elum
Principles & Guidelines
PELUM Kenya

The elum Principles and Guidelines, 2013

PELUM KENYA

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Acronyms

AEZ – Agro-ecological Zone

ASALs – Arid and Semi Arid Lands

ELUM – Ecological Land Management

EMCA – The National Environmental Management and Coordination Act

FAO – Food and Agriculture Organization of the United Nations

GHG – Green House Gases

IPM – Integrated Pest Management

KWS – Kenya wildlife Service

NEAP – Natural Environmental Action Plan

NEMA – The National Environmental Management Authority

PAR – Participatory Agricultural Research

PELUM – Participatory Ecological Land Use Management

UNEP – United Nations Environmental Programme

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About PELUM - Kenya

Participatory Ecological Land Use Management (PELUM) Association is a network of Civil Society Organizations/NGOs working with small-scale farmers in East, Central and Southern Africa. PELUM- Kenya is the Kenyan country chapter of the PELUM Association and has a membership of 42 member organizations. The PELUM Kenya network promotes people driven development towards sustainable land use and facilitates learning, networking and advocacy for sustainable natural resource management. Membership is drawn from Non-governmental organizations, faith based organizations, Community Based Organizations and civil Societies in Kenya. The secretariat for the network, is based in Thika and is hosted by one of the member organizations – SACDEP Kenya.

PARTICIPATORY ECOLOGICAL LAND USE MANAGEMENT (PELUM) ASSOCIATION (PELUM-KENYA)

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Thanks also go to those farmers who gave us their valuable time to interact and learn from their enterprises. Your generosity was overwhelming.

Dedication

To all the PELUM-Kenya member organizations and the communities and farmers they work with.

Executive Summary

This manual is made up of five main parts that clearly elaborate the critical issues of Ecological Land Use Management (*elum*).

The first part gives distinctive definitions of terminologies that are associated with *elum*. It will be worth noting that a common understanding is important when different organizations are in one network but doing different things addressing the same issue of *elum*.

The second part discusses the *elum* practices that cut across different farming systems as defined in part one. The concepts and principles of these practices are discussed.

The third part highlights the necessary processes and approaches that ought to be followed to generate, put in practice and scale up/out a practice or a technology. The key considerations being effectiveness, efficiency, safety, accessibility and gender inclusiveness among others.

The fourth part discusses the quality assurance procedures and guidelines of *elum* practices/ technologies. This is meant to foster uniformity of similar practices across the entire membership. The provisional benchmark is provided for one to test his/her technology to be aligned within the set standards.

The fifth part is an elaborate glossary that gives the meaning of key words / phrases that are used in agricultural related field. This is meant to foster understanding .

The information in this publication is a collection from PELUM Kenya member organizations, PELUM Kenya Secretariat, farmers and key relevant libraries.

Foreword

Much progress has been made in managing land in ecologically sustainable ways. However, more actions are needed before ecologically based land management is broadly implemented. The full ecological effects of human activities often are not seen for many years. Depletion of natural resources due to excessive nutrient mining or land mismanagement therefore disrupts natural processes in ways that are irreversible over long periods of time.

Land use is the purpose to which land is put by humans and its goals usually conflict. This forms a key basis for the Kenyan chapter of PELUM Association's core focus enshrined in the vision of ecological land use management, concurrent with the intricate balance of smallholder rural communities deriving their livelihoods from this approach. This often poses a critical challenge for land use and management, as it involves reconciling conflicting goals and uses of the land. Therefore ways to avoid actions that would jeopardize natural resources are identified in ecological land use system approach, considered, applied and out-scaled.

It is for this reason that a harmonious and clear understanding of the complex words often used in the capacity building, application and advocacy processes in *elum* was found useful in defining the Association's ethics. A guideline manual that for one forms a basic understanding and appreciation of the diversity yet contributory approaches and systems in *elum* for beginners; as well as firming and stimulating creativity in the application for practitioners was consultatively prepared for sharing.

The *elum* Principles and Guidelines book is a foundation that enhances natural potential for smallholder productivity, nutrient cycling, water management and the optimal application of other physical and biological conditions that affect ecological cycles. While these guidelines can provide the basis for specifying and understanding ecological concerns relevant to the needs of specific types of land users, such as smallholder farmers, it is equally important to note that these guidelines must however be translated to particular land users. The technical information provided may be incomplete for uptake and replication, and may be limited in requisite information especially to the beginners.

It is expected that positive steps in integrating these ecological land-use management aspects at national and local scales will be taken thereby resulting in an unprecedented increase in the adoption of low external inputs in sustainable agriculture systems, and contributing to the management of the land sustainably.

We believe that by producing this book, PELUM Kenya has made positive contribution towards increased application of *elum* in Ecological Organic Agriculture (EOA), environment conservation and protection. We encourage broad readership including practicing farmers; students in colleges and universities; lecturers and researchers.

Finally, PELUM Kenya will greatly appreciate feedback that will enable us to make improvement on future editions.

Zachary Makanya
Country Coordinator

December 2013

1.0 Introduction

1.1 PELUM Association

Participatory Ecological Land Use Management (PELUM) Association is a network of Civil Society Organizations/NGOs working with small-scale farmers in East, Central and Southern Africa. The Association membership was founded in 1995. The network has grown from 25 pioneer members (in 1995) to over 230 members in 2012 in 10 countries namely Zambia, Zimbabwe, Tanzania, Uganda, Botswana, Lesotho, South Africa, Malawi, Rwanda and Kenya. The regional activities are coordinated at the Regional Secretariat (RS), currently located in Lusaka, Zambia. PELUM Kenya is the Kenyan country chapter of the PELUM Association and has a membership of 42 member organizations.

The PELUM Kenya network promotes people driven development towards sustainable land use and facilitates learning, networking and advocacy for sustainable natural resource management. Membership is drawn from non-governmental organizations, faith based organizations, Community Based Organizations and civil Societies in Kenya.

PELUM-Kenya envisions self-organized communities in Kenya that are able to make choices towards improved quality of life that is socially, economically and ecological sustainable. The association endeavors to build the capacity of the member organizations and partners in Kenya to empower the local communities through participatory methodologies in ecological land use management and sustainable development. The mission of the network is to promote participatory ecological land use and management practices for improved livelihoods among small holder farmers in Kenya.

1.2 The context on which *elum* is based

Ecological land use management (*elum*) is farming in harmony with nature, using cultivation techniques and breeding programs that do not rely on chemical fertilizers, pesticides or herbicides, or artificial genetic modifications. It combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.

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PELUM Association which advocates for this kind of farming has firmly embraced the spirit of involving all actors within a landscape to act in a concerted manner for optimal results and sustainability of the ecosystem. As a result, the need for a common understanding and approach to *elum* issues was realized since different aspects of the approach such as permaculture and organic farming entail varied inputs and efforts hence different interpretations by practitioners.

Landscapes are also varied across the country with some areas being better endowed for certain agricultural activities than others hence the need for different interventions within a common framework. In the rangelands, pastoralism is among the preferred land uses and it is important for the practice to adhere to known and agreed upon methodologies. Dry land forestry as well as conservancies for wildlife conservation have all continued to ensure dry land biodiversity is maintained hence the need to align human activities to a common approach geared towards maintaining the diversity. In the high altitudes, there are other practices such as intensive farming that yields expected results for populations living in these regions.

In addition, productivity has continued to be affected by multiple factors, including climate change, degradation of the natural resource base, loss of biological diversity, diminishing arable land due to desertification and prolonged droughts, as well as marginalization of smallholder farmers particularly through lack of investment in basic infrastructure to bring them into their national and regional economies. Consequently, the current agricultural and food supply systems are not sustainable given the over reliance on non-renewable external inputs associated with production of high levels of greenhouse gas emissions, and the negative impacts on soils and biodiversity, farm animal welfare, nutrition and public health outcomes, and low level of resilience against external shocks.

All the above referenced issues facing production activities as well as increasing population require meticulous balancing of the need to feed the population and maintain the ecosystem balance. This requires a common understanding of the approaches to be employed in production and landscape management. It is this realization that has prompted PELUM Kenya to develop general guidelines for ecological land use practices to be utilized by practitioners across the landscape. This will ensure adequate food production for the ever expanding population and also availability of resources for the future generations.

2.0 Understanding Some Key Terminologies

2.1 Ecology

The totality of relationships among organisms and their ambient (surrounding) environment

2.2 Sustainable Land Management

Means to manage land without damaging ecological processes or reducing biological diversity. It requires the maintenance of the following key components of the environment:

- Biodiversity: the variety of species, populations, habitats and ecosystems;
- Ecological integrity: the general health and resilience of natural life-support systems, including their ability to assimilate wastes and withstand stresses such as climate change and ozone depletion; and
- Natural capital: the stock of productive soil, fresh water, forests, clean air, ocean, and other renewable resources that underpin the survival, health and prosperity of human communities.

Land is often managed for multiple benefits, such as agricultural production, biodiversity conservation, water quality, soil health and supporting human life. To ensure long-term sustainability, land managers need to consider economic, social and environmental factors.

2.3 Sustainable practices

Relates to, or being a method of harvesting or using a resource without depleting or damaging the source.

2.4 Ecological Land Use Management

Is the use of the land resources to meet the needs of the current generations while maintaining the potential/productivity/capacity of the same resources to be used by future generations and to maintain the ecological balance/ecosystems.

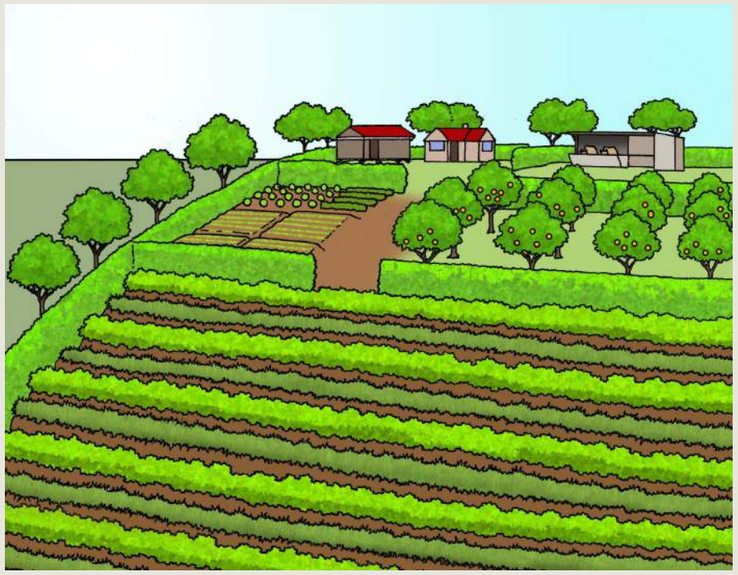


Fig 1: Ecological land use management

2.5 Sustainable Agriculture

Is a system of farming based on a process that strives to meet the needs necessary for an integrated , happy life of those depending on the farm by developing the available human, physical, financial and natural resources. It is regarded as a philosophy based on human goals and on understanding the long-term impact of our activities on the environment and on other species. Broadly it is a farming system that is economically viable, embraces social fairness and environmental safety. It is a complex issue though, for it is associated with production of food while maintaining our biophysical resources including soil, water and biota with no diverse impacts on the wider environment, and it should be within the following six principles:

a. Maintain a fertile soil
b. Use appropriate farming technologies
c. Maintain healthy integration of farming enterprises
d. Manage the farming resources sustainably
e. Establish and maintain beneficial external associations
f. Manage all farming enterprises profitably

2.6 Organic Farming

Is a system of farming based on ecological principles, hence the terms biological or ecological farming which are also used to describe this production method. It avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, and livestock feed additives. To the maximum extent it relies upon crop rotations, crop residues, animal manures, legumes, green mature, off-farm organic wastes, mechanical cultivation, mineral-bearing rocks and aspects of biological pest control to maintain soil productivity and tilth, to apply plant nutrients, and to control insects, weeds and other pests. The broad principles of organic farming addresses the issues on health, ecology and fair sharing among all species; but more specifically the following principles underpin organic farming:

a. The principle of interdependency - in living nature nothing happens which is unconnected to the whole.

b. The principle of diversity -natural ecosystems have a diverse, intricate web of life that establishes checks and balances which suppress outbreaks of pest species.

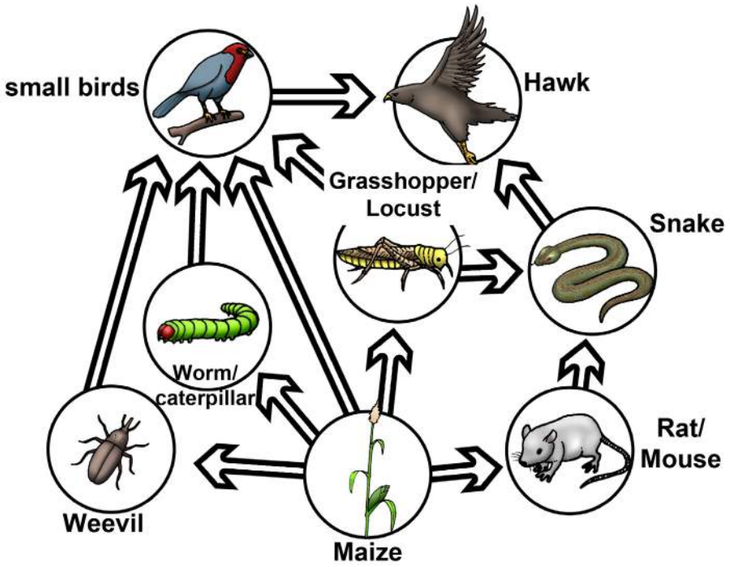


Fig 2: Principles of diversity

c. The principle of recycling - natural ecosystems are characterized by a continual growth, decay and recycling of nutrients.

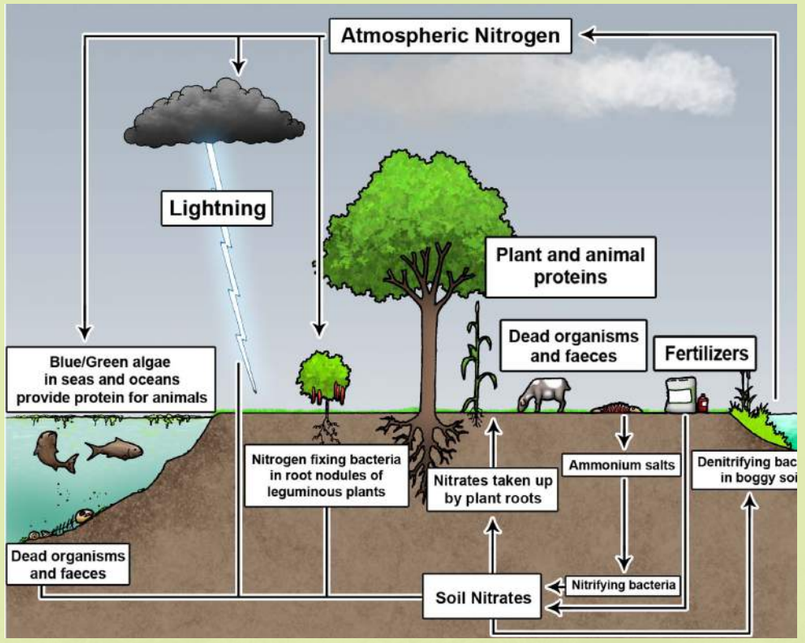


Fig 3: Principle of recycling-Nitrogen cycle

d. Soil fertility - a well-balanced and biologically-active soil will provide the crop with sufficient nutrients for optimum growth and yields, with a minimum of pest and disease problems.

2.7 Conservation Agriculture

Is a concept for resource-saving agricultural crop production that strives to achieve acceptable profits together with high and sustained production levels while concurrently conserving the environment. It is based on the three Principles:

Fig 4: Intercropping

a. Disturbing the soil as little as possible

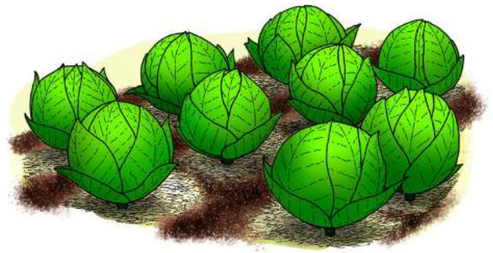


Fig 5: Conservation agriculture

b. Keeping the soil covered as much as possible
c. Mixing and rotating the crops

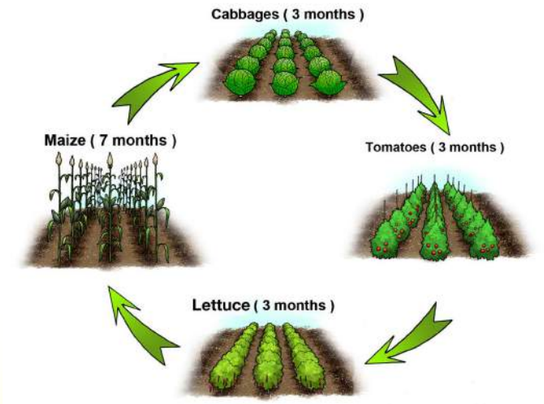
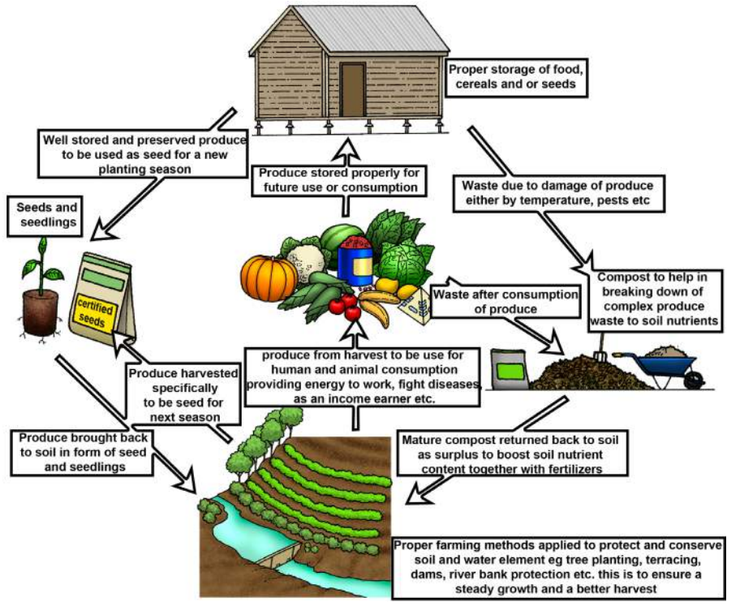


Fig 6: Conservation agriculture crop rotation

2.8 Permaculture

Is concerned with but not limited to, designing ecological human habitats and food production systems, and follows specific guidelines and principles:

a. Care of the earth and its resources
b. Care of people
c. Return of surplus or fair share



2.8 Permaculture

In itself it is not a production system per se, but rather a land use planning philosophy, and is not limited to a specific method of production.

2.9 Regenerative Agriculture

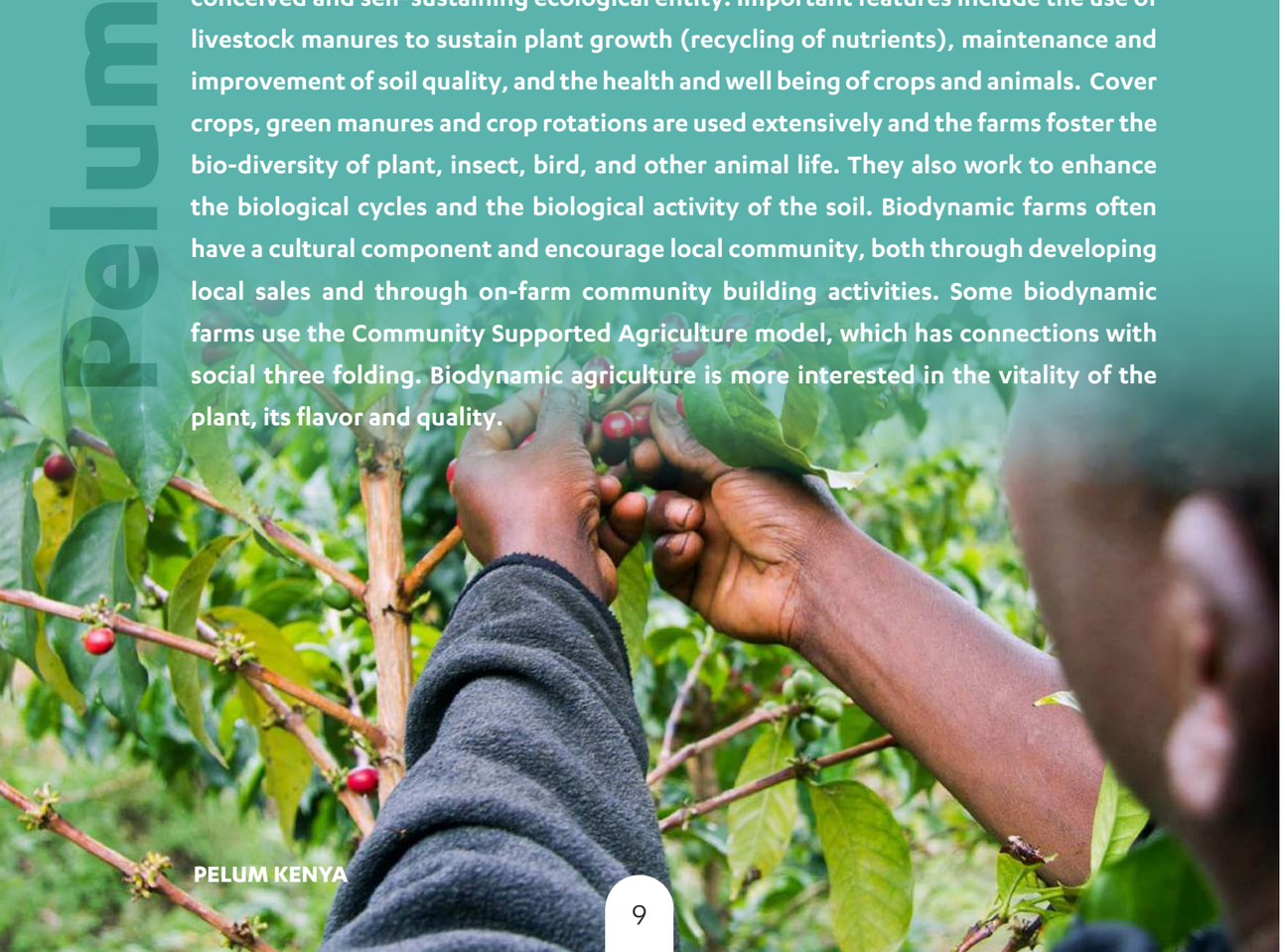
Regenerative crops are those that have the ability to renew their growth or production cycle. Bunds on nature's own inherent capacity to cope with pests, enhance soil fertility, and increase productivity. It implies a continuing ability to re-create the resources that a system requires.

2.10 Ecological Agriculture

It is meant to address the growing environmental degradation, dwindling natural resources and the urgency to meet the food needs of the increasing population. Ecological agricultural system backed up by green technologies is meant to address these needs, of raising food and animals as an agro-ecological set up, where it mimics natural ecology.

2.11 Biodynamic Agriculture

It is a method of organic agriculture that considers farm as a living system and where one activity affects the other. Biodynamic agriculture developed from Anthroposophy, which is a human oriented spiritual philosophy founded by Rudolf Steiner, a philosopher and a spiritual researcher, in the beginning of the 20th Century. Biodynamic farmers seek to integrate soil, crops, animals, and society as interdependent parts of a holistically conceived and self-sustaining ecological entity. Important features include the use of livestock manures to sustain plant growth (recycling of nutrients), maintenance and improvement of soil quality, and the health and well being of crops and animals. Cover crops, green manures and crop rotations are used extensively and the farms foster the bio-diversity of plant, insect, bird, and other animal life. They also work to enhance the biological cycles and the biological activity of the soil. Biodynamic farms often have a cultural component and encourage local community, both through developing local sales and through on-farm community building activities. Some biodynamic farms use the Community Supported Agriculture model, which has connections with social three folding. Biodynamic agriculture is more interested in the vitality of the plant, its flavor and quality.



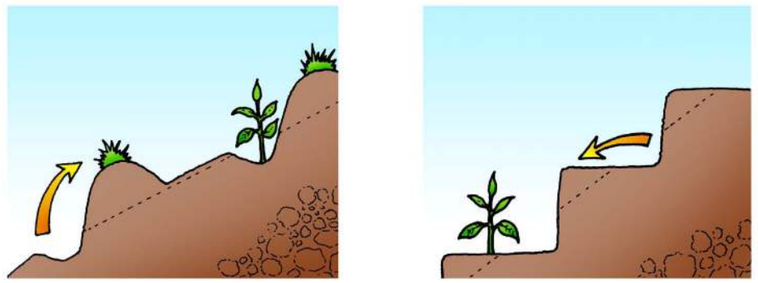
3.0 Key Ecological Land Management Practices

The practices are clustered under thirteen main areas;

3.1 Sustainable land management

This means maintaining land in its natural form so that it keeps producing / regenerating itself for production purposes. Whether land is being used for agriculture or not, it is important to make sure that its potential to produce is retained. It is worth to note that not all land is suitable for raising crops or urban building. Such factors as degree of slope, soil characteristics, rockiness, erodibility, and other characteristics determine the best use of a parcel of land- (refer to appendix II) The following are some of the practices that help the farmer to take care of his/her land.

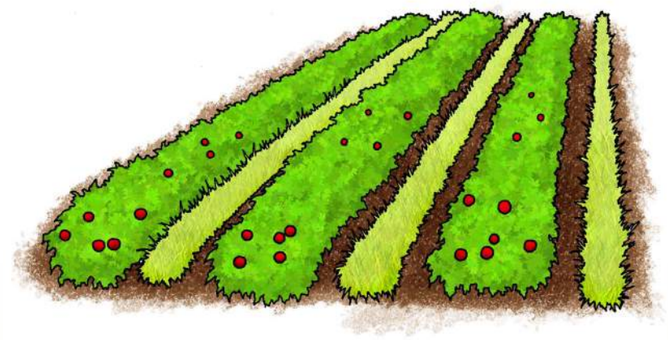
3.1.1 Terracing - this is laying physical structures along contour lines on the earth is surface at predetermined intervals for soil and water management. Swale is also a common practice in permaculture; that means designing erberms similar to those in a fanya chini, and planting crops on the lower side. Other common types of terraces being fanya juu, fanya Chini, stonelines, grass strips and trushlines.



3.1.1 Terracing

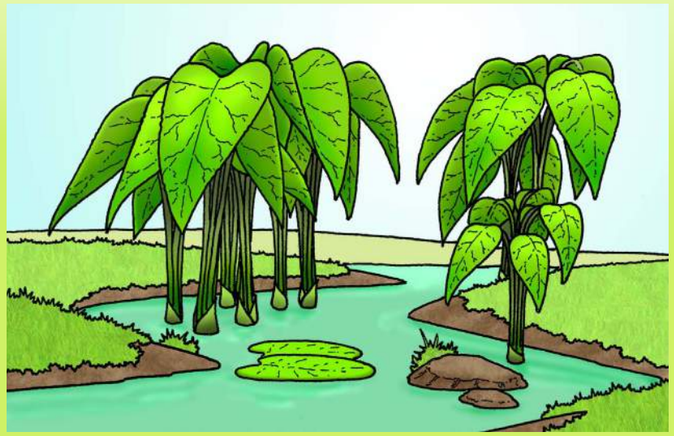
3.1.2 Contour farming – means tilling the land at right angles to the land slope. It reduces the soil erosion by as much as 50% and in drier regions, and increases crop yields by conserving water.

3.1.3 Strip farming - is alternating strips of closely sown crops such as hay, wheat etc with strips of row crops such as maize, soybeans etc. This helps conserve soil water and prevent soil erosion.



3.1.3 Strip farming

3.1.4 Vegetated water ways - are depressions on sloping land where water collects and flows off the land. When well maintained, the speed of the water is reduced, the roots tend to hold the soil particles in place.



3.1.4 Vegetated waterways

3.1.5 Biodiversity conservation - the primary causes of biodiversity loss are habitat loss by humans converting ecosystems to agriculture, overexploitation by harvesting species at unsustainable levels, the introduction of exotic species that disrupt ecosystems and compete or prey on native organisms, and purposeful killing of pest organisms. Maintaining an intact biodiversity is critical if agriculture has to flourish and satisfy an ever increasing human and animal populations.

3.1.6 Land reclamation - food production requires big pieces of land if it has to meet the demand by the increasing population. Unfortunately, the land value goes down every time it is subjected to such treats like erosion, over mining of plant nutrients, over compaction, excessive reduction of ground cover among others. It is therefore necessary to redeem the degraded lands into arable status. This calls for practical interventions such as drainage, gabion establishment where big gullies have developed, tree planting, furrowing among many others.

3.2 Maintenance of healthy and fertile soil

The key symptoms of unhealthy/infertile soil are expressed in plants showing nutrient deficiency. This results to low crop yields, high levels of inorganic fertilizers needed to produce good crop, short crops that are stunted, bare soil, crop yields that vary widely from year to year. The following are some of the soil quality management components:

3.2.1 Enhance organic matter - whether soil is naturally high or low in organic matter, adding new organic matter every year is perhaps the most important way to improve and maintain soil quality. Organic matter improves soil structure, enhance water-and nutrient-holding capacity, protect soil from erosion and compaction, and support a healthy community of soil organisms. Practices that increase organic matter include leaving crop residues in the field, choosing crop rotations that include high-residue plants, using optimal nutrient and water management, growing cover crops, applying manure or compost, using low–or no-tillage system and mulching.

3.2.2 Minimized tillage - Reduced tillage minimizes the loss of organic matter and protects the soil surface with plant residue. This is well addressed by conservation agriculture principles.

3.2.3 Efficient management of pests and nutrients - an important function of soil is to buffer and detoxify chemicals, but it is worth to note that the soil's capacity for detoxification is limited.

Pesticides and chemical fertilizers have valuable benefits, but they also can harm non-target organisms and pollute water and air if they are mismanaged. Nutrients from organic sources also can pollute when misapplied. Therefore, efficient pest and nutrient management means testing and monitoring soil pests, applying only the necessary chemicals which at right time and place, and taking advantage of non-chemical approaches such as crop rotation, use of cover crops and manure management.

3.2.4 Prevention of soil compaction - compaction reduces the amount of air, water, and space available to roots and soil organisms. Avoid use of heavy machinery while preparing the land, when the soil is wet.

3.2.5 Keep the soil covered - bare soil is susceptible to wind and water erosion and to drying and crusting. Ground cover protects the soil, provides habitats for large soil organisms, such as earthworms and other insects and can improve the water availability.

Soil organisms are the primary decomposers and break up plant litter into smaller pieces that later turn to humus

3.2.6 Diversifying cropping systems - each plant contributes a unique root structure and type of residue to the soil. Diversity across the landscape can be increased by using buffer strips, small fields, or contour strip cropping.

3.3 Production of healthy crops

3.3.1 Healthy seed - that a seed produced naturally without manipulation of its genetic makeup and in a clean and natural environment.

The seed, whether in grain form, or cutting (Vegetative), disease free and of good size so as to grow and produce a good and healthy food

3.3.2 Crop rotation - means changing the type of crops grown in the field each season or each year aimed at improving the soil structure and fertility. It has other key advantages such as weeds, pests and diseases control as well as reducing the risk in case on one crop fails. Some key considerations for good crop rotation include crop requirement for different crops, root systems, vulnerability to pests and diseases etc

3.3.3 Companion cropping - this is a practice of planting more than one crop in the same land the same season that have a complementary relationship. A good illustration is that of a cereal crop such as maize planted together with a legume such as beans, where the bean gets physical anchorage while itself fixing nitrogen to the soil that is in return used by the maize plant. This is recommended, or all the intercroppingsystems for increased yield and soil fertility management.

3.3.4 Integrated pest and disease management (IPM) - uses a variety of methods to control pests and diseases rather than relying on chemicals alone. It's a technique that depends on a complete understanding of all ecological aspects of the crop and the pests to which is susceptible. Some of the methods used include disrupting reproduction, using beneficiary crops, modifying farming practices and selectively using pesticides and other curative chemicals that have minimal harm to the ecosystem.

3.3.5 Mulching - mulch is dry, vegetative material used to cover the soil. It helps reduce loss of soil-water through evaporation, reduce soil erosion and provide plant nutrients as the material decomposes.

3.3.5 Mulch on a vegetable farm

3.3.6 Efficient planting techniques/ methods - it is very important to use a technology that saves on space, water and labour but still yield as expected. Some of these techniques/ methods require the farmer to be more innovative into how to prepare the soil to the right depth and with enough plant nutrients, how to prepare the planting holes as well as how to place the seed. Some of the techniques used are multi-storey gardens, fertility trenches, Mandala gardens, to name but a few.

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3.3.6 Mandala gardens - a small plot of kitchen garden...

3.3.7 Agroforestry - is an integrated system that can be practiced in different ecological zones/ climate under different emphasis of farm entities. It entails establishment of trees and farm crops grown together (agrosilviculture) and or livestock (Agrosilvopastoralism). Deep rooted trees that get moisture from further depths and are referred so that crops do not suffer. Agroforestry means all practices that involve a close association of trees or shrubs with crops, animals and pasture. The mix and their interaction are extremely important. Each component has its requirement and if not well addressed can make the whole system fail.

This association is both ecological and economic

- It involves combining practices in the same place at the same time, Intercropping and related practices or practices in the same place but at different times (Rotational practices)
- The place may be as small as a single garden or cropland or as extensive as a small watershed or a vast stretch of communal grazing land.

Agroforestry have numerous benefits, some of which are

- Agroforestry helps in soil fertility replenishment and land regeneration; hence increasing the food production
- Generates income by sale of tree products thus reducing rural poverty as the money is invested in various IGAs

- Some Agroforestry trees are fruit bearing, hence improving nutrition of the rural people.
- Conserve biodiversity through integrated conservation and development solutions based on Agroforestry technologies, innovative institutions and better policies;
- Protect watershed services through Agroforestry-based solutions that reward the people through clean water and other benefits
- Enable the rural people to adapt to climate change and to benefit from emerging carbon markets, through tree cultivation
- Build human and institutional capacity in Agroforestry research and development

3.4 Livestock related practices

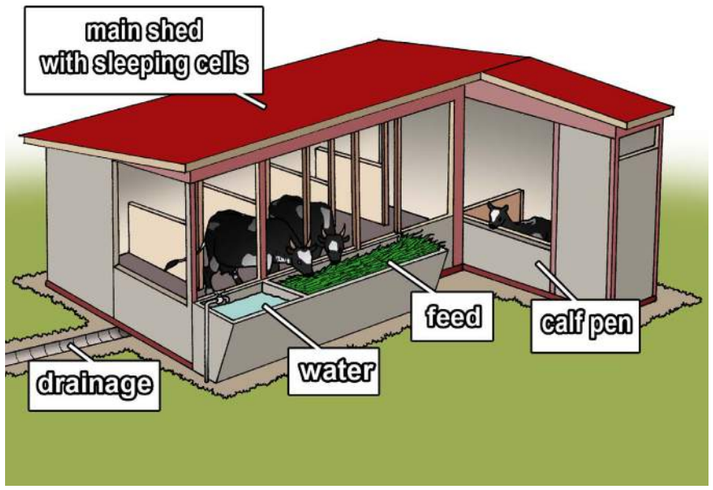
For a long time, African people have been closely associated with all kind of animals.

These animals have been sources of food, income, power and recreation. At the current times, land subdivision and ownership, pasture and water shortage and diseases have become a big hindrance for those farmers that would like to keep large number of livestock. For livestock production to be profitable, certain mandatory practices need to be done right, such as;

3.4.1 Keeping the right breeds - that have high performance levels in terms of yield, better quality carcass, resistance against common pests and diseases and one that responds well to changing climatic conditions. For breeding to be successful, the livestock keeper must first have good quality animals that are also well fed and in good health. Breeding is either done for livestock improvement or inheritance. Improvement deals with the productivity of the animals through the inheritance and environmental factors such as feeding, climate management, diseases prevention and control among others, while inheritance refers to passing over the traits of the parent to the offspring.

3.4.2 Good animal nutrition - the main functions of food are to provide energy to maintain the animal, to keep it warm and healthy, and promote body building. In order to determine what feedstuffs to put together and how much of each one to use to make a balanced ration, the feeder must know: the nutrients requirement for both maintenance and production; nutrient composition of available feedstuffs, the appetite and desired level of production.

3.4.3 Animal welfare - The welfare of an animal includes its physical and mental state and we consider that good animal welfare implies both fitness and a sense of well-being. Any animal kept by man, must at least, be protected from unnecessary suffering. It is believe that an animal's welfare, whether on farm, in transit, at market or at a place of slaughter should be considered in terms of five freedoms. These freedoms define ideal states rather than standards for acceptable welfare. They form a logical and comprehensive framework for analysis of welfare within any system together with the steps and compromises necessary to safeguard and improve welfare within the proper constraints of an effective livestock industry. Following are the main animal freedoms:



3.4.3 Animal welfare - proper animal housing with sufficient feed, clean water source and proper waste management

Freedom from Hunger and Thirst - by ready access to fresh water and a diet to maintain full health and vigor.

Freedom from Discomfort - by providing an appropriate environment including shelter and a comfortable resting area.

Freedom from Pain, Injury or Disease - by prevention or rapid diagnosis and treatment.

Freedom to Express Normal Behaviour - by providing sufficient space, natural environment, proper facilities and company of the animal's own kind.

Freedom from Fear and Distress - by ensuring conditions and treatment which avoid mental suffering.

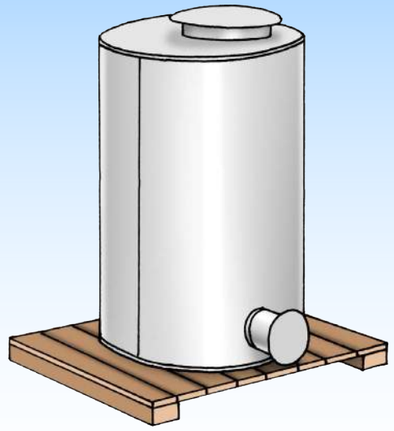
3.4.4 Livestock health - health is a state in which all the body organs and systems are normal and are functioning normally. Any deviation from this is termed as a disease. Ill health animal can usually be detected by various signs in terms of animal appearance, behaviour, feeding habit, defaecation, urination, appearance of the skin and coat, mucous membranes, temperatures, pulse rate and respiration rate among others. As a good farmer, it is important to know how to translate the symptoms and seek the right treatment, but most importantly is to prevent the disease by addressing what might cause the disease in advance where possible.

3.4.5 Use of Animal waste in production of organic fertilizer and pesticides - livestock manure commonly known as farm yard manure, is the main fertilizer especially for livestock keepers. It is recommended that for it to be good for use, first it has to be collected and heaped under a shade for about 21 to 28 days so that it can partly decompose and release harmful gaseous components that can easily scorch the crops. The liquid form (slurry) and or manure tea is also used to apply on crops as a top dresser. The quality of the livestock manure depends on the feeds and how it is handled after collection. It should not be stored under a hot sun to avoid evaporation of essential nutrients such as nitrogen.

3.5 Harvesting and post harvest management practice

This is meant to increase the shelf life of agricultural produce as well as add value to the raw foods in terms of taste, ease of handling the products and general appeal of the products. The related practices for this to happen include:

3.5.1 Storage facilities - they need to be well made and prepared to allow for enough ventilation, light, temperatures. They should be dry so as to avoid dumpy environment. Security from rodents, pests and thieves must be assured.



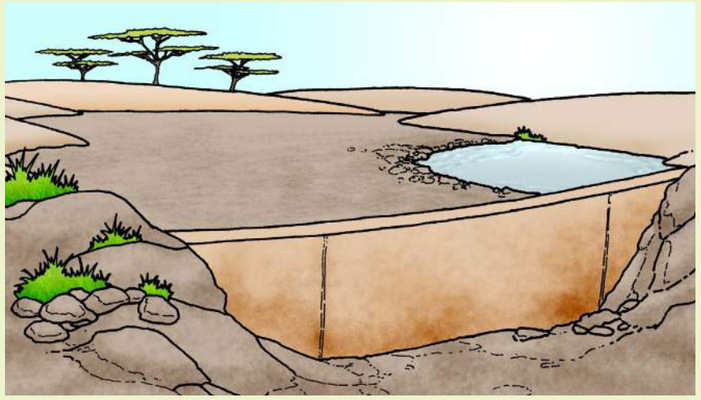
3.5.1 Post harvest storage facilities - a good shed, probably metallic system in use by smallholder farmers

3.5.2 Sorting and grading before storage - for any produce to have a long shelf life, it is necessary to sort it well to remove the damaged or spoilt ones.

3.5.3 Preservative and value addition of farm produce - most of the produce and products from the crops and livestock respectively are very perishable thus their daily demands are high and hence the need to preserve. For some to be preserved, their forms need to be changed to a longer lasting, for instant fresh milk to powder, raw potatoes to crisp etc, and by doing so the food security is enhanced

3.6 Efficient water harvesting and use

This can be both "exsitu"- harvested and used far from the source or "insitu" – harvested and used at the source, mostly by field crops. Either way, well designed systems and structure such as water pans, weirs, sand dams; to facilitate collection and utilization are very necessary. It is regrettable to see farmers in some parts of Kenya looking for water as soon as the rains stops, meaning that water harvesting has not been embraced and practiced in a large scale. Water plays a very significant role in agriculture and is completely impractical to do without. The key characteristic of farm water being : ***Quality*** – meaning safe water for use by human, animals and plants, ***Quantity*** – enough water to meet the demand on the farm and finally the ***reliability*** – water that is available when required.



3.6 Efficient water harvesting

3.7 Efficient use of farm energy

Family energy requirements can be very costly and need to be handled carefully to avoid unnecessary domestic expenses. From the production to use, efficiency is a key consideration. It is therefore important to employ systems and equipment that produce (e.g. Kilns for charcoal burning) and equipment (such as jikos, stoves) that use less but produce the needed calories. It is also advisable to use renewable sources such as biogas and solar for sustained production and clean environment. Recycling of wastes papers, and other flammable materials to produce energy is a worthwhile practice.

3.8 Afforestation

Afforestation is the practice of planting trees in barren lands so as to create a forest. It is important because it helps check the over-use of natural resources by providing an alternative source pool. it is different from reforestation, which is the process of specifically planting native trees into a forest that has decreasing numbers of trees. While reforestation is increasing the number of trees of an existing forest, afforestation is the creation of a 'new' forest.

Our Earth has been constantly trying to cope with the way in which human beings use natural resources, clear forest lands, cut trees, and contaminate the air, land, and water. Industrial revolution, population bursts, and pollution create permanent damage to the earth, and the result is global warming and climate change. In such situations, something that can help extend the life of the planet and its living organisms is the increase of natural resources and decrease of exploitation of these resources.

By planting trees and creating forests, many of the commercial needs of human beings are fulfilled, while not destroying what is left of the planet. Afforestation is, therefore, a practice that has been propagated by government and non-government agencies in Kenya as a way to stop over-exploitation of nature.

The importance of afforestation is immense in today's scenario because it is mainly done for commercial purposes. In a natural forest or woodland, the trees are heterogeneous. Owing to the sensitivity to over usage and slow growths, these forests cannot be used continuously for commercial purposes like wood products. The process of planting trees in empty lands helps promote the fast propagation of specific types of trees for the wood industry.

With the increasing demand for wood fuels and building materials, this process helps to meet these demands without cutting down the natural forests. Deforestation can lead to the depletion of trees in water catchments and riverside zones. Afforestation ensures trees and plants that hold the soil in these sensitive areas remain protected.

Tree planting has been introduced along with agricultural crops in croplands, and is referred as Agroforestry (refer to the notes above)

In terms of the environmental benefits, planting trees is always beneficial whether it takes place in a barren land or is used as a method to regenerate a depleted forest. Trees help check atmospheric carbon dioxide; large scale afforestation can curb the problems caused due to burning of fossil fuels, industrialization and so forth.

3.9 Biodiversity

Biodiversity is a broad term used to describe the diversity / variety of genes, species, and ecosystems in a region. It can be considered at different levels, including:

3.9.1 Genetic variation - the differences within a species that affect the physical characteristics and appearance and qualities of the individuals such as productivity, ability to withstand stress and adapt to change.

3.9.2 Species variation - a species is a distinct type of animal, plant or micro-organism that shares common characteristics and can breed only with others similar individuals.

3.9.3 Ecosystems - this is the interaction of different species with each other and physical environment that sustain ecological functions and services.

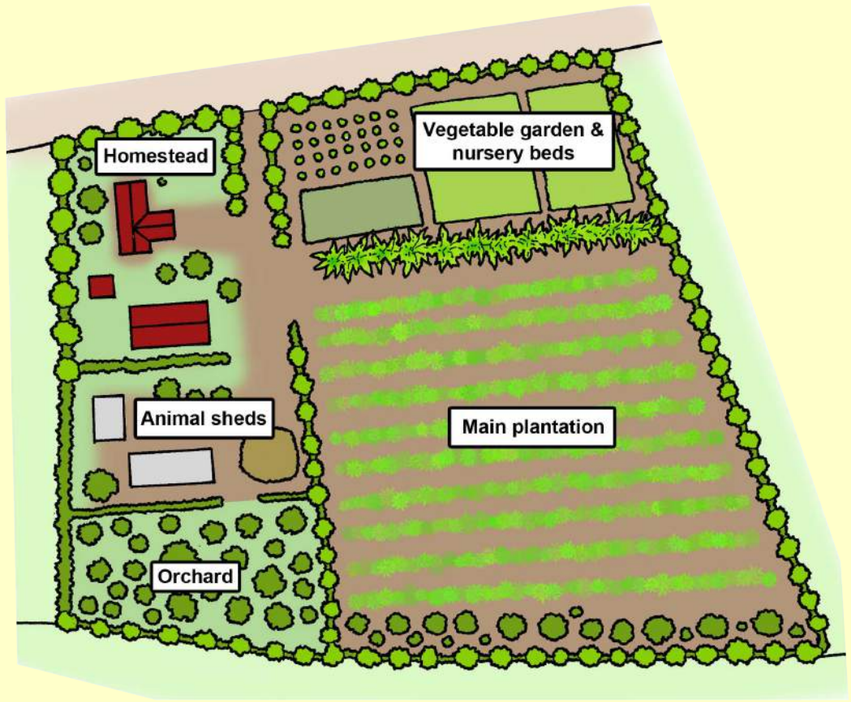
3.10 Agrobiodiversity

Agricultural biodiversity, also known as Agrobiodiversity, is an important sub-set of biodiversity. It is a part of biodiversity related to agriculture and the production of food and non-food natural resources. It is technically defined as the variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries. It comprises the diversity of genetic resources (varieties and breeds) and species used as food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predicators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic), as well as the diversity of the agro-ecosystems.

3.11 Farm Planning

There is no specific definition but thus relates to 'an action of out lining ideas to be implemented on the farm in a given activity cycles. A farm plan is a group of proposed integrated activities or ideas to be carried out on some specified areas of the farm in a given activity cycle.

Basically farm planning is preparing ideas on paper on what is to be carried out on a farm within a given period and brings with it both managerial and production benefits



3.11 Farm planning

Some of key production benefits include

- Helps realize increased productivity per unit area.
- Helps reduce wastage of resources:, for example structures will not be built where they can be pulled down later due to their misplacement.
- Allows for recycling of farm by products, hence Minimizing costs and maintaining the environment
- Crop rotation is possible that helps minimize pest and disease incidences.
- Food security is improved through diversification as well as improvement of the house hold nutrition status.
- Farm planning eases management of the farm enterprises
- Minimizes labour wastages, areas requiring frequent visits, checking or harvesting are set up near the home.
- Farm planning enables the farmer to foresee the costs and budget implications before engaging in the business.

Some of the managerial benefits include:

Leads to proper decisions making, resource allocation, time management and financial planning.

Gives the farmer direction and ensures proper resource allocation, utilization and sustainability

It's a primary tool for documenting compliance to standards and regulations and ensures integrity of the *elum* activities taking place on the farm.

No single farm plan resembles another because of diverse farmers' needs - different objectives, land sizes topography, environment, resources, like labour, capital and management.

The key guiding principles

Each farmer therefore is required to make his or her own farm plan and not to copy plans of others.

A farm plan should not be on paper only but must be translated on the ground to realize the benefits.

A farm layout should be kept simple and easy to interpret by all member of the family.

Planning should consider the needs of the family concerned, set measures to acquire the family needs, but also set measures to sustain the natural production resource base.

A farm plan is necessary for all types of farmers: large and small scale because it's the first step to sustainable land management.

Farm plans must be updated regularly: periodically, annually or biannually so as to include the seasonal changes on the farm.

A farm plan must be done within the *elum* principles in terms of ecological, economic and social factors as outlined in the other sections of the these guideline.

This includes: Maintenance of the *elum* integrity, social welfare and sustainability, animal welfare, improvements of the soil, sustaining and improving the crop yields, income versus

investments, ecological sustainability and minimizing of risks through diversification.

Other important considerations to bear in mind include: availability, accessibility and affordability of inputs for the selected enterprise as well as the beauty, hygiene and infrastructure both within the farm and outside.

The key steps in farm planning

Set the specific farm objectives: generate income, produce food for the family, protect the land and its resources, demonstrate good farming practices or produce fuel for the family.

Selection of the farm enterprises. What will exactly be done on the farm to achieve the objectives that were formulated above? The total family food requirements per month, season, or per year.

Gathering the farm and field history. This involves collecting and evaluating information on the past activities or operations on the farm or particular portions of the farm. The history helps the farmer to decide if the land or field is suitable for the proposed *elum* production.

Carrying out a field survey. A farmer is expected to have a total understanding of the farm; know its potential and limitations

Farm layout or Farm map. This is drawing on a paper the physical aspects of the farm, including the key features, boundaries, placement of the selected enterprises/ activities in the landscape.

Some of critical management systems include but not limited to:-

- Involve careful planning and organizing the resources before implementation
- Integrate all the farm enterprises, as *elum* works with the whole total farm but not discrete units of the farm
- An effective management system should consider the natural patterns as they directly influence the discrete farm units

- Should be organized in systems as described below. All the systems described aim at ensuring natural base conservation and avoidance of contamination and risks in the production process

Documentation and Records keeping

Record keeping in a well managed farm is a mandatory exercise. This is important as it's the only proof that the farmer is using the acceptable *elum* practices, technologies and inputs. The types of records kept vary depending on type and size of the operation. Records are important in *elum* practices as they assist in setting up and managing traceability in the production and marketing system.

The main components of a farm record include

Field history

Farm Field maps

Input records

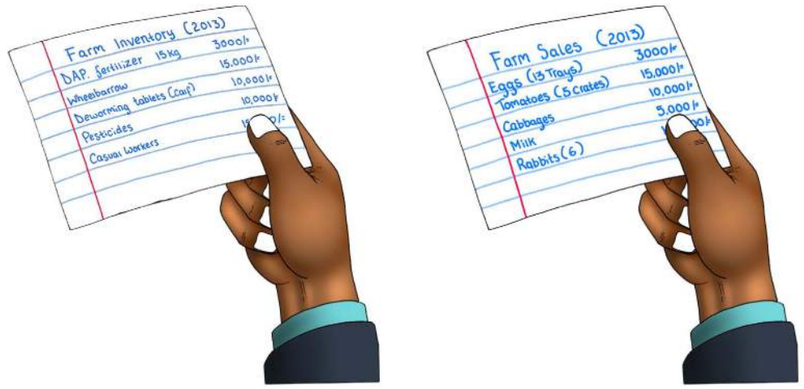
Farm activity records or activity log

Sales records (purchase order, invoices, receipts, dates and address of buyer, quantities sold)

3.12 Small Scale Farmers Enterprise Development within the *elum* principles

The options for small scale farmers to access income generating opportunities in bigger and more lucrative markets are restricted in most parts of country due to a number of challenges: technical and financial support is inadequate or non available, the economics of scale limit consolidation of economic loads, local market forces can be very unstable, while the commercial trading terms are unfavorable or limiting.

The situation is worse off in remote areas where subsistence agriculture and *elum* practices are the primary food security methods. Experience has also shown that in most cases the same areas continue to rely on external support through governments, NGOs, development agencies and donors thereby developing a major risk of dependency. Furthermore most of the farm business in rural areas are based on agrochemicals which are usually toxic and do not take into account the element sustainability.



Some possible solutions

elum based production and marketing of either primary or value added goods in export and domestic markets presents a tangible and valuable opportunities for small scale farmers, companies and their producer organizations.

The following are possible enterprise development opportunities

- The guiding principle is that the *elum* farmers have to be directed to grow products where they have a competitive advantage. Such products will need a small space, low labour inputs (esp. considering women are the majority of small *elum* farmers) and the products are of extremely high value (in terms of monetary value).
- The growing high value field crops (herbs, spices, essential oils) and wild harvested products (gums, resins, and essential oils) provides an opportunity to develop trade in strategic regional and international markets. *elum* based buyers are interested in the development of long term trading relationship with small scale farmers and do provide for
- in-built supportive commercial trading terms. e.g. sourcing of correct seeds, development of demonstration/trial sites with key lead farmers, providing extension services and professional support.

NGO support to the market entry by providing:

- A revolving fund for the upfront payments to farmers at the point of sale of the products.
- Guarantee the market price to the farmers for the initial start up consignments.
- Payments for certification as are required by some *elum* practices.
- Development of fair trade initiative and marketing component adds value to *elum* production. Training in and the development of the criteria for fair trade becomes an important input into the system.
- Development and support farmers' advisory training materials. The literature assists or support the producers to increase production as well as the quality of the production.
- Training of NGO extension staff and lead farmers in commercial *elum* techniques and technologies.
- Exploring the opportunities of specific trade support schemes supported by companies, governments and agencies to support the integration of small scale farmers in local and international trade.
- Making use of modern ICT platform for information and trading opportunities. Further the producer groups would be encouraged to participate and be represented at appropriate international and regional trade fairs.
- The development of appropriate quality control protocols which are consistent with market specification.
- In *elum* practices where certification of the production and processing process is crucial, co-ordination of the certification processes and training be provided. The producers will need to be trained in all relevant areas of particular *elum* certification and technical aspects.

3.13 Marketing products produced within *elum* principles

The market of products produced within the *elum* principles has the following unique characteristics that differentiate them from the conventional markets for similar products.

- Very exacting on quality and specific on its product definition. The elum market defines very clearly what it wants.
- While it follows the same structure as in other conventional product sectors, it has its own market niche, requirements, standards, consumers and organization. This market defines exactly what it wants, making it look old fashioned and very demanding.
- The market does not emphasis on **Spot trading** but on building long term trade relations between the buyer and the supplier.
- Before entry it requires the producer to understand its structure, requirements by having adequate market knowledge on it based on sound research.

The net result is that

- The market is under supplied and in particular all key product sectors.
- Presents a golden opportunity for those who can supply it consistently, providing the needed quality and quantity consistently and reliably over time.
- Increased public concerns regarding the dangers of food contamination from pesticides, heavy metals, and other synthetic contaminants have provoked the escalation of the *elum* market place. This in particular applies to the market sector where minimum processing is required or undertaken.
- The *elum* market is growing very fast in real terms compared to other sectors in similar product categories. Consumer interest is definitely going up and is forecasted to grow in the next decade.

- Undergoing rapid restructuring and reorganization in terms of market channels, branding, and consumer acceptances. Currently the products have penetrated main stream markets (supermarkets) from its niche markets signifying major supply changes and increased market acceptance.
- To increase *elum* production in order to respond to the market increased demand, there a number of supportive market Trade support programs already taking place within governments, non governmental organization and the commercial sectors. The initiative provide market access and linkages, market information, trade and market development support, market prospecting and market exchange visits.

4.0 Processes and Approaches to Foster elum

Participatory learning - this is meant to foster all inclusive knowledge creation and acquisition in a way that people learn from each other and from all available sources such as Indigenous and Traditional Knowledge (ITK) and also the most current and researched information

Training - putting the acquired knowledge into practice

Extension / Outreach - this means taking the technology to the wider audience far from the area of its invention; through methods such as farmer to farmer learning visits, field days and exhibitions

Information management and dissemination strategies / initiatives - to enhance continuity and relevance of knowledge/skill on good agricultural practices through simple but effective channels and methods such newsletters, magazines, short message service , farmers exchange visits

Participatory Action Research (PAR) - The approach empowers the local people in analyzing their own realities at a local level through participation and ownership of knowledge.

It involves others/stakeholders in analysis, dialogue and decision (planning, implementation, impact assessment, monitoring and evaluation) e.g. development and promotion of appropriate climate change mitigation and adaptation.

Use of sustainable agriculture approach - that is based on a process that strives to meet the needs - necessary for an integrated happy life – of those depending on the farm by developing the available human, physical, financial and natural resources. This embraces Organic / bio-intensive / ecological / apiculture/ etc

Creating awareness on critical policies - they are necessary in guiding the ownership and the use of both natural and manmade resources and facilities such as land, forest, water, pasture, minerals , mines etc

***Mechanize elum* practices;** to address the decreasing labour demands in Agri culture, draft animals have played a great role

5.0 Putting a Practice Within elum Standard

Quality assurance is adherence to already agreed standards that guide the extent to which one can use / apply a practice or a technology. Some of the key considerations in this context would be:

- *To be accordance to legal national legislations – policies, acts etc on matters such as land , water, seed, forest, minerals, pasture and grasslands and above all the Kenyan constitution*
- *Research in elum practices to generate scientifically verifiable data /information*
- *It must cater for the environment through mitigating effects of climate change, water conservation and improvement of soil life*
- *Has to promote production of quality and safe food*
- *Has to contribute to increased household cash income*
- *Must be aimed at reducing the cost of inputs so that farmers income can be boosted*
- *Has to encourage farmer to farmer learning and networking in order to allow easy access of information and knowledge sharing. This is by acknowledging that no one is a custodian of knowledge / information and for it to grow it has to be shared.*
- *Use of appropriate technologies that are effective, efficient and accessible (at reach and affordable within the financial capacity and capability of households to develop and implement the practice*
- *Address the social-cultural issues of the communities, such as gender, culture, changing family structure etc*
- *Always consider the Environmental conservation and protection which must be adhered to at all times*

The elum Principles and Guidelines, 2013

Appendix 1:

Test your practice / Technology

•	Does it cause any environmental hazard?	Yes		No
•	Is it accepted by your community / culture?	Yes		No
•	Can it be replicated in similar/different situation	Yes		No
•	Can it be improved/adjusted / amended?	Yes		No
•	Can it be used by all gender?	Yes		No
•	Does it help you generate enough family income?	Yes		No
•	Does it help to you realize more harvest?	Yes		No
•	Does it make the farm work easier and safer?	Yes		No
•	Does it endure the test of time?	Yes		No
•	Does it give room to explore for more practices	Yes		No

Appendix 2:

Land capability classes

Cluster	Land class	Characteristic	Capability	Special conservation measures
Land suitable for cultivation	I	Excellent, gently sloping, well drained	Crop land	Normal good practices adequate
	II	Good land with minor limitations such as slope, sandy soils, and or poor drainage	Crop land and pasture	Strip cropping and contour farming
	III	Moderately good land with significant limitations of soil, slope, or drainage	Crop land, pasture and watershed	Contour farming , strip cropping, terraces and waterways
	IV	Fair land with severe limitations of soil, slope, or drainage	Pasture, orchards, urban, industries, but limited cropland	Crops on limited basis, contour farming, strip farming, terraces and waterways.
Land not suitable for cultivation	V	Slightly limited by rockiness, shallow soil , or wetness	Grazing , forestry, watershed, urban and industry	No special precautions if properly grazed or logged. It must not be ploughed
	VI	Moderately steep slopes	Grazing , forestry, watershed, urban and industry	Grazing or Logging may be limited at times
	VII	Very steep slopes, Vulnerable to erosion	Grazing , forestry, watershed, urban and industry, wildlife, recreation	Careful management is required when used for grazing or logging.
	VIII	Very steep slopes, shallow soils, lack of water, or too much water	watershed, urban and industry, wildlife, recreation	Not to be used for grazing or logging.

Source: *Environmental science – a study of interrelationships by Eldon D. Enger, eleventh Edition*

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Glossary of terms

Arable land- areas of land whose ecology and environment are suitable for the production of cultivated crops

Arid – A term applied to regions or climate that lack sufficient moisture for crop production without irrigation

Biodiversity – is a broad term used to describe the diversity / variety of genes, species, and ecosystems in a region.

Biomass – the total mass of living microorganisms in a given mass of soil

Clay – a fine –grained soil has a high plasticity index in relation to the liquid limits

Climate - is the average weather over a period of time. The classical period for averaging weather variables is 30 years, as defined by the World Meteorological Organization (WMO)

Climate change – Climate change is a change in the state of the climate that persists for an extended period, typically decades or longer. Climate change may be due to natural and anthropogenic processes.

Compost – organic residues or a mixture of organic residues and soil, which have been piled and moistened and allowed to undergo thermophilic decomposition

Contour – am imaginary line on the earth surface connecting points of the same elevation / altitude

Cultivation – a tillage operation used in preparing land for seeding or transplanting or later for weed control and for loosening the soil

Desertification – is land degradation (excessive loss of vegetation cover) in arid, semi arid and dry sub-humid zones resulting from various factors, including climatic variations and human activities

Ecology- is a study of the ways organisms interact with each other and with their nonliving surroundings

Ecosystem – is a region in which the organisms and physical environment for an interactive unit

Enterprise – is a business unit/ entity

Environment – everything that affects an organism during its lifetime

Extinction – loss of the entire species and is a common feature of the evolution of organism

Food chain- is a series of organisms occupying different trophic levels through which energy passes as a result of one organism consuming another

Genes – distinct piece of DNA that determines the characteristics of an individual displays.

Green house gases- gases such as carbon dioxide, chlorofluorocarbons, methane and nitrous oxide; that let sunlight entre the atmosphere but slow the loss from the earth surface.

Habitat – a space that an organism inhibits / lives

Humus – organic material resulting from the decay of plant and animal remains.

Land – the area of ground especially one used for a particular purpose such as farming or building

Leaching - removal of plant nutrients in solution by the passage of water through the soil

Macronutrients – the three main plant's nutrients Nitrogen, Phosphorous and potassium

Manure – decomposed matter used as organic fertilizer

Natural Selection – is the process that determines which individuals within a species will reproduce and pass their genes to the next generation.

Niche – is a functional role an organism has in its surrounding

Ozone – is a molecule of three atoms of oxygen (O_3), is an extremely reactive molecule that irritates respiratory tissues and can cause permanent lung damage.

pH – the negative logarithm of hydrogen ion activity (concentration) of a soil. A pH of 7 is neutral, less 7 is acidic and higher that 7 is alkaline.

Plant food ratio – the ratio of numbers of fertilizer units in a given mass of fertilizer expressed in the order N-P-K.

Pollution – is any addition of matter or energy that degrades the environment for humans and other organisms

Population – is considered to be all the organisms of the same kind found within a specific geographical region.

Preservation – the degree to which something has not been changed by the effects of time or weather

Runoff – the portion of precipitation on area that is discharged from the through and move freely

Seed – planting material that grows to a new plant of the same type

Soil – the unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

Soil conservation – a combination of all management and land-use methods that safeguard and soil against depletion or deterioration caused by nature and /or humans

Soil erosion – is the wearing away and transportation of soil material by agents such as water and wind.

Soil fertility – ability of the soil material to support the life of a plant from the germination to maturity

Soil organic matter- the organic fraction of the soil that includes plant and animal residues at various stages of decomposition, cells and tissues of the soil organisms and substances synthesized by soil organisms

Soil profile – is a series of horizontal layers in the soil that differ in chemical composition, physical properties, particle size, and amount of organic matter

Species – is a population of all the organisms potentially capable of reproducing naturally among themselves and having off-springs that also reproduce.

Tillage – the manipulation, generally mechanical, of the soil properties for any purpose; but in agriculture is restricted to modifying soil conditions for crop production

Tilth – the physical condition of soil as related to its ease of tillage, fitness as a seedbed, and its impedance to seedling emergence and root penetration

Transpiration – the process by which water molecules are released from the

Vermitechnology – is the application earthworms for various reasons, among them: development of arable soils, turn over soil, break down of plant organic matter, aeration and drainage.

Water harvesting - the term used to describe the process of collecting and storing water from an area that has been modified or treated to increase precipitation runoff

Water table – the upper surface of groundwater or that level in the ground where the water is at atmospheric pressure

Yield – the amount of a specified substance produced per unit area.

Water table – the upper surface of the groundwater or that level in the ground where the water is at atmospheric pressure

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