling amaranth as a cash crop. About 180 of farmers surveyed reported having stopped growing amaranth, with the major reason being disappointed over the inability to market it as a cash crop (Appendix II, [Tables 9 and 10](#)). Various actors have worked on the amaranth marketing challenge in Uganda. According to Dorothy Nakimbugwe (personal communication), the desire for accessing markets was always expressed by farmers in a study done in Kamuli District in eastern Uganda. These farmers engaged in a 5 year project (2008-2012) implemented by Makerere University in collaboration with VEDCO, NARO and University of Nairobi and with support from the East African Inter-University council/SIDA. In a subsequent project supported by the McKnight Foundation and implemented by Makerere University, VEDCO and NARO (2010-2013) in Nakasongola and Apac Districts of Uganda, farmers again emphasized their desire to market their production. Currently, in response to farmers' requests, Makerere University, Department of Food Technology & Nutrition (DFTN) purchases grain amaranth for research purposes from farmers in Kamuli and Apac Districts. VEDCO promotes production and consumption by the communities and supports farmers with post-harvest handling and collective marketing. Makerere University has also facilitated access to processing companies who purchase the grain amaranth through VEDCO. The processing companies have also purchased amaranth grain from Partners Worldwide, a business-as-mission organization allied with World Renew, and more recently from farmers' groups supported by 'Farming God's way'. Nakimbugwe sees building consumers' awareness of the benefits of amaranth consumption and building up quality and adequate supply for traders and millers as keys for building an amaranth market in Uganda.

Nakimbugwe credits World Renew with having introduced grain amaranth to Uganda. It was actually introduced to a Pentecostal Church community near Iganga, Uganda through World Renew and Partners World Wide. This focus was to develop amaranth as job-creating, cash crop for the East African market. Francis Ssenyonjo coordinated this effort to bring a business and marketing approach to amaranth development work with small farmers in Uganda in two areas of Uganda. His account reveals some of the challenges involved in cash cropping and marketing work with farmers.

Case Study: Cash Cropping and Marketing Challenges in Uganda

Francis Ssenyonjo, a former World Renew-Uganda finance manager and later coordinator of amaranth development and marketing for Partners World Wide in Uganda, worked on amaranth commercialization from 2004 to 2011. This work focused first with farmers in the Iganga area and later with farmers in the Mbale area. Although there was some success in marketing grain amaranth through Makerere University for the urban market of Kampala, Francis found that Kenya offered a larger market. After being involved in six years of work and overseeing investment of an estimated \$300,000 US in this effort in Uganda, Francis concluded that farmers' capabilities are best suited in growing amaranth, not for processing and marketing. Processing and marketing require managerial expertise, Uganda National Bureau of Standards-certified hygienic facilities, and machinery and capital investment beyond the reach of most farmers in Uganda. Therefore Francis recommends that capable business people take on the task of marketing development. Francis also noted that currently another commercially-oriented project is growing amaranth near Fort Portal, with about 200 amaranth growers involved. This project began with the vision of exporting amaranth to the USA, but is currently exporting to Kenya due to the harvesting and mechanization challenges in scaling up production to export scale. Francis does see good potential for NGOs to organize farmers around amaranth grain collection centers and organizing farmers to meet with buyers---so that their amaranth can be sold. But, he adds that caution should be exercised and that promises to purchase amaranth from farmers should not be made unless there is reliable commitment and capacity to meet the promises. Otherwise small farmers' welfare is put at risk.

In summary, although farmers consistently express the hope that amaranth will become a reliable cash crop, NGOs and churches should exercise caution about making promises that farmers' will be paid for their amaranth production. However, the experience of ADS in Western Kenya points to a potential role in organizing farmers for collecting their harvests and in linking farmers to businesses that process and sell amaranth on commercial scale. Local marketing to neighbors, schools, clinics etc., is also within the capability of churches and NGOs, and the PAG church in Kabale, Uganda has also had success in using radio broadcasting to raise awareness of the value of amaranth among local communities.

Findings on Effectiveness – the extent to which introduction and promotion of amaranth in the target communities attained its objectives: effectiveness of the introduction/promotion approaches

Previously grain amaranth was unknown to most farmers in East Africa. This was the reason that World Renew sought special funding from the CFGB to enable reinforcement of amaranth training in Western Kenya and methodical introduction in Uganda and Tanzania. The findings of this evaluation indicate that the basic demonstration methodology used in introducing grain amaranth was simple and effective, consisting of:

1. Training men and women farmers how to prepare and eat grain amaranth flour and popped amaranth as food. Participants were able to decide immediately on whether or not the taste of amaranth was acceptable.
2. Providing grain amaranth seed that had previously been selected for its adaptability to East African conditions and had previously met East African taste tests.
3. Providing training to farmers on how to plant, thin, harvest, thresh, and clean the amaranth crop.

In Western Kenya and Ngaamba the promotion of amaranth occurred in the late 1990s and early 2000s. There was no follow up training in Ngaamba, but in Western Kenya this was reinforced by training in the year 2006, that was enabled by the CFGB grant during 2006-8. This enabled the work of two Canadian volunteers who carried out nutrition and growing demonstrations along with follow up visits. This same grant enabled the extension of grain amaranth to the World Renew partners working in the Mwanza area of Tanzania, and to the target areas of several World Renew partners in Uganda. In most cases, selected staffs of the World Renew partners were also trained by these Canadian volunteers.

A finding in this evaluation is that the follow-up and persistence of key leaders in the World Renew partner organizations has been crucial in the effectiveness of the introduction of grain amaranth. In Western Kenya it is clear that the director of ADS, Peter Moody has promoted the amaranth initiative from the beginning. Similarly the leadership of the Kabale PAG church in southwestern Uganda and of the Church of Uganda in Lira Diocese---have clearly been persistently supportive of the introduction of amaranth, and in seeking to achieve marketing linkages for the participants.

This evaluation asked several questions related to effectiveness:

1. Has the World Renew-CFGB effort achieved the desired results?

In Western Kenya, the results achieved are even more than expected. The Lugari and Amairo communities have developed amaranth to a marketing and even processing level. Lugari has 3000 farmers producing amaranth, with 209 members of the amaranth cooperative ([App I, Lugari Timeline](#)). This group started with only 32 members in 2006 and now has its own grinding mill and cleaning equipment. The majority of the farmers eat amaranth grain porridge themselves at least three days per week ([App I Table 1](#)). Grain amaranth production and consumption in Lugari has resulted in both, increased incomes and improved nutrition.

In Uganda the amaranth promotional effort has been effective in improving nutrition and health, particularly for those living with AIDS, but also for general family well-being. However, there is an unmet opportunity to carry out research that could document the nutritional impacts of amaranth. For example, there may be some helpful records at health centers that could be a starting point, but this evaluation did not have the time and resources to engage with the health centers. There is also an intriguing research opportunity to explore the causes for the impact on CD-4 counts that people living with AIDS testify about.

2. What are the factors that led to achieving the desired results?

Note: Many of the “encouraging factors” and “hindering factors” were named by farmers during narration of their community’s amaranth development story in the timeline exercise ([App I, Part II](#)).

Some of the factors mentioned by partners’ staff and community members, or observed by the evaluation team:

1. World Renew’s partners’ staffs were trained in amaranth nutrition and growing and they, in turn, trained community leaders. “Good teaching via cooking demonstrations on eating and farm demonstrations on growing” was mentioned as a key to success.
2. The training given by the Canadian volunteers was also influential in Western Kenya as it provided reinforcement of learning and introduced new home nutrition knowledge. Farmers said that previously they had only understood grain amaranth as a cash crop and had not used it as food for their own families.
3. World Renew partner staff linked farmers with commercial buyers. This is the case of the ADS in Western Kenya, who have set up a business development department to help farmers market both amaranth and honey.
4. Community participants were willing to organize themselves into collaborative community development groups because of their desire to overcome poverty and into support groups for people living with AIDS.
5. The participants’ motivation to achieve a viable cash crop. (This generally seems to have been a stronger motivator than the motivation to achieve better health.)
6. Promoting amaranth through World Renew’s network of existing partnerships proved effective, particularly where partners’ staff saw the potential of the idea and owned it.
7. Amaranth promotion was easily integrated into ongoing projects for continuing follow up.
8. World Renew prepared and distributed brochures that made information dissemination easy.
9. Radio programming e.g. in Kabale, and use of church meetings raised awareness.
10. Partner staff grabbed the idea – Peter Alele, James from Kabale.
11. People continued growing (on a small scale) and eating it even without support and even when it was not a cash crop because of the nutritional benefits that they experienced.
12. People came up with their own ideas on uses and preparation methods.

Some factors that hindered the achievement of desired results:

1. Unfulfilled promises about buying the production from farmers. The marketing goal was introduced too soon. In several areas, there was this disconnect between participants’ thinking, i.e., that it was a money-making crop and their understanding of the nutritional benefits. However, in the West Nile region of Uganda (not visited in this evaluation) World Renew staff state that communities appreciated the nutritional benefits of amaranth and have created an internal market, selling among their own communities (Joseph Mutebi, personal communication).
2. In Uganda there has been lack of follow up by both World Renew and its partners on the issue of seed selection and seed rejuvenation.
3. Misinformation: Sometimes exaggerated claims have been made, e.g., that amaranth contains more protein than soybean.
4. The terms of reference and role of the Canadian volunteers from World Renew who promoted amaranth from 2006 to 2008, was not always well explained to the World Renew partnering organizations.
5. Soil fertility restoration methods were not taught simultaneously with amaranth growing.

6. World Renew staffs in East Africa have been over-extended to the point where they have not been able to provide consistent support to amaranth promotion.
7. World Renew in East Africa lacks Agriculture & Health specialists to the degree needed
8. In general it appears that increased focus on incorporating amaranth into the post-weaning diet of young children and into the diet of mothers could enhance the results---especially in areas with high child stunting rates.
9. Although some areas of Uganda have high levels of child stunting, World Renew has not incorporated amaranth into a focus on maternal and child health, even though it has integrated amaranth quite well into the HIV and AIDS responses, with emphasis on people living with AIDS.

Findings on Efficiency of promoting Amaranth as compared to other ways of improving nutrition, health and food crops in drought-prone areas

It is difficult to accurately tabulate the cumulative value of all the inputs that have gone into amaranth promotion since the World Renew's work on it in 1999. However, a large part of the ensuing CRWRC expansion work with grain amaranth was accomplished via a focused promotion, financed with by the CFGB: during 2006, 2007, and the early part of 2008. The financial support that CFGB approved for year 1 was \$91,175 and for year 2 was \$116,300, for a total of \$207,475. At the end of 2007, CRWRC's amaranth promotion volunteers, Sid and Audrey Kramer reported that they and the CRWRC partners were tracking a total of 2603 new amaranth growers and an estimated 750 who had started in previous years ([App VI](#)). This special promotional work by the Kramers reinforced previously begun grain amaranth work in Western Kenya and introduced grain amaranth to several new areas in Uganda and Tanzania. When it became clear that amaranth consumption was helpful for people living with AIDS, World Renew designated a small amount of special "EMBRACE AIDS" funding, in the amount of \$2000 to further promote grain amaranth in Kabale, Uganda.

Stephan Lutz, staff of World Renew-Kenya, related that World Renew spent approximately \$100,000 in funding a special honey bee promotion over 8 years that has resulted in approximately 300 bee keepers in Western Kenya. In comparison the amaranth promotion work in Western Kenya has resulted in 3000 amaranth growers in just the Lugari area, and many more in other parts of Western Kenya. In Lugari, the growers' cooperative has been able to attract other grants to help with a processing center. In comparison, World Renew has worked on soybean introduction in several countries, but has not seen soybean adopted by comparable numbers of farmers, learning about it through family members and fellow villagers, as has occurred with amaranth in East Africa.

Efficiency relates as well to the approach used. World Renew promoted grain amaranth via Christian NGOs and church-based partners, who in turn worked with grassroots community organizations. Later, World Renew saw the ADS partner in Western Uganda achieving success in linking farmers to commercial markets in Nairobi, Kenya. In contrast Partners World Wide promoted amaranth as a commercial cash crop, trying to achieve an amaranth business model in a more direct way. According to Francis Ssenyonjo, the former coordinator of this program, the amount spent was approximately \$300,000 and the current number of amaranth growers in Fort Portal is about 200 (not including the farmers in Mbale and Iganga). (See text box earlier in this report.)

Thus, the findings of this evaluation point to the conclusion that the grain amaranth promotion in East Africa is proving to be a cost effective and efficient investment, with results that continue to multiply and could multiply much more when commercial markets open up in Uganda and Tanzania as they have already done in Kenya. It is the finding of this evaluation that the special funding by CFGB was money well spent that is continuing to multiply in effect.

Findings on Sustainability of the Amaranth program after funding has been withdrawn

The Ngaamba farmers in Kenya provide evidence that the use of amaranth as a nutritional supplement crop in semi-arid areas is sustainable. Over 10 years period, they have continued growing amaranth, adopted their own inter-cropping practices, sourced for new seed, and adapted it to local food preparations---all signs of sustainability---with almost no outside support and with no outside market. Similarly, the farmers we studied in Uganda have also struggled with marketing yet most who once started growing amaranth continue doing so for home consumption. So, this study found that a large majority of farmers 366/472, or 78%, who once started growing amaranth, have continued doing so (App II, [Tables 6&7](#)).

The majority of farmers surveyed estimated that at least 25% of the households in their village are presently growing grain amaranth, 80% of farmers reported that other households have learned about growing amaranth from them and 38% of farmers estimated that more than 10 households had learned about growing amaranth from them (App II, [Tables 12, 13](#) and [14](#).) Farmers mentioned sharing seeds and information about growing and consuming. The farmer survey also found that about 23% of the farmers surveyed were “new farmers,” i.e., farmers who had started growing amaranth after the time of formal promotion by the World Renew partner organization. Thus, this evaluation found strong evidence that grain amaranth promotion is now occurring by word of mouth among farmers, again suggesting sustainability when there is no promotional effort by outside agencies. Furthermore, we found at least 245 farmers among those surveyed have persisted in growing amaranth for 3 to 10 years. ([App II, Table 8](#)). However, it should also be noted that disillusionment with failed marketing hopes has caused some farmers to stop growing amaranth (App II, [Tables 9](#) and [10](#)). Thus, both the farmer survey and the focus group sessions make it clear that sustainability for amaranth production would be enhanced further if marketing were easier for farmers. On the other hand it is not clear that cash cropping of amaranth would motivate its use as a nutritional supplement crop for family health unless farmers were trained and motivated to use it within their family diets.

During focus group discussions, farmers mentioned a couple of factors that have sometimes reduced the continuation and spread of amaranth:

- 1) Social Stigma effect: Because of its benefits for those living with AIDS there have been cases of a stigma becoming attached to farmers who are seen growing amaranth---with people assuming that the farmer has AIDS himself or herself.
- 2) Seed availability: Where World Renew and its partners are no longer formally promoting grain amaranth, farmers complained that finding good seed can be a problem. This was related to the cross pollination problem with weed types of amaranth in Uganda.

In summary, the findings of this evaluation point to a high likelihood that grain amaranth production and use is going to be sustainable in East Africa. The health-nutrition benefits, the good fit within the ecological context, the acceptability and ease for home use within the local diets, the grassroots nature of information sharing, and the probability that the urban market will continue to grow----all contribute to the likelihood of sustainability.

Appendix I: Results of Farmers' Focus Group Discussions and Partner Interviews

Introduction

Participatory farmers' focus group activities were carried out in Western Kenya, and in two regions of Uganda. The following tables and notes constitute the information collected during focus group sessions and also during interviews with the staff of World Renew partnering organizations that work with farmers in the focus groups.

Part I: Tables of Findings: Participatory Focus Group Activities

Table 1: Percentage (%) of Farmers in Focus Groups Reporting Consuming Amaranth Grain in Past Week

Days Eaten	Lugari (Kakamega, Western Kenya)n=21	Amairo (Busia, Western Kenya) n=18	Amanga-Akuko (Lango Diocese Uganda) n=19	Katuna (Kabale, Uganda) n=12	Ave %
7	5	44	11	8	17
6	0	6	0	8	3
5	0	11	0	0	3
4	19	6	0	0	6
3	19	22	21	25	22
2	5	6	26	8	11
1	5	6	5	0	4
0	52	0	32	50	33

Table 2: Percentage (%) of Farmers in Focus Groups Reporting Consuming Amaranth Leaves in Past Week

Days Eaten	Lugari (Kakamega, Western Kenya)n=21	Amairo (Busia, Western Kenya) n=18	Awmanga-Akuko (Lango Diocese Uganda) n=19	Katuna (Kabale, Uganda) n=12	Ave %
7	5	39	0	17	15
6	5	0	0	25	7
5	10	11	5	0	6
4	14	11	5	0	8
3	10	11	21	8	13
2	0	11	42	17	17
1	5	17	0	0	5
0	52	0	26	33	28

Observations:

1. The focus group farmers emphasized the usefulness of both the flour of amaranth grain and the leaves for family consumption. The most common form of eating the grain mentioned was in a porridge mixture containing 1 part amaranth flour to 3 parts maize or millet flour. The most common form of eating the leaves was as fried lightly in cooking oil.
2. Lugari, in western Kenya is the community that has advanced the farthest in commercializing grain amaranth. Yet the findings of the focus group showed about ½ had not eaten grain or leaves during the preceding week, even though it was amaranth growing season and leaves were available.
3. We also visited a group of people living with AIDs and people living with AIDs community support group, OketoBilo, in Lango Diocese, Uganda. We were unable to complete the full recall of the most recent week's consumption due a severe rainstorm interrupting our interview. However, 14/16 participants reported having eaten amaranth leaves at least one day in the last week, and 8/16 reported having eaten grain flour at least once in the last week, with 3/16 reporting that they had eaten amaranth grain flour all 7 days of the week.

Table 3: Amaranth's Importance for Well-Being as Compared to Other Livelihood Endeavors as Ranked Focus Group Farmers: Results of Farmers Allocating a Total of 10 Seeds According to Perceived Importance of the Crop*

Crop	Lugari (Kakamega, Western Kenya)	Amairol (Busia, Western Kenya)	Awmanga-Akuko (Lango Diocese Uganda)	Katuna (Kabale, Uganda)
Amaranth	29 (1)	84 (1)	56 (1)	35 (1)
Maize	16 (3)	13 (2)	21 (7)	
Livestock	17 (2)	9 (5)	23 (6)	16 (3)
Greens	16 (3)			4 (6)
Banana	9 (4)	4 (8)		
Sunflower	4 (5)			
Cassava	4 (5)	5 (7)	36 (5)	
Sweet Potato	3 (6)	2 (10)	4 (9)	2 (8)
Millet		11 (4)		
Beans		12 (3)	44 (2)	14 (4)
Rice		6 (6)		
Cowpea		3 (9)	16 (8)	
Green Gram		11 (4)		
Ground Nuts			40 (3)	
Sesame			37 (4)	
Pumpkin			4 (9)	1 (9)
Irish Potato				19 (2)
Sorghum				5 (5)
Fruits				5 (5)
Cabbages				5 (5)
Carrots				3 (7)

***Notes:**

1. The first number is the actual number of seeds that farmers placed on each crop. The number in parentheses is the comparative ranking of the particular livelihood aspect for farmers within the focus group.

2. The number of farmers participating in the ranking exercise was often not the same as the number that participated in the estimation days of consumption, due to farmers arriving at varying times during the focus group sessions. In Awmanga-Akuko, the number of participants increased.

Table 4: Amaranth Motivators and Influencers: Results of Amairo Farmers Ranking Importance of Behavioral Influencers on Key Behaviors Related to Amaranth-- Using 10 Seed Voting*

Influencing Factor	Key Behaviors Related to Amaranth				
	Eating Grain Flour	Eating Leaves	Teaching Others About Amaranth	Adding Value, e.g., by Grinding or Popping	Selling
Good Teaching	23	24	17	19	14
Influence of Key Others	2	5	8	0	0
Health Benefits	20	16	14	14	15
Desire for Cash	24	15	17	18	22

*The farmers were given seeds and instructed to place the seeds under the behavior according to how much or how little they considered that a given influencing factor such as good teaching (usually by an NGO) had influenced them to practice the behavior, such as eating amaranth flour.

Observations: Although this activity was time-consuming to explain to farmers, it did provoke good discussion. Some of the highlights were:

1. Most of the people in the focus group had learned the importance of amaranth through the training by the NGO, Anglican Development Services.
2. People know that their neighbors also need more cash income, so they are inclined to share the idea of growing amaranth when there is a market for it.
3. Selling amaranth can improve family health because it is easier to get treatment for illnesses when one has money.
4. The value of the grain for potential sale is increased, more than 2X, by grinding it into flour.
5. Several testimonies of improved health aspects were shared: improved vision, improved thinking ability, relief from skin rashes, improved strength, improved resistance to illnesses, improved health of children.

Part II: Histories and Timelines on the Development of Amaranth: Narratives from World Renew Partner Organizations and Farmers Focus Groups

Introduction

This section combines historical information related by representatives of World Renew partner organizations and farmer focus groups. The partner representatives shared their recollection of development story of amaranth. The farmer focus group discussions elicited farmers' memories of how they have learned about and used amaranth.

1. **Ngaamba, Machokos District: Ngaamba Village** is located in a drought-prone area, about 2 hours east of Nairobi, at an elevation estimated at 1000m. There have been several drought years in which Ngaamba has appealed for food assistance via CRWRC and Canadian Food Grains Bank. In the year 1999 they were introduced to grain amaranth via visits by CRWRC staff, Thomas Post and Francis Muthoka, who contracted Dr. Davidson Mwangi. He trained the "Ngaaka" farmers' group on eating amaranth: mixed with maize for porridge, "ugali"---the corn flour staple, and as popped amaranth. Mwangi also instructed the farmers in production methods and promised to help them market their harvest. At first farmers tried amaranth in small plots, usually about 1/8 of an acre. It proved more drought resistant than

any other crop they grew, including millet. For a time they were able to market their amaranth grain to a maize miller in Nairobi, "on Kinyaga Road", at a price of \$ 250 Ksh/Kg. Later the price paid to them declined to 70 Ksh/Kg. Still later, when the CRWRC staff person retired, the Ngaamba group lost their transport and connection to the market in Nairobi. Currently they sell small amounts of amaranth grain in their local market at 100 Ksh/Kg.

In spite of marketing disappointments, 8 out of 21 farmers present in the focus group continue growing amaranth for their family use. They view grain amaranth as a valuable nutritional supplement, of special importance for people living with AIDS, because it is considered to boost the immune system. Usually farmers in Ngaamba who grow amaranth plant it in rows interspersed among their maize and bean fields. They have noticed that amaranth seems to grow better when intercropped with beans, but seems to compete with maize for light and water if intercropped with maize. They estimated that their average amount of amaranth comes to about ¼ acre with an estimated yield from this area of 60 to 70 kg, depending on the soil fertility. Those who have stopped growing amaranth cited their main reasons as lack of market and being reluctant to change their diet, preferring to continue their traditional ways of eating instead of incorporating amaranth.

As a nutritional supplement the Ngaamba farmers highlighted the benefit of eating amaranth-maize or amaranth-millet porridge for breakfast and of eating the leaves mixed with leaves of kale and tomato, cooked lightly in oil. The Ngaamba farmers have sold amaranth seed to many other farmers from neighboring villages, and have also sourced new seed from the Kenya Agricultural Research Institute at the price of 1000 Ksh/kg.

Conclusion: The Ngaamba farmers provide evidence that the use of amaranth as a nutritional supplement crop in semi-arid areas is sustainable over a 10 year period. They have continued growing amaranth, adopted inter-cropping practices with it, sourced for new seed, and adapted it to local food preparations---- all signs of sustainability.

2a.Lugari&AmairoKakamega, Western Kenya (Anglican Development Services (ADS): at elevations ranging around 1500 m): Peter Moody, director of Anglican Development Services (ADS), recounted that his organization was introduced to grain amaranth in the year 2000, when World Renew sponsored Dr. Davidson Mwangi to share his knowledge and seeds with their organization. Some key lessons that Peter Moody shared with us:

- For farmers with sufficient land, especially those who had lost cotton as a cash crop, the prospect of being able to sell amaranth grain to millers in Nairobi, as had been promised by Dr. Mwangi---caused great excitement. Within two years, approximately 200 farmers had produced about 2000 kg of amaranth. However, disillusionment set in when the Krinaga Millers in Nairobi could not buy all the production.
- Sid and Audrey Kramer, World Renew volunteers came in 2006 and taught them how to use amaranth as food. (This was the volunteer couple whose involvement was made possible by CFGB funding.)
- Now, in 2014, some farmers with whom ADS works are milling their own grain.
- Now two companies are buying amaranth grain from Western Kenya: INCAS, and Pure Health Company
- Under the guidance of Peter Okwako, head of the ADS business development department, ADS itself markets some amaranth flour to a comprehensive care center for HIV positive patients and to two child development centers (ADS buys grain amaranth from farmers at 60 KSH/Kg and the selling price is 150 KSH/kg), as well as small amounts to three orphanages.

(Western Kenya has had a high AIDS infection rate.) There is a possibility that these health-related organizations may have kept growth and health records for future research follow up.

- The comparison between amaranth grain and maize prices paid to farmers are amaranth 60 KSh/Kg, and maize: ranging from 15 to 42 KSh/Kg, depending on the supply in the market.
- Peter Moody suggested that the size of land holdings contributes to farmer's ability to dedicate land to amaranth. He also estimated that 20% of the Lugari farmers are growing amaranth at ¼ acre, 65% at ½ acre, and 15% at 1 acre or greater levels. For our two focus group areas: Lugari is considered by Peter Moody, to have relatively large land holdings per farmer as compared to the Busia area in which Amairo is located.

2b. Lugari Farmers' Amaranth Timeline Story

2006:

- In 2006 Lugari farmers entered into a partnership with ADS of western Kenya. A "Pastor Joseph" was trained by ADS and brought the amaranth idea to Lugari. In 2006 they produced 14 tons of amaranth grain, valued at 560,000 KSh.
- Members were selling individually
- 8 members were trained, via a World Renew project that was funded by Foods Resource Bank (FRB) on seed bulking and storing.

2007:

- The farmers organized themselves better
- They produced 40 tons of grain, and sold it for 1.6 Million (M) KSh.
- Their buyer was the INCAS Company in Nairobi who sent a truck to transport the grain the farmers had collected.
- INCAS promoted amaranth as boosting the human immune system against AIDS.
- The reserved a part of their harvest for their own food consumption.

2008:

- They produced 52 tons of grain, and sold it for 2.08 M KSh.
- They experienced the challenge that golden and white colored seed were mixed.
- Also, they saw some black amaranth seed in their harvest. (An indicator of crossing by the wild-weedy types of amaranth.)

2009:

- When the farmers discovered that flour milled from grain amaranth was selling at 200 KSH/Kg, (more than double the prices paid for grain to the farmers) they started organizing themselves to obtain their own grinding mill. Via a proposal they made to Western Kenya Community Development Fund the farmers obtained a grant of 3.2 M KSh for processing equipment.
- Upon receiving the processing plant the farmers struggled with challenges of insufficient capital to pay cash for grain, competition from outside middle men who could offer cash for grain, and the INCAS Company required them to have a group bank account.
- A few farmers ground and sold amaranth flour as individuals. One of these won first prize for this work at the annual Nairobi Agriculture Show.

2010 to 2012:

- The processing equipment was in the village but was not installed due to lack of funds. So, the farmers raised funds from community members and politicians. Their former building was inadequate and ADS required that they build a new one---for which the farmers raised funds via membership fees. The grain cleaner arrived from Denmark.
- KENFAD did a video on the work of the Lugari amaranth farmers.

2013-2014

- Their de-stoner and grinding mill finally began operations and the Lugari amaranth cooperative started selling flour.
- There are now 3000 growers with 209 being members of the coop.
- They face the challenge of obtaining quality certification from the government.
- Some of their farmers are able to grow 3 crops of amaranth per year. We visited one of their members, Beatrice. She harvests about 240 kg from her ¼ acre plot. She has to rotate her amaranth planting due to amaranth's high demands on the soil fertility. She mixes amaranth flour with finger millet flour for her porridge.

General Observations on Lugari:

1. This farmers' group was the most advanced in terms of commercialization and number of amaranth producers. They are also very blessed to be located in a region having well-distributed rains that permit multiple crops of amaranth.
2. Challenges mentioned: obtaining quality certification, obtaining enough working capital to maintain cash flow.

2c. Amairo, Busia Farmers' Amaranth Timeline Story

Introductory information by Bramwell and Irene, the ADS regional staff:

Climate & Growing Seasons:

December, January and February are mostly dry. April-May is the first rains and the time when the first amaranth crop can be planted. The crop takes 65 to 75 days to mature. A second crop can be planted in July, after the pause in the rains is finished, and a third crop in October. Irene is promoting amaranth to 14 groups, of which several are HIV-AIDS support groups. According to Irene, there is huge potential to exploit amaranth's nutritional benefits for health of children, adults and people living with AIDS.

2002:

- They started their community self-help group

2004

- They heard about amaranth and wanted to plant it for cash, because of their poverty and health problems.
- 15 people planted amaranth, hoping to earn cash. They observed that it was a short-term, rapidly maturing crop that could help them, but the selling price was only 18 KSH/Kg.

2005-2006:

- ADS trained them and gave them seed.
- The market price proved disappointing, at 30 KSH/Kg.
- Most of those who tried growing amaranth tried it on ¼ acre and produced from 20 Kg to 60 kg. A few tried it on ½ acre, with the highest producer harvesting about 300 Kg/acre.
- However, they did not eat the grain---because they did not know that the grain could be used as human food and did not know how to prepare it. They only ate some of the amaranth leaves and fed the grain to their chickens.
- In 2006 they were trained by Sid and Audrey Kramer on how to both grow and cook amaranth for human food.

2007:

- They received further training on planting, harvesting, marketing and grain storage from the Kenya Agriculture Research Institute (KARI). This was organized by ADS and 5 members of the Amairo group went to this training.
- The price they received for their grain was only 20 KSH/Kg.

2007-2012:

- They “died to selling” amaranth because the price was so low!
- But, they continued to grow it for their own consumption.

2013-2014:

- ADS helped them set up collection/storage points so that ADS can easily buy from them.
- The price of amaranth grain improved to 60 KSH/Kg.
- More farmers joined the group. Now the Amairo collection center has about 250 participating farmers.
- They make their own amaranth flour, using the same village grinding mill that is used to grind maize and millet. However, the mill has to repeat grind the amaranth, due to the small seed size.
- Now they continue to consume because they understand the food value of amaranth.
- The mothers in the focus group said that they start feeding amaranth porridge to their babies at age 6 months, i.e., as a post-weaning food.

Observations:

1. This self-help group showed a lot of enthusiasm even though they face some challenges such as:
 - Low soil fertility in combination with the heavy feeding characteristic of the amaranth plants.
 - Stem borer attacks on the amaranth were reported
 - Seed degeneration occurs and there is need to buy fresh seed after 3 planting cycles.
 - The amaranth collection building seemed too hot, lacking shade.
 - One farmer we visited was not following good spacing and weeding practice, having tried to save time by broadcasting the seed.
 - We were served amaranth-millet porridge for lunch---quite good!
2. Lessons learned from experience:
 - Start with a self-consumption, nutritional approach. Only later enter into marketing.
 - Accompany amaranth teaching with teaching on restoring soil fertility.
3. Challenges mentioned by the Amairo farmers:
 - Seed purity vis a vis crossing by wild types.
 - Drying the harvest when there is rain.
 - Ensuring cleanliness of the grain when there are not clean tarps for threshing.
 - Stem borer attacks.
 - Some concern with amaranth becoming a weed in succeeding crops.

Part III: Lango Diocese, Church of Uganda, Amwanga Aduku Village

Introductory information by Diocesan secretary, Rev. Captain Peter Ocweo. Further introductory information from staff people: Hudson, George and Ebong.

Ecological info: The elevation in Lango is about 1080 m. There are two rainy seasons: March-June, and August-October.

History from the church secretary's point of view: "Amaranth took off very well!....Some friends from Canada taught about using amaranth in porridge, mandaazi, etc....It was like a gospel of amaranth was preached, but the fulfillment was delayed like the coming of Christ....people were expecting a good market for their amaranth, but it did not turn out....people used to have cotton as a cash crop...the gospel was that amaranth was nutritious and marketable...the marketable was the disappointment....here the land is fertile and they can grow amaranth, but now they have gone back to growing sesame...my father-in-law had a stroke, half of his body was paralyzed and had difficulties walking and talking. He started eating amaranth and can now sustain a conversation and walk 2 km. He eats amaranth every day....so, I do believe in amaranth nutrition!"

(Note: The "friends from Canada were references to the World Renew volunteers, Sid and Audrey Kramer. We learned later that it was actually a former staff of the Lango Diocese who had promised the farmers a market for their amaranth).

3a. Aduku Village Focus Group Timeline Story

2008:

- Peter Allele, now a resident of Aduku, was then a field officer for the Diocese of Lango when amaranth was introduced. Peter had a heart condition, but by eating GA since 2001, he feels better.
- Sid and Audrey Kramer, volunteers from World Renew, collaborated with Peter in the training of 2 mobilizers from Aduku who trained the other farmers. Tim Dam was the World Renew consultant to the diocese. Peter continued the training efforts of Sid and Audrey. Many people became interested in growing amaranth, even though they did not yet have seed.
- The training efforts included field demonstrations of amaranth growing, demonstrations at hospitals and schools. Peter Allele also trained Maganjo grain millers, a milling company in Kampala on how to prepare amaranth flour.

2009:

- Peter Allele brought amaranth seeds for planting, but there was only enough seed for 5 people.

2010:

- They multiplied the seed.

2011-2014

- They trained more people on how to use amaranth products: flour for porridge and popped amaranth, and amaranth in bread.
- Many more people became interested, e.g., all 100 people in the community health program became interested.
- They discovered that when you are sick and eat amaranth it makes you healthy. Aduku Testimony #1: "I was so sick I could barely drink water, and then I started eating amaranth. My CD-4 count was only 98, but now it is 604!" Aduku Testimony #2: "Eating the leaves of wild amaranth used to make me have diarrhea. But, this does not happen when I eat the leaves of grain amaranth..... When I started eating amaranth I gained strength and got pregnant. My baby would play inside of me (gestures of a baby kicking and dancing inside the mother!) The baby was so active that I went to the hospital to see if the baby was normal. I took amaranth throughout my pregnancy. My child has been more vigorous and more resistant to illnesses than my previous children."
- For Animals: It helps chickens recover from coccidiosis, and pigs get fat fast if they eat amaranth leaves.

- Peter Allele tried to interest local hospitals and clinics to buy amaranth grain and flour, but so far has found little market.

Observations:

1. The World Renew consultant for this partner, Edward Okiror, was pleasantly surprised that this village was still growing and using amaranth. In 2010, Edward took amaranth seed from this same area in Lango Diocese, to provide seed for the Pentecostal Assemblies of God partnering organization in Kabale.

3b. Lango Diocese, based in Lira Town, Church of Uganda, Oketo Bilo Village

Introduction: Our focus group activities in this village were curtailed due to an intense rain storm that prevented us from hearing each other under the metal roof of a church. However, we were able to carry out a shortened interview with 16 people who have a home-based care group for people living with AIDS.

Highlights & Findings of the interview:

- They first learned about grain amaranth from the World Renew volunteers, Sid and Audrey Kramer, in 2008.
- There is a 13% prevalence rate of HIV in this area.
- Benefits of eating amaranth cited:
- Gives you energy
- You can eat both the grain and the leaves
- Eating the roots has an aphrodisiac effect on men and helps alleviate tonsillitis; eating the stems is good for ringworm; eating amaranth helps malnourished children and alleviates skin rashes.
- You can easily prepare amaranth flour for eating: by mixing it with maize or millet flour, boiling it in water with some lemon grass for flavor; or you can use amaranth flour in soup, making a curry-like dish.
- People living with AIDS have noticed that when they eat less amaranth their health declines.

Challenges cited:

- This community has noticed increasing amounts of black seeds in the golden and white grain amaranth. This is due to crossing with the native wild types.
- The two people from this village who received the training on amaranth were transferred to a different village.
- Currently there is no avenue for marketing the amaranth. These people want both: health---from eating the amaranth, and money from being able to sell it!
- If there is too much moisture in the grain when it is stored it spoils.
- The farmers were not trained well in seed selection. When farmers do not rogue out black seeded plants, their seed for the next generation degenerates fast.
- They don't have a source of reliable pure seed.
- In the past amaranth may have been stigmatized as a crop for people who have AIDS. However, now, when people see that malnourished children recover by eating amaranth, they want it for their children, too.

Observations:

- The Lango Diocese has 3 staff to work with 19 communities. There has also been staff turnover. The present staff may have not been trained on amaranth production and consumption themselves.

These may be reasons that explain why the need for fresh seed (available in Kenya) and the need for follow up training in communities, e.g., for using amaranth as a nutritional supplement for children---have gone unattended. However, proving that amaranth consumption has a positive impact on health and nutrition has been accomplished!

- Seed selection and seed supply need to be addressed.
- The Oketo-Bilo AIDS support group stated that they keep their own health records after visits to the regional hospital. This would seem to make follow-up studies to track the effect of amaranth on AIDS patients more challenging.
- Even people living with AIDS, who need the amaranth in their own diets, as are the people in this care group, insist that having a market is crucial.

Part IV: Kabale Pentecostal Assemblies of God, PAG, SW Uganda

Introduction: Environmental and Contextual information shared by the PAG staff:

- Elevation: Approximately 2000 m
- Average land holding per farmer: 0.5 acre
- Two rainy seasons: March-April and September-October----thus two planting seasons that are also appropriate for planting amaranth
- Main food crop: Irish potato
- Climate change observation: they have noticed a warming and lessening of foggy conditions
- Reforestation: There has been a large scale planting of pine trees in the last five years
- Nutritional situation: Kabale is one of the regions of Uganda a high rate of child stunting, at over 40%.

(The USAID-funded “Community Connector” program is also promoting amaranth use as a nutritional supplement.)

PAG staff observations regarding amaranth promotional work:

- Participants: PAG reached a peak of 2000 participating farmers growing amaranth. The main focus of PAG was on amaranth as a nutrition supplement for people living with AIDS. World Renew funded part of this promotion via an EMBRACE AIDS grant to PAG. This number of amaranth farmers has now fallen, due to marketing disappointments.
- Health impacts: PAG has observed frequent cases of CD-4 counts doubling and even tripling in 6 months when people living with AIDs consume amaranth grain and/or leaves. However, PAG has not focused on supplementing children’s diets with amaranth. The Community Connector program is doing this.
- Consumption form: The most commonly accepted form of consuming amaranth is in porridge that is a mixture of amaranth flour with either maize or millet flour. Historically people ate the leaves of a local variety of amaranth, “omuridi,” but sometimes this caused diarrhea when eaten by people living with AIDS. Leaves of the grain type introduced by the Kramers do not cause diarrhea.
- Seed type: They are still promoting the same golden-seeded variety that the World Renew volunteers, the Kramers, brought them in 2008.
- Promotional activities known about by PAG staff:
 - They have placed a poster at the regional hospital that explains the benefits of amaranth. Yet, the hospital does not purchase amaranth. Patients’ families bring food to feed family members and the hospital does not provide food.

- They have used the local Christian radio station to promote amaranth
- The USAID-funded nutrition program, “Community Connector” is also promoting the use of amaranth. USAID has prioritized Kabale for nutrition emphasis because the child stunting rate in Kabala is over 40%. Community Connector requires all its participants to have an amaranth garden.

4a. Katuna Village Focus Group Timeline Story (Very close to the border with Rwanda)

2008:

- Amaranth was promoted by PAG, with training from Sid and Audrey Kramer
- Many families started growing, producing 40 to 100 Kg/ family, and consuming it, noticing positive health impacts.

2009:

- Many positive stories started arising: of improved CD-4 counts
- There was discouragement because there was little market
- Struggles: Lack of tarps for cleaning the amaranth, some pests such as aphids, you could not plant amaranth 2X in succession, due to its heavy nutrient requirements.

2010:

- Fewer people planted and fewer people consumed amaranth due to marketing disillusionment

2011-2014

- In 2013 PAG did more training on consuming amaranth, but most of this promotional work was focused on people living with AIDS. The pastor of the PAG group in Katuna stated that “In 2008 we were living as a church in our community with people who had AIDS, but we had nothing to give them. Now, we can offer those seeds of amaranth. The market is a problem, but life is better than money, so we encourage people to plant it!”
- Benefits noted: CD-4 counts increase, memory of both children and adults improves, peoples’ skin becomes more smooth, skin rashes disappear, and it gives some cash income when it can be sold in the local market.
- Challenges noted:
 - Aphids become problematic---especially in the second time amaranth is planted on the same land.
 - Marketing to neighbors has become difficult because now they have their own plots of amaranth.
 - Birds are attracted to ripening amaranth grain, but now they try to plant sorghum at the same time to lure the birds away.
 - Rats eat the stored grain
 - Harvesting is a time consuming process
 - Soil exhaustion: even with animal manure, yields are low when you plant amaranth on the same plot twice in succession.
- Price observations: (Note: About 2550 Ugandan Shillings equal \$1US)
 - At one point the price of amaranth flour was up to 10,000 Ugandan Shillings (Ush)/ Kg.
 - Currently the price of amaranth flour is 5000 Ush/Kg, and the price of amaranth grain is about 3000 Ush/Kg.

Notes:

1. 8/13 focus group members grew amaranth in the last growing season, with 5/13 of the focus harvesting under 10Kg of grain, with only 1/13 harvesting more than 10 Kg. Yet, this focus group ranked amaranth as their most important crop for their well-being because of its positive effects on their health.
2. Testimony: Jane, a widow, 45 years of age, 4 children, the youngest child is HIV +. When her husband died in 2004 the village discriminated against her. She used to sell avocados and then villagers accused her of putting her own blood into the avocados. She took Jeremiah 33:2 as her hope: "Call on me, and I will show you good things." The time came when she received one teaspoon of grain amaranth seed. At that time her CD-4 count was 145. When she got anti-retroviral medicine her count improved to 500; when she started eating amaranth it improved to 800 and then next measurement was 1250. Before, her stomach used to feel sick after she ate, but eating amaranth helped her stomach. Her youngest child is healthy, with a CD-4 count of 1574 and a viral load of 20%. Now Jane continues to grow amaranth, intercropping it with other crops, and selling some. She tells everybody about amaranth! Her testimony is Psalm 118:17: "I will not die but live, and will proclaim what the Lord has done..." Through translation, Jane's statement of this verse was: "I was dying but God picked me up again. I believed that I would live to tell people."
3. Ways of eating: Steam amaranth leaves on top of beans or other foods, add spoons of amaranth flour to maize or millet porridge. If you are very unhealthy mix amaranth flour at 1:1 ratio with the other flours.

Appendix II: Synthesis of Farmer Survey Data: Amaranth Evaluation March-April 2014

Section A: General Information on Farmers Surveyed

Data collection was conducted in the months of March and April and all the data was collected was done so with help from partner staff.

Samples were drawn from three Countries: Kenya, Tanzania and Uganda. 484 farmers were interviewed and consisted of 276, 61 and 147 respondents respectively. 4 of the questionnaires collected from Kenya had a lot of missing data and hence the analysis used 272 questionnaires from Kenya.

Specifically, the data was drawn from the following areas in the three countries.

Table 1: Locations of Farmer Surveys

Location	Country			Total
	Kenya	Uganda	Tanzania*	
Sangerema	0	0	11	11
Magu	0	0	50	50
Aduku**	0	48	0	48
Kabale**	0	49	0	49
Oyam	0	50	0	50
Western**	191	0	0	191
Mt Kenya	81	0	0	81
Total	272	147	61	480

*In Tanzania, the data collected was translated from English to Kiswahili and back to English during the data entry process.

**These communities were also included in the farmer focus group activities whose findings are contained in [Appendix I](#).

Table 2: Responses: Is the respondent an old or new farmer?*

Type of Farmer		Country			Total
		Kenya	Uganda	Tanzania	
Type of Farmer	Old farmer	232	105	32	369
	New farmer	40	42	29	111
Total		272	147	61	480

*Old farmer was understood to mean a farmer who began growing amaranth during a promotion by the NGO partner of World Renew; while “new farmer” was understood to mean someone who began growing amaranth after the NGO partner ceased formal promotional work.

Table 3: Responses: What is the primary occupation of the head of the household?

Occupation	Country			Total
	Kenya	Uganda	Tanzania	
Casual Laborer	27	0	2	29
Salaried Employee	31	3	5	39
Farmer	214	144	52	408
Small scale Business Person	0	0	2	2
Total	272	147	61	480

Table 4: How many members does your household have?

No of Members	Country			Total
	Kenya	Uganda	Tanzania	
<5 members	98	44	12	154
5-10 members	146	88	42	276
>10 members	28	15	7	50
Total	272	147	61	480

Table 5: Have you ever grown grain amaranth?

Response	Country			Total
	Kenya	Uganda	Tanzania	
Yes	271	147	54	472
No	0	0	6	6
Total	271	147	60	478

Table 6: What made you start growing grain amaranth?

Reasons for Growing Amaranth	Country			Total
	Kenya	Uganda	Tanzania	
Nutrition	44	33	2	79
Income generation	96	14	1	111
Heard from Neighbors	8	1	2	11
Heard from NGO/ CBO	10	15	3	28
Experiment	5	0	0	5
Total	272	147	61	480

Table 7: Are you currently growing grain amaranth?

Responses	Country			Total
	Kenya	Uganda	Tanzania	
Yes	218	95	53	366*
No	52	52	2	106
Total	270	147	55	472

Table 8: If yes, when did you start growing grain amaranth?

How long ago did you start growing amaranth?	Country			Total
	Kenya	Uganda	Tanzania	
Less than a year	12	3	3	18
1-3 Years	54	39	42	135
>3-6 Years	52	44	8	104
>6-9 Years	45	25	0	70
>10 Years	71	0	0	71
Total	234	111	53	398*

*Enumerators for the farmer survey may have not counted some farmers in the responses tabulated in Table 7 that are tabulated in Table 8

Table 9: Did you start growing grain amaranth and have stopped?

	Country			Total
	Kenya	Uganda	Tanzania	
Yes	99	57	23	179*
No	171	90	36	297
Total	270	147	59	476

Table 10: If you stopped, why did you stop growing grain amaranth?

Reasons Given for Stopping	Country			Total
	Kenya	Uganda	Tanzania	
Financial reason	7	6	0	13
Environmental reason*	16	10	21	47
No market for produce	66	26	0	92
Lost interest	1	5	0	6
Other reasons	11	10	7	28
Total	101	57	28	186*

Notes on Tables 9 and 10: *Environmental reasons would include erratic rainfall, bird damage, etc.

*Apparently there was an error by the enumerators that produced a difference between the number of 186 in Table 10 and the number 179 in Table 9.

Table 11: Size of Villages in Farmer Survey: Approximately, how many households are in this village?

Farmers' Estimated No of Households in Their Village	Country			Total
	Kenya	Uganda	Tanzania	
<50 Households	8	9	9	26
50-100 Households	153	14	0	163
>100-150 Households	71	17	1	89
>150-200 Households	5	50	5	60
>200 Households	27	57	43	127
Don't know	8	0	2	10
Total	272	147	60	479

Table 12: Farmers' Estimates on Percentage of Households in Their Village Presently Growing Grain Amaranth

Farmers' Estimate (%)	Country			Total
	Kenya	Uganda	Tanzania	
25	151	129	46	326
50	57	7	7	71
75	55	1	0	56
100	2	10	0	12
Total	265	147	53	465

Table 13: Has any household learnt about growing grain amaranth from you/your household?

Responses	Country			Total
	Kenya	Uganda	Tanzania	
Yes	200	130	48	378
No	61	17	13	91
22	2	0	0	2
Total	263	147	61	471

Table 14: How many households have learnt about growing grain amaranth from you/your household?

Estimated Number	Country			Total
	Kenya	Uganda	Tanzania	
<10 Households	88	82	37	207
10-30 Households	89	32	6	125
>30-60 Households	12	12	2	26
>60-90 Households	5	0	2	7
>100 Households	4	4	0	8
None	16	0	1	17
Total	214	130	48	392

Section C: Acreage and Production of Grain Amaranth

Table 15: Land Holding: How much lands do you and your household own?

Estimated Acreage	Country			Total
	Kenya	Uganda	Tanzania	
<1 Acre	52	25	0	77
1-2 Acres	90	25	9	124
>2-4 Acres	70	42	12	124
>4-6 Acres	33	30	11	74
>6-8 Acres	18	7	10	35
>8-10 Acres	0	8	4	12
>10 Acres	4	10	9	23
Total	267	147	55	469

Table 16: How much land did you and your household use for growing grain amaranth in the last season?*

Acreage Estimated	Country			Total
	Kenya	Uganda	Tanzania	
1/4 Acre	124	105	28	257
1/2 Acre	62	36	20	118
3/4 Acre	26	1	0	27
1-2 Acres	41	5	5	51
Total	253	147	53	453*

*Results reported in Table X showed 366 farmers surveyed grew amaranth last year. Farmers may have understood the question: "How much land did you and your household use for growing amaranth in the last season?" as meaning during the season when they last grew it. This would have counted the land used by farmers who had stopped growing amaranth at the time of the survey. However, it is clear that the majority of farmers surveyed are using ¼ acre or less for growing amaranth.

Table 17: Do you grow amaranth for the grain and/or the green vegetables?

Response	Country			Total
	Kenya	Uganda	Tanzania	
Grain	55	7	0	62
Green vegetables	0	4	0	4
Grain and Green vegetables	196	136	53	385
Total	251	147	53	451

Table 18: How much grain amaranth did you harvest last growing season?

Estimated Harvest	Country			Total
	Kenya	Uganda	Tanzania	
<10 Kg	39	63	31	133
10-30 Kg	79	58	10	147
>30-60 Kg	70	19	7	96
>60-90 Kg	22	0	1	23
>90-120 Kg	2	4	2	8
>120-150 Kg	2	3	2	7
>150 Kg	32	0	0	32
Total	246	147	53	446

Table 19: How much of the amaranth grain harvested in the last season was eaten in your household?

Proportion of Grain Eaten by Household	Country			Total
	Kenya	Uganda	Tanzania	
1/4	171	33	23	227
1/2	14	26	22	62
3/4	11	15	4	30
All	31	60	0	91
None	12	13	2	27
Total	239	147	51	437

Table 20: How much of the amaranth grain harvested in the last season was sold?

Estimated Proportion Sold	Country			Total
	Kenya	Uganda	Tanzania	
1/4	16	12	26	54
1/2	19	29	10	58
3/4	152	19	7	178
All	20	4	0	24
None	26	83	10	119
Total	233	147	53	433

Table 21: Approximately, how much amaranth green vegetable did you harvest last growing season?

Estimated Weight of Amaranth Leaves Harvested	Country			Total
	Kenya	Uganda	Tanzania	
<10 Kg	36	14	28	78
10-30 Kg	129	114	14	257
>30-60 Kg	48	6	6	60
>60-90 Kg	16	5	5	26
>90-120 Kg	0	3	0	3
>120-150 Kg	2	0	0	2
Total	231	142	53	426

Table 22: How much of the amaranth green vegetable harvested in the last season was eaten in your household?

Estimated Proportion of Leaves Eaten by Household	Country			Total
	Kenya	Uganda	Tanzania	
1/4	88	21	33	142
1/2	32	51	13	96
3/4	17	5	5	27
All	91	70	0	161
None	27	0	2	29
Total	255	147	53	455

Table 23: How much of the amaranth green vegetable harvested in the last season was sold?

Estimated Proportion of Leaves Sold	Country			Total
	Kenya	Uganda	Tanzania	
1/4	70	15	36	121
1/2	18	27	12	57
3/4	13	5	3	21
None	147	100	2	249
Total	248	147	53	448

Table 24: What price per Kilo, did you receive for the amaranth grain sold?

Estimated Price/Kg Received for Grain*	Country			Total
	Kenya	Uganda	Tanzania	
0-0.5 USD	40	12	44	96
0.5-5 USD	176	40	9	225
5-10 USD	5	8	0	13
Didn't sell	0	82	0	82
Total	221	142	53	416

*Price estimated were converted to \$US from original estimates in Kenyan, Ugandan, and Tanzanian currencies. * Farmer focus groups in Kenya estimated per/kg prices at 60Ksh/Kg or about \$US 0.72/Kg (Lugari, Western Kenya). In SW Uganda the local market prices estimated by PAG staff were 3000 Ug Sh/Kg (\$1.20 US/Kg) for grain and 5000 Ug Shs (\$2.00 US/Kg for amaranth flour).

Table 25: What price per Kilo, did you receive for the amaranth green vegetables sold?

Estimated Price/Kg Received for leaves	Country			Total
	Kenya	Uganda	Tanzania	
0-0.5 USD	41	36	48	125
0.5-5 USD	45	3	2	50
5-10 USD	7	0	2	9
30-50 USD	0	3	0	3
Didn't sell	0	100	1	101
Total	93	142	53	288

Table 26: What total amount did you receive from sale of amaranth products in the last season?

Estimated Per Farmer Incomes: Amaranth Sales	Country			Total
	Kenya	Uganda	Tanzania	
0-10 USD	31	42	44	117
>10- 50 USD	107	23	9	139
>50- 100 USD	49	0	0	49
>100- 150 USD	9	0	0	9
>250 USD	0	3	0	3
Total	196	68	53	317

Table 27: How do/did you manage pests and worms of grain amaranth?

Pest Control Methods Used by Farmers	Country			Total
	Kenya	Uganda	Tanzania	
Spraying*	78	80	20	178
None	154	35	27	216
Fertilizer	0	0	1	1
Don't know	7	0	1	8
Remove infected plants	5	19	0	24
Using Ashes	19	13	6	38
Total	263	147	55	465

*The most common spray mentioned was Karate: "A broad spectrum synthetic parathyroid insecticide for the control of biting, chewing and sucking insect pests in French Beans, Peas and Ornamental Flowers."

Table 28: How do/did you store your grain amaranth after harvest?

Storage Method Used	Country			Total
	Kenya	Uganda	Tanzania	
Storage bags*	161	119	41	321
Open storage	48	3	0	51
None	30	10	2	42
Don't know	0	0	1	1
Bucket	22	10	11	43
Granary	2	0	0	2
Sugar bags*	0	5	0	5
Total	263	147	55	465

*Both storage bags and sugar bags were named by farmers. They could be the same.

Table 29: How do/did you store your amaranth green vegetables after harvest?

Leaf Storage Methods Named	Country			Total
	Kenya	Uganda	Tanzania	
Store in a basin/ sack and sprinkle with water	19	2	47	68
Eat/ sell immediately don't store	172	135	0	307
Don't know	68	2	8	78
Drying	4	8	0	12
Total	263	147	55	465

Section D: Utilization of Grain Amaranth

Table 30: D1. Why do you grow grain amaranth?

Reasons Named	Country			Total
	Kenya	Uganda	Tanzania	
Eat	26	30	2	58
Sell	19	0	2	21
Eat and Sell	214	117	51	382
Total	259	147	55	461

Table 31: Does your household consume amaranth grain?

Responses	Country			Total
	Kenya	Uganda	Tanzania	
Yes	225	147	49	421
No	34	0	12	46
Total	259	147	61	467

Table 32: Does your household consume amaranth green vegetables?

Responses on Consumption	Country			Total
	Kenya	Uganda	Tanzania	
Yes	238	144	54	436
No	15	0	6	21
11	0	3	0	3
Total	253	147	60	460

Table 33: Does your household consume the grain more than the green vegetables?

Grain vs. Leaf Consumption	Country			Total
	Kenya	Uganda	Tanzania	
Use grain more	66	43	2	111
Use green vegetables more	178	101	53	332
Total	244	144	55	443

Table 34: How many times in a week does your household consume the amaranth green vegetables?

Frequency of Consumption: Leaves	Country			Total
	Kenya	Uganda	Tanzania	
Once a week	11	0	0	11
Twice a week	55	32	11	98
Three times a week	49	39	30	118
Four times a week	37	35	8	80
>Four times a week	82	41	5	128
Total	234	147	54	435

Table 35: How many times in a week does your household consume the amaranth grain?

Frequency of Consumption: Grain	Country			Total
	Kenya	Uganda	Tanzania	
Once a week	28	20	6	54
Twice a week	26	61	24	111
Three times a week	48	22	20	90
Four times a week	27	14	0	41
>Four times a week	96	30	2	128
Total	225	147	52	424

Note: How many times/week could be a big reason for variable health impact? This would need more research to find out the minimum daily intake and daily frequency needed.

Table 36: How many days in a week, would you estimate your household's consumption of amaranth (green vegetables and grain)

Frequency of Consumption: Leaves & Grain Combined	Country			Total
	Kenya	Uganda	Tanzania	
Once a week	4	6	2	12
Twice a week	31	16	22	69
Three times a week	65	14	19	98
Four times a week	44	12	6	62
>Four times a week	90	99	3	192
Total	234	147	52	433

Table 37: What ways do you commonly prepare grain amaranth in your household?

	Country			Total
	Kenya	Uganda	Tanzania	
Popping	17	36	16	69
Porridge	169	82	34	285
Popping and Porridge	14	19	0	33
Other	9	0	5	14
Popping and other	0	4	0	4
Porridge and Other	12	0	0	12
Popping, Porridge and Other	9	6	0	15
Total	230	147	55	432

Note: Porridge is the most popular consumption method. This could be a way of providing the 20 to 40 grams/day/person that is recommended by the findings from Mexico.

Table 38: What ways do you commonly prepare amaranth green vegetables in your household?

	Country			Total
	Kenya	Uganda	Tanzania	
Boiling	93	49	49	191
Frying	144	95	6	245
Boiling and Frying	6	3	0	9
Total	243	147	55	445

Section E: Health Benefits of Amaranth

Table 39: Do you think eating amaranth helps your health and the health of your household members?

	Country			Total
	Kenya	Uganda	Tanzania	
Yes	254	147	55	456
No	9	0	0	9
Total	263	147	55	465

Note: Farmers have a nearly unanimous impression that amaranth helps their health.

Table 40: If Yes, What health difference do you see in your household members because of grain amaranth?

Differences Named	Country			Total
	Kenya	Uganda	Tanzania	
No health differences	19	0	6	25
Boosts body immune system	61	31	3	95
Nutritious for children	29	50	3	82
Aids in treatment of various ailments	86	37	39	162
Nutritious for all family members	77	29	10	116
Total	272	147	61	480

Table 41: Are there any negative effects in consumption of grain amaranth?

Responses re Negative Effects Observed	Country			Total
	Kenya	Uganda	Tanzania	
Yes	7	0	0	7
No	265	147	61	473
Total	272	147	61	480

Unfortunately, the negative effects were not described.

Table 42: What are the 2 most important advantages about growing grain amaranth compared to other crops?*

Advantages Of Growing Grain Amaranth Over Other Crops	Country			Total
	Kenya	Uganda	Tanzania	
Income generation	108	19	38	165
Less Laborious	20	11	1	32
Matures faster	97	70	2	169
Better selling price compared to Maize	3	0	0	3
Cost effective	9	4	2	6
Gives bounty harvest	9	10	0	19
Nutritious	22	33	18	73
Soil Nutrients	4			
Total	272	147	61	467

*Farmers were presented the list of potential advantages below and asked to select the two most important.

1. Income Generation
2. Less Laborious
3. Matures Faster
4. Better selling price compared to maize
5. Cost Effective
6. Increases soil nutrients
7. Gives bounty harvest
8. Nutritious
9. Medicinal
10. Drying Challenges

Table 43: What are the 2 most important challenges you have in growing grain amaranth compared to other crops?*

Challenges Named for Growing Grain Amaranth Over Other Crops	Country			Total
	Kenya	Uganda	Tanzania	
Difficult to market	60	60	12	132
Laborious during harvesting	40	23	1	64
None	5	12	0	17
Seeds turn to black (a sign of crossing with wild amaranths.)	8	6	2	16
Wilts easily	17	6	8	31
Challenges in Drying	15	0	0	15
Late payment	11	0	0	11
Mixes with off (wild) types affecting yield grade	40	0	3	43
Affected by unknown pests/ diseases/ birds	53	40	34	127
Needs a lot of organic manure	23	0	1	24
Total	272	147	61	480

*Farmers were presented the list of potential challenges below and asked to select the two most important they face.

1. Difficult to market
2. Poor pricing
3. Wilts easily
4. Challenges in drying
5. Poor germination during rains
6. Affected by unknown pests
7. Needs a lot of organic manure

Table 44: Marital status

Marital Status	Country			Total
	Kenya	Uganda	Tanzania	
Married monogamous	170	113	58	341
Married polygamous	63	12	1	76
Single	4	4	0	8
divorced	0	1	0	1
Widow	35	17	2	54
Total	272	147	61	480

Appendix III: Focus Group Activities and Discussion Guide

1. Introductions and Explanation of Purpose of the Evaluation
2. Ten Seed Farmer Assessment of the relative importance of amaranth for their well-being. Process:
 - a. Farmers named the most crops and livelihood factors for their well-being and quality of life, and the facilitators wrote them on large flip chart paper
 - b. Each participant was given ten seeds of *Dolichus lab.* (This seed was purchased in a supermarket in Kakamega, Kenya, and was chosen for its legume cover cropping and soil fertility restoring ability. At the end of the exercise farmers were given small quantities of these seeds to try in their farms).
 - c. Participants were instructed to distribute their seeds proportionally, i.e., alongside the respective crop or livestock name—according to its importance for their well-being.
 - d. Facilitators counted the number of seeds farmers placed by each crop or animal and tabulated all the results.
 - e. Facilitators then asked a series of clarifying questions. For example:
 - “Why did you rank amaranth higher than x?”
 - “What are the advantages of amaranth as compared to other crops?”
3. Seven Day Daily Dietary Recall to assess the importance of grain amaranth in the diet: Having ranked the importance of amaranth, farmers were asked to recall the previous week and remember how many days in that week they ate:
 - a. The grain (as flour or popped)
 - b. The leaves

The facilitators tabulated the results as frequency of farmers recalling eating amaranth grain or leave a given number of days per week. We asked users to share how they prepared the grain/flour of amaranth and the leaves for their family use, and recorded the recipes. The facilitators asked how many were actually growing amaranth presently, last season, how many were growing it on less than and more than $\frac{1}{4}$ acres, etc.

4. Ranking Amaranth Motivators and Influencers—Using Ten Seeds. In one village farmers ranked the relative importance of 4 potential influences as named by the facilitators—good teaching, influence of significant others, desire for health benefits, and desire for cash; on five key behaviors: eating grain-flour, eating leaves, teaching others about amaranth, adding value by grinding or popping, and selling. Farmers were asked to place seeds in the grid according to the importance of the various influencers. This activity proved quite time-consuming to explain to farmers. Thus, it was only carried out in Amairo Village in western Kenya.
5. Timeline History of the Story of Grain Amaranth Development: We asked the villagers to share their story of amaranth development from the year it began for them until the present. For the first 4 community sessions we simply asked participants to volunteer information in a plenary session and a member of the evaluation team wrote their comments down on flip chart paper. For the last 2 communities visited, we split the participants into small groups, and asked each small group to share events that occurred in specific periods of the timeline story. This proved to generate more participatory energy and discussion.

Appendix IV: Farmer Assessment Tool Promotion of Grain Amaranth Program in East Africa (1998-2008)

INTRODUCTION

Hello. My name is _____ and I am working with ----- (e.g.SISA or an organization in Magu). We are conducting a survey that asks about Grain Amaranth - experience, lessons and impact it has had in you and your household. We would very much appreciate your participation in this survey.

This information will help us assess and document the change that growing Amaranth has in our households and community. The survey usually takes _____ minutes to complete.

Whatever information you provide will be kept confidential and will not be shared with anyone other than members of our survey team.

Participation in this survey is voluntary, and if we should come to any question you don't want to answer, just let me know and I will go on to the next question; or you can stop the interview at any time. However, we hope that you will participate in this survey since your views are very important.

At this time, do you want to ask me anything about the survey?

May I begin the interview now?

Signature of interviewer: _____ Date: _____

RESPONDENT AGREES TO BE INTERVIEWED . . . 1

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED . . . 2 -----END

Study Number of Respondent: _____

1. **Interviewer Name:**

2. **Cluster No:** _____ **District:** _____ **Division:** _____ **Location:** _____
Sub-location: _____ **Village:** _____

3. **Date of Interview:** ____/____/____ (DD/MM/YYYY)

4. **Time of Interview:** ____:____ AM/PM (e.g. 10:50 AM)

5. Respondent Classification: PLEASE TICK ALL THAT APPLY

- Old Farmer
- New Farmer

NOTES:

Section A: Family Structure

A1. What is your marital status?

- 01 Married monogamous
- 02 Married polygamous
- 03 Together but unmarried
- 04 Single
- 05 Separated
- 06 Divorced
- 07 Widow
- 77 Other, please specify: _____
- 88 Don't know
- 99 Refused

A2. How many members does your household have?

- <5 Members
- 5-10 Members
- >10 Members

A3. What is the primary occupation of the head of the household?

- Casual Laborer
- Salaried Employee
- Farmer
- Student
- Not employed

Section B: Background Information

No.	Question	Response	
B1.	Have you ever grown grain amaranth?	<input type="checkbox"/> 01 Yes <input type="checkbox"/> 02 No	
B1a	What made you start growing grain amaranth?	_____ _____ _____	
B2.	Are you currently growing grain amaranth?	<input type="checkbox"/> 01 Yes <input type="checkbox"/> 02 No	If no, skip to B3
B2a	If yes, when did you start growing grain amaranth?	<input type="checkbox"/> Less than a year <input type="checkbox"/> 1 - 3 years <input type="checkbox"/> >3 - 6 years <input type="checkbox"/> >6 - 9 years <input type="checkbox"/> >10 years	
B3.	Did you start growing grain amaranth and stopped?	<input type="checkbox"/> 01 Yes <input type="checkbox"/> 02 No	If no, skip to 4
B3a	If yes, Why did you stop growing grain amaranth?	<input type="checkbox"/> Financial Reason <input type="checkbox"/> Environmental Reason <input type="checkbox"/> No market for produce <input type="checkbox"/> Lost interest <input type="checkbox"/> Other reasons	
B4.	Approximately, how many households are in this village	<input type="checkbox"/> <50 households <input type="checkbox"/> 50 - 100 households <input type="checkbox"/> >100 - 150 households <input type="checkbox"/> >150 - 200 households <input type="checkbox"/> >200 households	
B5.	Approximately, how many households in this village grow grain amaranth?	<input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input type="checkbox"/> 100%	
B6.	Has any household learnt about growing grain amaranth from you/your household?	<input type="checkbox"/> 01 Yes <input type="checkbox"/> 02 No	If no, skip to 7
B6a	How many households have learnt about growing grain amaranth from you/your household?	<input type="checkbox"/> <10 households <input type="checkbox"/> 10 -30 households <input type="checkbox"/> >30 - 60 households <input type="checkbox"/> >60 - 90 households <input type="checkbox"/> >100 households	

Section C: Acreage and Production of Grain Amaranth

No.	Question	Response	
C1.	How much land do you and your household own	<input type="checkbox"/> <1 Acre <input type="checkbox"/> 1 - 2 Acres <input type="checkbox"/> >2 - 4 Acres <input type="checkbox"/> >4 - 6 Acres <input type="checkbox"/> > 6 - 8 Acres <input type="checkbox"/> >8 - 10 Acres <input type="checkbox"/> > 10 Acres	
C2.	How much land did you and your household use for growing grain amaranth in the last season	<input type="checkbox"/> 1/4 Acre <input type="checkbox"/> 1/2 Acre <input type="checkbox"/> 3/4 Acre <input type="checkbox"/> 1-2 Acres	
C3.	Do you grow amaranth for the grain or the green vegetables?	<input type="checkbox"/> Grain <input type="checkbox"/> Green vegetables <input type="checkbox"/> Grain and Green vegetables	
C4.	How much grain amaranth did you harvest last growing season?	<input type="checkbox"/> <10 Kg <input type="checkbox"/> 10 - 30 Kg <input type="checkbox"/> >30 - 60 Kg <input type="checkbox"/> >60 - 90 Kg <input type="checkbox"/> >90 - 120 Kg <input type="checkbox"/> >120 - 150 Kg <input type="checkbox"/> > 150 Kg	
C4a.	How much of the amaranth grain harvested in the last season was eaten in your household?	<input type="checkbox"/> 1/4 <input type="checkbox"/> 1/2 <input type="checkbox"/> 3/4 <input type="checkbox"/> All	
C4b.	How much of the amaranth grain harvested in the last season was sold?	<input type="checkbox"/> 1/4 <input type="checkbox"/> 1/2 <input type="checkbox"/> 3/4 <input type="checkbox"/> All	
C5.	Approximately, how much amaranth green vegetable did you harvest last growing season?	<input type="checkbox"/> <10 Kg <input type="checkbox"/> 10 - 30 Kg <input type="checkbox"/> >30 - 60 Kg <input type="checkbox"/> >60 - 90 Kg <input type="checkbox"/> >90 - 120 Kg <input type="checkbox"/> >120 - 150 Kg <input type="checkbox"/> > 150 Kg	
C5a.	How much of the amaranth green vegetable harvested in the last season was eaten in your household?	<input type="checkbox"/> 1/4 <input type="checkbox"/> 1/2 <input type="checkbox"/> 3/4 <input type="checkbox"/> All	

C5b.	How much of the amaranth green vegetable harvested in the last season was sold?	<input type="checkbox"/> 1/4 <input type="checkbox"/> 1/2 <input type="checkbox"/> 3/4 <input type="checkbox"/> All	
C5.	What price per Kilo, did you receive for the amaranth grain sold?	<input type="checkbox"/> 0-30 Ksh <input type="checkbox"/> 31 - 100 Ksh <input type="checkbox"/> 101 - 200Ksh <input type="checkbox"/> 201 - 300 Ksh <input type="checkbox"/> 301 - 400 Ksh <input type="checkbox"/> 401 - 500 Ksh	
C6.	What price per Kilo, did you receive for the amaranth green vegetables sold?	<input type="checkbox"/> 0-30 Ksh <input type="checkbox"/> 31 - 100 Ksh <input type="checkbox"/> 101 - 200Ksh <input type="checkbox"/> 201 - 300 Ksh <input type="checkbox"/> 301 - 400 Ksh <input type="checkbox"/> 401 - 500 Ksh	
C7.	What total amount did you receive from sale of amaranth products in the last season?	<input type="checkbox"/> 0 - 1000Ksh <input type="checkbox"/> >1000 - 5000Ksh <input type="checkbox"/> >5000 - 10000Ksh <input type="checkbox"/> >10000 - 15000Ksh <input type="checkbox"/> >15000 - 20000Ksh <input type="checkbox"/> >20000 - 25000Ksh <input type="checkbox"/> >25000Ksh	
C9.	How do/did you manage pests and worms of grain amaranth?		
C10.	How do/did you store your grain amaranth after harvest?		
C11.	How do/did you store your amaranth green vegetables after harvest?		

Section D: Utilization of Grain Amaranth

No.	Question	Response	
D1.	Why do you grow grain amaranth?	<input type="checkbox"/> Eat <input type="checkbox"/> Sell <input type="checkbox"/> Eat and Sell	
D2.	Does your household consume amaranth grain?	<input type="checkbox"/> 01 Yes <input type="checkbox"/> 02 No	
D3.	Does your household consume amaranth green vegetables?	<input type="checkbox"/> 01 Yes <input type="checkbox"/> 02 No	
D4.	Does your household consume the grain more than the green vegetables?	<input type="checkbox"/> Use grain more <input type="checkbox"/> Use green vegetables more	
D5.	How many times in a week does your household consume the amaranth green vegetables?	<input type="checkbox"/> Once a week <input type="checkbox"/> twice a week <input type="checkbox"/> three times a week <input type="checkbox"/> four times a week <input type="checkbox"/> >4 times a week	
D6.	How many times in a week does your household consume the amaranth grain?	<input type="checkbox"/> Once a week <input type="checkbox"/> twice a week <input type="checkbox"/> three times a week <input type="checkbox"/> four times a week <input type="checkbox"/> >4 times a week	
D7.	How many days in a week, would you estimate your household's consumption of amaranth (green vegetables and grain)	<input type="checkbox"/> Once a week <input type="checkbox"/> twice a week <input type="checkbox"/> three times a week <input type="checkbox"/> four times a week <input type="checkbox"/> >4 times a week	
D8.	What ways do you commonly prepare grain amaranth in your household?	<input type="checkbox"/> Popping <input type="checkbox"/> Porridge <input type="checkbox"/> Other	
D9.	What ways do you commonly prepare amaranth green vegetables in your household?	<input type="checkbox"/> Boiling <input type="checkbox"/> Frying <input type="checkbox"/> Other	

Section E: Health benefits of amaranth

No.	Question	Response	
E1.	Do you think eating amaranth helps your health and the health of your household members?	<input type="checkbox"/> 01 Yes <input type="checkbox"/> 02 No	If no, skip to E3
E2.	If Yes, What health difference do you see in your household members because of grain amaranth?	<input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____	
E3.	Are there any negative effects in consumption of grain amaranth?	1. _____ 2. _____ 3. _____ 4. _____	

E4. What are the 2 most important advantages about growing grain amaranth compared to other crops?

a. _____

b. _____

E5. What are the 2 most important challenges you have in growing grain amaranth compared to other crops?

a. _____

b. _____

Appendix V. - GUIDE QUESTIONS FOR INSTITUTIONAL INTERVIEW:

1. Background information on the village: (Background Information on the Villages where the farmer survey or farmer focus group work is to be done---to be supplied by the CRWRC Partner staff: description of the village and ecological zone):
 - Name of village
 - Average yearly rainfall
 - Name months of rainfall, i.e. growing season months, dry season months
 - Name of month when grain amaranth is planted and when it is harvested.
 - Name of main staple crop for this region
 - Estimated number of families who are growing grain amaranth in this village
 - Partner staff's overall view on the use of amaranth in this village:
 - a) How much is it used as a food by the people?
 - b) What difference has it made in their family nutrition and health?
2. How well does grain amaranth fit with the farmers' needs and challenges?
3. What are the major struggles that partner staff have observed that farmers experience with amaranth?
4. How well does grain amaranth fit with the farmers' socio-economic context?
5. What, if any, differences has grain amaranth made in the health of the families in this village?
6. What is the main thing that holds back the impact of amaranth on the health of the people? (ex: lack of grain, lack of knowledge, attitudes? etc...)
7. What, if any, differences has grain amaranth made in the income of the villagers?
8. What are the main factors that keep grain amaranth from having a bigger impact on the income of the villagers?
9. What lessons have we learned that CRWRC and CFGB should pay attention to for future work with amaranth?
10. What key lessons can be learned about the relevance of CRWRC and CFGB's investment in the promotion of amaranth? For example, what should we do better or differently?
11. Has the CRWRC-CFGB effort achieved the desired results?
12. What are the factors that led to achieving or not achieving the desired results?
13. What are the strengths and weaknesses of CRWRC and the approaches used?
14. Which methodologies can be improved or adapted to better respond to the needs of the most vulnerable and food insecure households?
15. What are the positive and negative changes that have resulted from the amaranth work: on men/women/children?

16. What are the factors for continued adoption or non-adoption of Amaranth in the communities?
17. To what extent has Amaranth growing and use spread farmer to farmer, family to family----without the help of CRWRC, or the CRWRC partners?
18. What are the key factors that have determined whether or not a farmer keeps on growing amaranth or not? (Key benefits/ Key disadvantages)
19. What are the social, economic and environmental implications of growing amaranth?
20. What are the key challenges of producers, consumers and traders?
21. What are the key issues that need to be done to improve the role of Amaranth in the household nutrition and economy?

Appendix VI: Grain Amaranth Project – Year II End of Project Activities Report by Kramers

Date: December 21, 2007

Amaranth Project 2007 - Locations & Partners in Uganda							
CRWRC Partner	Community & Environment	History	# old Beneficiaries	# planned new Beneficiaries	2007 Plans	Objectives/Indicators Applicable	M&E plan
<p>1.0 COU Lango: Church of Uganda Lango Diocese Planning and Development office, Lira</p> <p>Field Rep: Andrew Ocen at beginning of the year until May.</p> <p>Peter Alele</p> <p>CRWRC Consultant: Tim Dam</p>	<p>It is considered a semi-arid area, with rainfall between 1000-1500 mm/year over an 8 month period. Fertility is sufficient due to fairly wide rotation and fallowing.</p> <p>Warm night temps mean Amaranth does well. People here were IDPs who have been returning to</p>	<p>Lira was new to Amaranth grain production last year. By October 2006 Lango people had yielded a harvest of 800 kg Amaranth grain, from which seed was shared around communities. Since then, acreage of planted Amaranth "exploded"-- more than 100 acres</p>	<p>3 registered farmers traveled to Iganga;</p> <p>demo & seed for 50 registered farmers (but up to 250 farmers growing);</p> <p>but about 250 farmers planted in second season.</p> <p>Total: 50 registered farmers</p>	<p>Alaro: 20 new farmers;</p> <p>Apala: 20 new farmers;</p> <p>Aber: 20 new farmers;</p> <p>COSBEL (PLWH/A): 20 new farmers.</p> <p>Total: ~80 new registered farmers.</p>	<p>Big demo on COU grounds; Hospital demonstration ;</p> <p>Planting and Feeding demos for new growers, plus seed; 50 hoes and 50 threshing tarps for old registered farmers;</p> <p>Andrew to visit WRCCS demo; train 10 promoters of Amaranth (& give them bicycles).</p>	<p>1b: evaluate 50 farmers who received tarps and hoes.</p> <p>2: new farmers to receive seed and education.</p> <p>3: 2 big demonstrations planned.</p> <p>4: partner capacity built, especially through Andrew's experience travelling and training promoters.</p>	<p>1b: 10 old farmers (of 50 'registered') will be surveyed;</p> <p>2: 10 new farmers will be surveyed;</p> <p>3: one community surveys; one institutional questionnaires ;</p> <p>4: quarterly reports required.</p>

	their homes in the last year and a half.	were planted and 40 MT grain harvested in December 06. Big question: what to do with excess Amaranth??					
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	Activities and Accomplishments during 2007	<p>Alaro (August 24, 07) Demo for 100 people - 150 new growers</p> <p>Apala (Aug 22, 07) Small demo for 10 men. No follow-up due to departure of field worker</p> <p>Aduku: (10 small demos) - 108 new growers</p> <p>BoroBoro Demo for 40 persons – result is 22 new growers</p> <p>Aber Focus on educating for self consumption – 150 growers in area but mostly for the vegetable</p> <p>COSBEL Three demos for 150 clients and a demo garden. – 550 growers for self-consumption</p> <p>Hospital and Community Demos were accomplished.</p> <p>Total New Growers -- 830</p>	<p>1b: farmers did not receive tarps or hoes</p> <p>2: very successful – see # of new growers</p> <p>3: A number of smaller demos were held</p> <p>4: Andrew's departure delayed the accomplishment of this</p>	Surveys were completed.
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CRWRC Partner	Community & Environment	History	# old Beneficiaries	# planned new Beneficiaries	2007 Plans	Objectives/Indicators Applicable	M&E plan
<p>2.0 COU Bunyoro-Kitara: Church of Uganda Bunyoro-Kitara Diocese based in Hoima. Field Reps: Mike Kaahwa & Jonathan Kajura</p> <p>CRWRC Consultant: Arianne Folkema</p>	<p>The land here is generally fertile as it has not been cropped over yet. There is not a lot of protein in the normal diet, with little ground nuts or beans grown, but lots of starches like cassava, arrowroot, maize and sweet potato.</p> <p>CRWRC has an animal traction program here (Mike) and there is a PLWH/A and OVC program as well (Jonathan).</p>	<p>Every farmer knows Amaranth as a local vegetable growing in the wild. But people have not grown the new variety for the grain.</p>	<p>There were no beneficiaries in Hoima last year.</p>	<p>50 new registered farmers (25 with Mike among farmers he is already working with and 25 with Jonathan and the PLWH/A he is already working with);</p> <p>Total: ~50 new farmers.</p>	<p>Planting and Feeding demos for new farmers;</p> <p>follow up visits;</p>	<p>2: new farmers to receive seed and education.</p> <p>4: partner gets capacity building.</p>	<p>2:10 new farmers surveyed.</p> <p>4: quarterly reports required.</p>
	<p>Activities and Accomplishments during 2007</p>			<p>-Rev Mike supplied seed to 16 groups -- 400 growers -Rev Jonathan – gave seed to 700 households –</p>		<p>2: New farmers did receive seed and training (see beneficiary column). -50 farmers received hoes -4: Rev. Mike went on a study tour of Amaranth to Western Kenya and is</p>	<p>Surveys were completed.</p>

			700 growers -In March 2007, Sid and Audrey did 2 demos and visited 5 other community groups – 60 growers Total: 1160 new growers		encouraging the 30% who did not succeed due to late rains, etc. to try again.	
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Appendix VI Con't: Amaranth Project 2007 - Locations & Partners in Kenya

CRWRC Partner	Community & Environment	History	# old Beneficiaries	# planned new Beneficiaries	2007 Plans	Objectives/Indicators Applicable	M&E plan
<p>3.0 WRCCS: Western Region Christian Community Services (Anglican Church of Kenya or ACK)</p> <p>Field Rep: Bramwell</p> <p>CRWRC Consultant: Nyamuhukabogo</p>	<p>WRCCS covers a large area in Western Kenya.</p> <p>Average fertility of soils is insufficient to produce high yields, but rainfall is high. Farmers can produce 2</p>	<p>Amaranth had been grown here; farmers frustrated at not being able to sell in past. In 2006, Amaranth re-introduced in Kotur,</p>	<p>Big Demonstration for ~1,000; Kotur: 40 Farmers; Machabos: 2 Farmer's groups; Amukura: 14 Farmers; Kamurai: 17 Farmers; Waisichan: 30 Farmers.</p> <p>Total: ~100</p>	<p>Angorai: 25 new registered farmers;</p> <p>Chocoll: 25 new registered farmers;</p> <p>Amukura: ? New registered farmers. Hospital community.</p> <p>Total: ~50 new</p>	<p>Feeding & Planting Demos in 2 new areas (seeds);</p> <p>Follow up visits; Big Hospital Demonstration;</p> <p>Fertilizer for trial;</p> <p>50 hoes for</p>	<p>1a: 4 fertilizer trials;</p> <p>1b: 50 hoes to old farmers; tarps can be provided by WRCCS;</p> <p>2: new farmers will get training and seed for production for self-consumption;</p> <p>3: big demonstration will be held;</p>	<p>1a: Sid will report on these trials.</p> <p>1b:10 old farmers will be surveyed (representing all growing areas correctly).</p> <p>2: 10 new growers will be</p>

	crops/year.	Machabos, Amukura, Kamurai and to the Waisichan a waYesu group. They harvested around 40 MT of Amaranth.	registered farmers; estimated 210 growing farmers.	registered farmers.	old registered farmers.	4: Partner capacity will be built.	surveyed. 3: one community survey. 4: quarterly narrative reports.
	Activities and Accomplishments during 2007	<p>Amukura Church Demo (Feb 2007) for 80 members – 70 new growers</p> <p>Amukura Health Centre: Large Demo (over 500 attending) in May 07 – 100 new growers plus A. use in therapeutic feeding programs.</p> <p>Chocoll Demo (Apr. 07) – 30 new growers</p> <p>Angorai: Demo for 25 farmers resulted in 10 new growers. Problems with drought</p> <p>Nongomi: Demo for 40 – no new growers as collapsing dykes result in flooding -- 70 growers have to move to other land and start over</p>				<p>1a: 4 fertilizer trials were undertaken.</p> <p>1b: Some hoes were provided but resulted in major misunderstanding</p> <p>2: New farmers did receive training and seed</p> <p>3: A big demo was held at Amukura Health Centre in May</p> <p>4: Partner capacity was built and will graduate from the project Exchange visit to Hoima by Bramwell, Rose and Wilfred was undertaken.</p>	Surveys were completed.

		St. Joseph Health Mission Orphanage – growing ¼ acre for use in own feeding program.		
		Total: 225 new growers		

CRWRC Partner	Community & Environment	History	# old Beneficiaries	# planned new Beneficiaries	2007 Plans	Objectives/Indicators Applicable	M&E plan
<p>4.0 MKCCS: Mt. Kenya Christian Community Services (ACK)</p> <p>Field Rep: Isaac Manyaki</p> <p>CRWRC Consultant: Nyamuhu Kabogo</p>	<p>This is considered a semi-arid area; there areas with cold night temperatures.</p> <p>The soil fertility varies. People here are generally farmers.</p> <p>Plateau Hospital hosts many PLWH/A and malnourished children.</p>	<p>Farmers here had known about and grown Amaranth, but had chronic years of drought and lost their seed stock. In 2006, Amaranth was re-introduced to the area through the CRWRC Amaranth project--seed, education (especially on seed multiplication). A hospital demonstration</p>	<p>Hospital Demonstration (Nov 2006)</p> <p>How many attended?; about 200 farmers.</p> <p>Total: ~200 registered farmers.</p>	<p>Gikindu: 50 new registered growers. School and hospital communities .</p> <p>Total: 50 new registered farmers.</p>	<p>Feeding & Planting Demo in one new area for 50 new growers (seeds); School Demo; Hospital Demo; Provide 50 hoes to old registered farmers (tarps not necessary here); Support commercialization efforts; Support Mr. Muhia's work to grow Cruentus seed stock; fertilizer for 1 trial.</p>	<p>1a: 1 fertilizer trial.</p> <p>1b: 50 hoes provided to old farmers/test their knowledge/skill.</p> <p>2: new farmers will get training and seed for self consumption (in a new area that is dryer).</p> <p>3: School & Hospital Demos planned.</p> <p>4: Partner capacity will be built.</p>	<p>1a: Sid will report on these trials.</p> <p>1b:10 old farmers will be surveyed (representing all growing areas correctly).</p> <p>2:10 new growers will be surveyed.</p> <p>3: one community survey; one institutional questionnaires 4: quarterly narrative reports.</p>

		was done, and was done so well it will be used as a model for future hospital demos for the project. One farmer, Mr. Muhia, participated in harvesting Cruentus seed stock.					
	Activities and Accomplishments during 2007	<p>As a result of Hospital Demo in 2006:</p> <ol style="list-style-type: none"> 1) there is an Amaranth demo garden at the hospital 2) hospital is using A. in its daily diet 3) nutritionists use A. in training 4) A. use is integrated into nursing training programs <p>Isaac Manyeki held two demos in April resulting in – 96 new growers (with Sid and Audrey)</p> <p>Very successful school Demo by Sid and Audrey</p>			<p>1a: fertilizer trial did not take place</p> <p>1b. Hoes will be distributed now (Oct 07)</p> <p>2: This training was done by Isaac Manyeki</p> <p>3: Growing demos held by Isaac in April and school demo in Sept by Sid & Audrey</p> <p>4: Isaac involved in an exchange visit to Lira, Uganda during Dec 2007</p>	Surveys were completed.	

		(Sept 2007)			
		Demo for parents of school children two days later – 68 new growers Total: 164 new growers			

CRWRC Partner	Community & Environment	History	# old Beneficiaries	# planned new Beneficiaries	2007 Plans	Objectives/Indicators Applicable	M&E plan
<p>5.0 RCEA: Reformed Church of East Africa (included Plateau Hospital)</p> <p>Field Rep: Edith Chemorion</p> <p>CRWRC Consultant: NyamuhuKabogo</p>	<p>This is considered a semi-arid area; there are areas with cold night temperatures. The soil fertility varies.</p> <p>People here are generally farmers.</p> <p>Plateau Hospital hosts many PLWH/A and malnourished children.</p>	<p>In 2006, 4 deacons started growing Amaranth in groups based on what they learned through 3 field days.</p> <p>A study of the effect of Amaranth consumption on malnourished children was done at the hospital; however there were</p>	<p>120 registered farmers in 4 groups of 30 growing Amaranth;</p> <p>1 acre grown in a community to benefit 70 orphans;</p> <p>10 registered farmers through Plateau Hospital.</p> <p>Total: ~130 registered growers;</p>	<p>School & Hospital communities .</p> <p>Old farmers get follow-up and more education through big demos.</p>	<p>Hospital Demonstration (March 14);</p> <p>School demonstration;</p> <p>1 lead farmer, Andrew, to participate in fertility trial;</p> <p>no tarps or hoes needed here.</p>	<p>1a: 1 fertilizer trial.</p> <p>1b: old growers surveyed for skill building.</p> <p>3: Hospital and school demos.</p> <p>4: Partner capacity built.</p>	<p>1a: Sid will report on this.</p> <p>1b: 10 old growers will be surveyed.</p> <p>3: one community surveys and one institution questionnaires.</p> <p>4: quarterly narrative reports</p>

		limitations to the findings as it was a small scale exploratory study.	1 community garden.			
Field Rep: Abraham Namukoa	Activities and Accomplishments during 2007	<p>Demo for 15 male leaders at RCEA office in Eldoret (April 07) – minimal results Iten: Demo in Sept 07 – 12 new growers Pokot: Demo in August 07 – 27 new growers Nangili: Teaching for students and teachers – unknown results Kaptama: Demo for church leaders but tribal clashes have made follow-up impossible Nangili: Large community demo planned in Nov 07 Plateau Hospital – Large Demo day on March 14, 07 Results 1. A. is used in hospital feeding diets 2. A. demo garden on hospital grounds 3. community nurse promotes A. – 25 new growers 4. hospital buys and sells Amaranth</p> <p>Bungoma: Demo for 300 women at Convention during Dec. 2007.</p>			<p>1a: Fertilizer trial took place</p> <p>3: Plateau Hospital had a large demo day on March 14, 07</p> <p>4: Abraham went on exchange visit to Western Kenya</p>	Surveys were completed.

		Total: 64 new growers			
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Amaranth Project 2007 - Locations & Partners in Tanzania							
CRWRC Partner	Community & Environment	History	# old Beneficiaries	# planned new Beneficiaries	2007 Plans	Objectives/Indicators Applicable	M&E plan
<p>6.0 Magu:Mwanza, Tanzania</p> <p>Field Rep: Mr. Pamba</p> <p>Joseph Shigulu Development officer</p> <p>CRWRC Consultant: Steve Michmerhuizen</p>	<p>The soil here is very poor and there is something 'missing from it'. Food insecurity is a problem as the lake does not provide enough affordable fish for people inland. People are mostly farmers and rely on a starchy diet with little protein.</p>	<p>Mr. Pamba had introduced Amaranth to 10 growers a few years ago after an exchange visit with MRTC.</p> <p>In 2006, 40 growers produced Amaranth for home consumption and excess was sold at Ksh 33/kg.</p> <p>There are more than 100 farmers interested in</p>	<p>For this project, there were no beneficiaries last year.</p>	<p>~100 new farmers with hope that about half will be successful and use Amaranth grain for family consumption.</p> <p>Total: ~10 new trained farmers.</p>	<p>Hold a planting and feeding demo for 10 farmers in 'Amaranth' group; train Mr. Pamba on the technical aspects of growing Amaranth.</p>	<p>2: new farmers get seed and education.</p> <p>4: partner gets capacity building.</p>	<p>2:6 new farmer surveys;</p> <p>4: quarterly report from partner.</p>

		growing Amaranth but Mr. Pamba said he needed more technical help and training to carry this out.					
	Activities and Accomplishments during 2007	<p>Full demo on March 27, 07 Resulted in 140 new growers</p> <p>Full demos in 3 local clinics during which 223 women and children attended. Results unknown</p> <p>Full demo (Sept 19, 07) for 20 community leaders 20 New growers</p> <p>Total: 160 New growers</p>		<p>2: demos in March and Sept resulted in seed and education for new growers</p> <p>4. No capacity building activities were undertaken</p>			
	Summary of Accomplishments during 2007	<p>Total Number of New Growers in 2007:</p> <p>2603</p>					

Appendix VII: Coverage of the Kramers' Work at End of 2007*

Institutions the Kramers Worked with & Interviewed	
Name of the Institution:	Location:
Murang'a district hospital	Murang'a, Mt Kenya CCS
Thangathia Primary School	Murang'a, Mt Kenya CCS
Plateau Secondary School	Plateau, Eldoret
Plateau Hospital	Plateau, Eldoret
Min. of Agriculture	Amukura, Western Region
Amukura Health centre	Amukura, Western Region

Locations of Farmer Interviews in Project End 2007 (* Denotes Areas Visited in the 2014 Post Facto Evaluation)	
Partner:	Location:
WRCCS ACK (Now ADS: Anglican Development Services)	Amukura*
WRCCS ACK	Kakapel (Teso North)*
WRCCS ACK	Machakus*
WRCCS ACK	Amukura (Teso South)*
WRCCS ACK	Chacoll
WRCCS ACK	Amukura (Teso South)
RCEA	Eldoret
RCEA Eldoret	Kiplombe
RCEA, Eldoret	Cheptired
RCEA, Eldoret	Kipsenende
RCEA Eldoret	Kaptagat
RCEA, Eldoret	Nangily
Lango Diocese, Lira	Aber*
Lango Diocese, Lira	Aber (ajjabba)*

Locations of Farmer Interviews in Project End 2007 (* Denotes Areas Visited in the 2014 Post Facto Evaluation)	
Partner:	Location:
Mt Kenya CCS	Murang'a
Kabale (PAG)	Kabale*
Tanzania	Mwanza, Magu Area*

Notes:

Partner Organizations that Sid and Audrey Kramer Consulted with and Reported on in their Project End Report in 2007 and in Reports from 2008. (* Indicates involvement in the 2014 Post-Facto Evaluation.)

1. ***Church of Uganda Lango: Church of Uganda Lango Diocese Planning and Development office, Lira. Field Rep: Andrew Ocen at beginning of the year until May, then Peter Alele. CRWRC Consultant: Tim Dam**
2. **COU Bunyoro-Kitara: Church of Uganda Bunyoro-Kitara Diocese based in Hoima. Field Reps: Mike Kaahwa& Jonathan Kajura. CRWRC Consultant: Arianne Folkema**
3. ***KABALE, Pentecostal Assemblies of God, Western evangelical area. (OCTOBER 2008)**
4. ***WRCCS: Western Region Christian Community Services (Anglican Church of Kenya or ACK). Field Rep: Bramwell. CRWRC Consultant: NyamuhuKabogo**
5. **MKCCS: Mt. Kenya Christian Community Services (ACK) .Field Rep: Isaac Manyaki. CRWRC Consultant: NyamuhuKabogo**
6. **RCEA: Reformed Church of East Africa (included Plateau Hospital). Field Rep: Edith Chemorion CRWRC Consultant: NyamuhuKabogo? (Hospital Field Rep?: Abraham Namukoa?)**
7. ***Magu: Mwanza, Tanzania Field Rep: Mr. Pamba.JosephShigulu Development officer.CRWRC Consultant: Steve Michmerhuizen. Here farmer questionnaires were carried out but no focus group interviews.)**