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Theme: Environmental justice, Ethics and Values.

Balancing nature: People biodiversity and resilience

Title: Grain Amaranth: Unlocking mitigation and Adaptation potential of interactions between People, Plants, Livestock and Environment (PeoPle)

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ABSTRACT:

The decreasing per capita food/nutrition supply and increasing rural poverty in Sub-Saharan Africa due to the adverse economic and ecological effects of climate change requires substantial increases in agricultural productivity and improvement in marketing, trade and policy. At a time when some developing countries are diverting an increasing amount of their development budget to cope with weather-related emergencies, scientists, rural development institutions, extensionists and governments are challenged to develop and diffuse new technologies and models, to make optimal institutional arrangements and policy decisions to increase agricultural productivity and incomes for sustainable livelihoods in changing climate.

Developing countries will bear most of the costs of the damage from climate change. However, if developed countries, which produced most of the greenhouse gas emissions of the past act now, a ‘climate-smart’ world is feasible, and the costs for getting there will be high but still manageable. (*World Development Report 2010*)

However, farming has an enormous potential for mitigation against climate change. According to IPCC agriculture's sequestering potential, largely exceeds the emissions coming from farming, and 70% of this mitigation potential can be realized in developing countries through sustainable agriculture practices such as organic farming, agro forestry, and the production of renewable energies such as biogas and sustainable livestock management.

This paper will demonstrate how strategic poverty alleviation systems SPAS assists communities in dry lands to unlock the enormous mitigation and adaptation potential of the interactions between People, Plants Livestock and Environment (PeoPle) to contribute in balancing nature and create opportunities for tomorrow's generations.

SPAS trains small scale farmers to grow and integrate organic grain amaranth – a non – organic grass cereal which is drought resistant, disease and pest resistant and a nutritional powerhouse into these interactions for food/nutrition and income and by-products fed to livestock whose dung produce biogas or methane (a greenhouse gas) which is converted into electricity, hence reducing contribution of agriculture in greenhouse gas emissions (GHE) while increasing the resilience of communities and ecosystems.

SPAS develops and disseminates high quality certified organic seeds, cost effective and sustainable integrated pest management technologies, trade and marketing of products and empowerment through capacity building of public, private, NGOs and faith-based organic products and consumers' stakeholders and strengthens collaboration and linkages to strengthen opportunities for the poor to escape the worst impacts of climate change.

SPAS also provides social economic information to all stake holders on the potential of organic agriculture and sustainable livestock management, changes in farming systems, and advocates changes in dietary orientation and consumer acceptance of technology and likely potential of the PeoPle model, besides building capacity of Agricultural research and extension systems ,NGOs and the private sector in developing , diffusing and assessing the impact of organic grain amaranth in converting small-scale farms into sustainable agricultural systems.

SPAS also develops market plans and provides information on business opportunities using well trained analysts in social sciences for informed decision making in rural development.

A critical window of opportunity now beckons to move the economies of Sub-Saharan Africa off the current path of chemicals based agriculture towards a green economy and new dietary orientation based lifestyles that will at once make a sustainable contribution to improved health, food/nutrition security and poverty reduction and economic growth in changing climate. But although the sustainable practices of the PeoPle model benefit society as a whole and come at a cost that is compensated by direct benefits, farmers organisations have to work hard to get the entire international community to acknowledge this potential and the efforts required.

However, while SPAS experience implementing this model clarifies the opportunities, constraints and strategic directions that sustainable agriculture practices offers sub-

Saharan Africa in its attempt to balance nature and green the economies in changing climate, it is incumbent upon Developing Countries and the international community to do everything they can to enhance the ability of the poor to tap into the reservoir of this PeoPle model.

KEY WORDS:

GRAIN AMARANTH, MITIGATION/ADAPTATION, RENEWABLE ENERGY, POLICY AND RESILIENCE, LIVELIHOODS

1. BACKGROUND

The decreasing per capita food/nutrition supply and increasing rural poverty in Sub-Saharan Africa due to the adverse economic and ecological effects of climate change requires substantial increases in agricultural productivity and improvement in marketing, trade and policy. At a time when some developing countries are diverting an increasing amount of their development budget to cope with weather-related emergencies, scientists, rural development institutions, extensionists and governments are challenged to develop and diffuse new technologies and models, to make optimal institutional arrangements and policy decisions to increase agricultural productivity and incomes for sustainable livelihoods in changing climate.

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of the past act now, a 'climate-smart' world is feasible, and the costs for getting there will be high but still manageable. (*World Development Report 2010*)

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This paper will demonstrate how strategic poverty alleviation systems SPAS assists communities in dry lands to unlock the enormous mitigation and adaptation potential of the interactions between People, Plants Livestock and Environment (PeoPle) to contribute in balancing nature and create opportunities for tomorrows generations.

Sub-Saharan Africa also carries the heaviest disease burden as a result of HIV/AIDS, and farmers are also becoming too sick to farm due to HIV/AIDS, which affects negatively on family labor and food security. Fortunately amaranth is also a medicinal crop useful in the cure, prevention and/or management of most diseases that developing countries experience including HIV/AIDS, (*Mwangi Davidson, 2003*).

The number of hungry and undernourished people will remain stubbornly high by 2030 (*FAO, 2000*) partly due to the adverse effects of climate change which deepens food/nutrition, water and energy crisis (*CGIAR, 2007*) leading to increased economic constraints, hunger malnutrition and starvation especially among marginalized and

vulnerable social groups such as women, children, the aged and People Living With HIV/AIDS.

Sustainable development is the development that “meets the needs of the present without compromising the ability of the future generations to meet their own needs, (*World Commission on Environment and Development, 1987*). Indeed, achieving sustainable ways of living must be approached as a matter of basic social justice for both current and future generations and address health, education and gender equality (UNDP, 2011).

This is well demonstrated in the model’s business viability along the whole value chain; its ability to establish the critical link between nutrition, health and poverty with an environmental advantage; its ability to establish a balance between the need to care for the sick, particularly the HIV/AIDS infected, and productively earning incomes; its ability to assist in natural resource protection and its ability to allow for active participation by communities in the global strategy to mitigate and adapt to climate change; its uniqueness in increasing public awareness on healthful foods seeking behavior, organic agriculture and green energies; its ability to attract the youth to agriculture due to the innovative approaches used to deliver programmes to communities; its strong emphasis on partnerships with stakeholders and continuous establishment of new areas of interventions all work to elicit mass inspiration and commitment to save mother earth.

One of the greatest challenges facing the world today is ensuring access to ample, affordable, clean and sustainable sources of energy. Energy services are important for driving industry, moving water, boosting crop production, as well as for lighting, heating,

and cooling health facilities, especially in rural areas. The poor in rural areas needs affordable and clean energy to fuel development in these areas without harming the environment, (*World Bank, 2008*). The poor frequently spend about a fifth of their income on energy, (*World Bank, 2007*). A key objective of this PeoPLE model is to provide clean and affordable energy from the interactions of people, plants and livestock and the environment.

The model also aims at unlocking the potential of a green economy to place inequality and those who are experiencing vulnerability at the center of sustainable development

Support for local initiatives using local resources may turn out to be the most sustainable.

The integrated goals of food and energy security and poverty reduction are also inextricably linked with the need to reduce harmful air pollution and address climate change. SPAS also promotes organic grain amaranth based electricity for food and energy security, reduce poverty and harmful air pollution and address climate change.

Besides, more than 80% of countries in sub-Saharan Africa are either arid or semi-arid with livestock farming as the main economic activity.

This PeoPLE model became seductive to SPAS as it could assist these communities to enter a new era of sustainable development, ensuring that benefits are available over the long term because:

- It's business viability
- Provides a critical link between nutrition, health and poverty
- Establishes a balance between the need to care for the sick and productively earning incomes

- Utilizes locally available resources, farmers and local professional and assists in resource protection
- Allows for active participation by communities in a global strategy to mitigate and adapt to climate change
- Active participation of farmer families and women groups for increased public awareness
- Innovative approaches used to deliver programmes to communities
- Partnerships with stakeholders
- Continuous establishment of new areas of interventions like green energy
- Is a holistic approach to development

1.1 Constraints

The special attributes associated with grain amaranth are likely to make it become a “mans crop” thereby denying its benefits to nutrition vulnerable populations like women, children, aged, people with disabilities and people living with HIV/AIDS. Farmers are also becoming too sick to farm due to HIV/AIDS, which affects negatively on family labor. Fortunately amaranth is also medicinal useful in HIV/AIDS management.

Raising the general public awareness of and support for activities of PeoPLE model for improved educational outcomes, for instance, to prevent intergeneration transmission of poverty due to malnutrition has been curtailed by communities’ inability to quickly change their dietary orientation disseminating widely this sustainable community based model to improve health and nutrition for enhanced educational outcomes.

People would want to cling to nutrition deficient grass cereals like maize and white rice unaware that the former would experience 30% reduction in production in the next three decades due to weather variations. Increased awareness creation may not be an option.

Yet SPAS and partners ability to debunk or jettison stereotypes concerning grain amaranth has been lower than would be expected given the urgency. The association of grain amaranth with other amaranth species such as weed amaranth or pigweed- or *muchicha* in Kiswahili or *terere* in kikuyu, which is associated with poverty, has created negative attitude towards it in the mind of the public and even the government, (Mwangi, 2003). Furthermore, there has also been a slow appreciation of indigenous/traditional foods in general. Low public awareness on traditional foods in general, and organic grain amaranths' nutritional and/or healing abilities, in particular, and its economic value has not helped the situation.

Furthermore, today in Kenya as is elsewhere in the world, most people depend on the mass media, for their “enrichment,” concerning all aspects of life including health and nutrition. Unfortunately, the media has not taken it upon itself to preach about traditional foods and medicinal resources like grain amaranth and mitigation and adaptation to climate change. Yet these “enlightenment” sources have fundamentally changed the way people perceive things including what they eat. Lack of sustained and elaborate funding and research in the development of traditional foods and medicinal resources as a way of climate change preparedness has not been a blessing either.

2.0 MATERIALS AND METHODS

Strategic poverty alleviation systems-SPAS is a not for profit organization registered in Kenya working with poor communities in promoting sustainable alternatives to conventional methods and practices in agriculture, health, energy and the environment.

SPAS integrates organic grain amaranth into the interaction between People, Plants, Livestock Environment (PeoPLE) to provide solutions to the key challenges facing communities and governments.

A crucial role has been to establish networks and coalitions for creating awareness for accelerated delivery and adoption of this PeoPLE model, identifying and developing mechanisms and local institutions to coordinate activities and involving policy makers in project implementation; developing training manuals and facilitating workshops on organic agriculture, natural resource management, village seeds banks, silage making, zero grazing, biogas production and conversion to electricity, composting, organizing field schools, exchange visits, and demonstrations on grain amaranth recipes and linking farmers to markets.

SPAS provides socio-economic information to all stakeholders on the potential of organic foods, changes in the farm and market, consumer acceptance of technology and likely potential for marketing in different zones, besides building capacity of National Agricultural Research and Extension Systems, NGO's and the private sector in developing, diffusing and assessing the impact of organic grain amaranth technology.

Market plans on seeds production and distribution; information for business opportunities in seeds and amaranth processed food and feed products; well trained analysts in social sciences for informed decision making in rural development are made available.

SPAS and partners also performs the organic agriculture sub-sector analysis, collects and disseminates information, assesses the potential impact of changes in farming systems, production and incomes, and builds capacity in marketing, policy and economic analysis.

Also promotes high quality certified organic seeds, the development and diffusion of cost effective and sustainable integrated farming systems and pest management technologies, trade and marketing of seeds and high quality value added processed organic products and the empowerment through capacity building of public, private, NGO's, and organic products stakeholder organizations.

On sustainable energy, farmers are trained to grow organic grain amaranth for food and income; its by-products (waste products) fed to livestock whose dung produces biogas to run diesel generators and produce electricity for community needs and surplus sold. The solid slurry is used as fertilizer. Project takes advantage of amendment of Electric power act allowing for competition in generation, supply and distribution. Communities are provided with skills, Information and knowledge on amaranth, animal feeds, dung harvesting, bio-gas production, conversion to electric power and demonstrations on environment and modern technologies, nutrition. Current sources of energy and needs are established, training protocol and manuals prepared. Increases trust in bio gas and electric power through education on utilization, safety, environmental and economic value, and gets leadership support. Collects data and tracks energy indicators and builds capacities of consumers, besides monitoring and providing management info, compliance of populations, monitoring and evaluation.

3.0 RESULTS

SPAS supports poor communities in their search for sustainable alternatives to conventional practices in agriculture, health, energy and the environment through the promotion of organic grain amaranth. Significant progress has been achieved in disseminating this technology to different agro-ecological zones where nutrients deficient maize and white rice are the staple to address the widespread nutrients deficiency hence contributing to achievement of Kenya's social-economic goals and aspirations, besides attracting public and private sectors support to this non-conventional initiative that have been shown to work.

SPAS in partnership with Kenya Organic Agriculture Network-KOAN and other stakeholders have developed a training manual for farmers on organic agriculture production.

SPAS experience implementing the PeoPLE model demonstrates that it adds value to the dominant sources of food and livelihoods with very encouraging results. Uptake of this model by many communities and other countries, regional programs, donors, multilateral organizations, and the private sector has begun to bear fruit, and will enormously contribute to poverty reduction and realization of the MDGs sustainably. The share of organic products in the food market supply matrix has been enhanced, availability, accessibility and sustainability of food supply at cost effective prices to poor households and communities' enhanced, while farming systems have benefited.

Involvement of government gives project long-term political support while Strategic public and private partnerships and collaboration strengthen solutions. External inputs are

minimal, for it uses people's own efforts and local resources, household labour, and volunteers. It generates incomes for communities from sale of surplus grain, fish, biogas and electricity, and increases businesses. Participatory Monitoring & Evaluation PM&E system applied, participants become change agents. Project generates enormous environmental benefits, utilizes methane, (an ozone depleting gas), manure for amaranth and other food or fodder crops production.

This PeoPLE model produces broad based positive impacts and multiple benefits for current and future generations in such diverse areas as income and employment generation, improved nutrition and health, sustainable HIV/AIDS and environment management but also help to shatter the myth that without the traditional nutrients deficient staple cereals like maize, white rice and tubers, countries of Sub-Saharan Africa cannot break from the yoke of perennial food/nutrition insecurity, ill health and poverty.

4.0 DISCUSSIONS

THE PROMISE OF THE PeoPLE MODEL

The PeoPLE model perhaps holds the greatest promise for improving livelihoods around the world besides providing the tools to build a brighter, cleaner and more prosperous future. Besides, it allows nations of the world to open themselves to modernity without losing sight of their traditions and values like herbal medicines.

SPAS uses the knowledge gained to influence a policy shift and practice. For instance, in 2004, SPAS wrote to government line ministries urging them to adopt grain amaranth as a tool for food security and invited them to joint field visit in one of the project sites. That

visit was not in vain as today, ministries are very much involved in creating awareness on organic grain amaranth. Ministries and stakeholders also organize organic amaranth days. Grain amaranth does very well where organic inputs like manures are used so SPAS uses it to convert small-scale farming systems into organic production systems and green energy. It is abundantly clear that while the international economic crisis and climate change are a real threat to sub-Saharan Africa agriculture, organic grain amaranth offers an innovative way to mitigate the negative effects of these challenges and prevent the regions poor from descending deeper into poverty. Indeed, amaranth, once considered a barrier to food security (was regarded as a notorious weed and food for the poor) is now revealed as a rich source of opportunities and possibilities to achieve regional goals and aspirations.

Although substantial work has been done, even more work remains to target and deliver intervention to micro-nutrients deficient populations in Kenya and other parts of the region. However, successful model development and deployment will require collaboration among agriculturalists, health and nutrition specialists, and advocates for the poor. Countries in the region should forge partnerships to develop this technology to maximize on the benefits that may exist in joint attack on the global challenges of today and tomorrow. With increasing evidence of extreme hunger, malnutrition and starvation attributable to climate change, the urgency and greater need for promoting this model cannot be over-emphasized. Rural areas of the region are home to 80% of the population, eking a living from farming, making them directly vulnerable to the effects of climate

change, (FAO, 2007). Food crops and farming systems suited to the new conditions are needed now.

Nevertheless, for model to make real differences in the lives of the poor people in the region, it must be widely disseminated and utilized in a variety of ways.

Besides, in its quest to attain food safety and security, the region can spear head organic agriculture which African peoples are familiar with (the poor grow organically by default) and the region may become a net producer of organic agricultural products creating a niche market for itself. Since organic grain amaranth is not a transgenic crop and not industrially fortified with nutrients, it is unlikely to be opposed by NGO's and environmental groups. Indeed, these have played a key role in its dissemination to farmers, which may hasten revolutionalization of farming systems and dietary orientation to suit the new climatic conditions.

5.0 RECOMMEDATIONS/LESSONS

This model optimized by organic grain amaranth is a holistic approach to sustainable development and demonstrates that the vision for safe food/nutrition and green energy secure communities, improved health and environment is certainly possible. However, it will not be attained without the adoption of a more coordinated and strategic approach, based on the support, input and involvement of governments, civil society, communities and the international community.

If integrated into the diets and landscapes of rural communities of sub-Saharan Africa, organic grain amaranth may provide practical tools to address the new challenges for agriculture in the region due to climate change. Pro-active strategies can be adopted by

respective governments to increase options to build sustainable livelihoods systems that are in harmony with nature to support food/nutrition safety and security and the pursuit of inexpensive climate management of risks associated with diseases, pests and food safety contaminants.

Initiatives should be undertaken to implement a continental scheme, establish and strengthen model, information, education, and communication and training capacities.

Specific strategies should be devised to increase technology development and deployment. Through organic grain amaranth African-small-holder enterprises, majority of who are women, and who provide between 70%-80% of agricultural production should be supported to create small-holder based African Green Revolution and transform agriculture into a highly productive, profitable and sustainable system to enable the region to be food, nutrition, green energy and livelihoods secure.

6.0 CONCLUSION

Experience by Strategic poverty alleviation systems-SPAS implementing the PeoPLE model has demonstrated that grain amaranth holds the greatest promise in addressing the global challenges for agriculture in sub-Saharan Africa and all that is needed is to upscale activities to the entire region. To assure energy security and help communities develop in a sustainable way, make the model, which has multiple benefits, available now. This is a model with low external inputs or capital outlays and utilizes existing skills and knowledge which are optimized with existing local community resources.

Vision for sustainable energy and food security is certainly possible, but will only be attained with adoption of a coordinated and strategic approach, based on the support, input and involvement of government, industry and the donor community. Integrating grain amaranth technology into the interaction between crops, animals and the environment provides a dependable path towards energy, food and livelihoods secure future in a changing climate. Besides, organic grain amaranth appears to be the most potent tool in our policy arsenal for achieving energy/food security, and rapid development, with an environmental advantage.

Perhaps the magnitude of climate change and poverty problems in sub-Saharan Africa and the threat they pose to the continent's ecosystems, growth, peace and security will suffice to keep stakeholders awake until solutions are found. This model could prove catalytic and besides, with many of the MDGs unlikely to be realized, this paper should sound an alarm about the implications of doing nothing towards this especially the adoption of models that have been shown to work. The top priority should be given to finding the most effective path to bring the benefits of this model to the majority who still go without basic needs.

7.0 ACKNOWLEDGEMENTS

ISEE2012 for providing a platform for discussions for advancing understanding of the relationships among ecological, social and economic systems for the mutual well-being of nature and people at a time when progress towards sustainable livelihoods appears to be drowned by the global economic crisis and the adverse effects of climate change and

increased poverty. The opportunity for SPAS and partners to present an African approach to the solution is critical and is greatly appreciated. It is hoped that ideas, issues and approach raised here will enable analysts and policy makers of different regions to approach their particular challenges with a more informed sense of what may be important, and what has worked in the past in other situations.

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FIGURES AND TABLES

Grain Amaranth's Economic and Commercial Value

Based on production from one acre a farmer would be expected to make a gross profit margin of about Ksh 61 per crop (within 45-75 days) as detailed below.

<u>Description</u>	<u>Unit</u>	<u>Qty</u>	<u>Unit price</u>	<u>Value</u>
			<u>Ksh</u>	<u>Ksh</u>
<u>Income</u>				
Harvested grain	Kg	1,000	80	80,000
<u>Production Costs</u>				
Cost of 1 Kg of seeds	Kg	1	500	500
Land preparation	Acre	1	3,500	3,500
Manure	Ton	1	3,500	3,000
Weeding	Acre	1	4,000	4,000
Thinning	Acre	1	4,000	4,000

Harvesting	Acre	1	4,000	4,000
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61,000

Gross margin

NB. 1 US\$=Kenya shillings 90

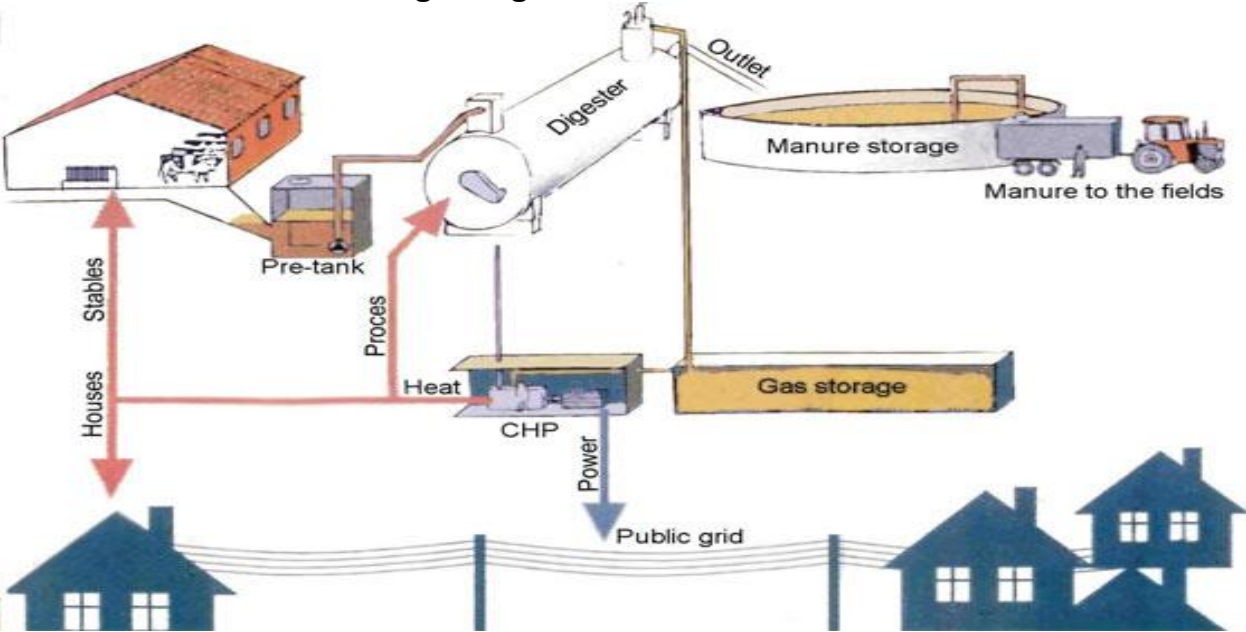
Organic grain Amaranth is associated with the cure, prevention and/or management of diseases:

CURE	PREVENTION	MANAGEMENT
<ul style="list-style-type: none"> ▪ Kwashiorkor ▪ Marasmus ▪ Facilitates the evacuation of placenta after birth. ▪ Nausea ▪ Dizziness ▪ Migraines ▪ Scurvy ▪ Herpes 	<ul style="list-style-type: none"> ▪ Dermis diseases ▪ Cancer of the stomach, gullet, breast, lungs and colon. ▪ Improves quality of male sperm ▪ Prevents aging ▪ Plays a major role in preventing heart diseases ▪ Tapeworms ▪ Prevents bile accumulation ▪ Prevents deposition of tartar on the teeth ▪ Prevents constipation ▪ Prevent high blood pressure ▪ Prevents weakness of muscles 	<ul style="list-style-type: none"> ▪ Reduction of Tuberculosis T.B ▪ Helps in the secretion of urine ▪ Helps in the secretion of milk ▪ Reduction of diabetes ▪ Controls the growth of Candida – alb cans (thrush) in the mouth and esophagus for AIDS patients ▪ Good for rheumatism ▪ Manages Bronchitis ▪ Assists in wound healing. ▪ Manages HIV/AIDS

	<ul style="list-style-type: none"> ▪ Prevents paralysis ▪ Prevents emotional instability. 	
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Source: Mwangi, 2003

From biogas to electricity
Farm Biogas Digester



A farmer and a field worker (holding folder) admires a mature crop of grain amaranth, ready for harvesting but was planted the same time with the maize now approaching flowering stage. While below, the secretary (2nd left), poverty eradication commission, in the Ministry of Planning, National Development and Vision 2030 sample Organic Grain Amaranth recipes during a field day.





The secretary to poverty eradication commission in the ministry of planning and national development join community members after training to sample grain amaranth porridge