NATIONAL STRATEGY ON AGRO-ECOLOGY

4th Draft

CONFIDENTIAL DISCUSSION DOCUMENT

agriculture,
forestry & fisheries

Department:
Agriculture, forestry & fisheries
REPUBLIC OF SOUTH AFRICA

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1. INTRODUCTION

The contemporary challenges of agriculture have evolved from the merely technical to also include social, cultural, economic and particularly environmental concerns. Agricultural production issues cannot be considered separately from environmental issues. In this light, a new technological and development approach is needed to provide for the agricultural needs of present and future generations without depleting our natural resource base. The agro-ecological approach does just this because it is more sensitive to the complexities of local agriculture, and has broad performance criteria which include properties of ecological sustainability, food security, economic viability, resource conservation and social equity, as well as increased production.

Agro-ecology is a discipline that uses ecological theory to design, manage and evaluate agricultural systems that are productive but also conserves natural resources. Agro-ecological farming also refers to interactions of all important biophysical, technical and socioeconomic components of farming systems and regards these systems as the fundamental units in which mineral cycles, energy transformations, biological processes and socioeconomic relationships are considered in an interdisciplinary way. Agro-ecology is closely related to the concept of sustainable agriculture. Agro-ecology is a climate smart agriculture that seeks to increase productivity in an environmentally and socially sustainable way, strengthen farmers' resilience to climate change, and reduce agriculture's contribution to climate change by reducing greenhouse gas (GHG) emissions and increasing carbon storage on farmland.

Agro-ecological farming is a whole-systems approach to food, feed, and fibre production that balances environmental soundness, social equity, and economic viability among all sectors of the public, including international and intergenerational peoples. Inherent in this definition is the idea that sustainability must be extended not only globally but indefinitely in time, and to all living organisms including humans.

Agro-ecological farming is based on the following:

- The application of ecology to the design and management of sustainable agro-ecosystems.
- A whole-systems approach to agriculture and food systems development based on traditional knowledge, alternative agriculture, and local food system experiences.
- Linking ecology, culture, economics, and society to sustain agricultural production, healthy environments, and viable food and farming communities.

Agroecology is concerned with the maintenance of a productive agriculture that sustains yields and optimizes the use of local resources while minimizing the negative environmental and socio-economic impacts of modern technologies. In industrial countries, modern agriculture with its yield maximizing high-input technologies generates environmental and health problems that often do not serve the needs of producers and consumers. In developing countries, in addition to promoting

environmental degradation, modern agricultural technologies have bypassed the circumstances and socio-economic needs of large numbers of resource-poor farmers.

Agriculture everywhere is significantly impacted by climate change. At the same time, agriculture stands as a central player in contributing to solutions to climate change and other world challenges. Agroecology is a form of agriculture when and where properly implemented provides all the solutions for soil fertility, natural parasites, pest and weeds control and remediates the challenges of irrigation. The principle of agro-ecology is that a healthy soil enables healthy pastures, and crops, hence animal production. Agro-ecological practices are using sustainable grazing, when all the challenges presented by the livestock sector in South Africa, is largely due to over grazing, a consequence of breeding for money, rather than to produce to keep the land sustainable.

To put agro-ecological technologies into practice requires technological innovations, agriculture policy changes, socio-economic changes, but mostly a deeper understanding of the complex long-term interactions among resources, people and their environment. To attain this understanding agriculture must be conceived of as an ecological system as well as a human dominated socio-economic system. A new interdisciplinary framework to integrate the biophysical sciences, ecology and other social sciences is indispensable. Agroecology provides a framework by applying ecological theory to the management of agroecosystems according to specific resource and socio-economic realities, and by providing a methodology to make the required interdisciplinary connections.

As a way to improve the resilience and sustainability of food systems, agroecology is now supported by an increasingly wide range of experts within the scientific community, and by international agencies and organizations, such as the United Nations Food and Agriculture Organization (FAO), UNEP and Biodiversity International. It is also gaining ground in countries as diverse as the United States, Brazil, Germany and France.

The ultimate goal of agroecological design is to integrate components so that overall biological efficiency is improved, biodiversity is preserved, and the agroecosystem productivity and its self-regulating capacity is maintained. The goal is to design an agroecosystem that mimics the structure and function of local natural ecosystems; that is, a system with high species diversity and a biologically active soil, one that promotes natural pest control, nutrient recycling and high soil cover to prevent resource losses. The agroecology is the sustainable way to address production challenges faced by plant production sector in South Africa such as climatic change, environmental, social and economic challenges.

2. PURPOSE AND OBJECTIVES

The purpose of this strategy is to achieve and create an ecologically, socially and economically sustainable agro-ecology sector that is globally competitive and contributes towards poverty alleviation, job creation, food security, economic development and climate change mitigation and adaptation.

The purpose will be attained through the following objectives:

- To facilitate broad stakeholders participation in the agro-ecological sector.
- To promote adoption of agro-ecology practices.
- To promote the production of agroecological products for both local and export markets.
- To improve of soil organic matter and biological activity.
- To increase of soil cover and crop competitive ability.
- To sustainably increase productivity, resilience (adaptation), reduces or removes greenhouse gases and enhances achievement of national food security and development goals.

3. THE RATIONALE FOR AGRO-ECOLOGY

3.1. PRINCIPLES OF AGRO-ECOLOGY

In the search to reinstate more ecological rationale into agricultural production, scientists and developers have disregarded a key point in the development of a more self-sufficient and sustaining agriculture: a deep understanding of the nature of agro-ecosystems and the principles by which they function. Given this limitation, agro-ecology has emerged as the discipline that provides the basic ecological principles for how to study, design and manage agro-ecosystems that are both productive and natural resource conserving, and that are culturally sensitive, socially just and economically viable.

The core principles of agroecology include recycling nutrients and energy on the farm, rather than introducing external inputs; integrating crops and livestock; diversifying species and genetic resources in agroecosystems over time and space; and focusing on interactions and productivity across the agricultural system, rather than focusing on individual species. It is highly knowledge-intensive, based on techniques that are not delivered top-down but developed on the basis of farmers' knowledge and experimentation. It goes beyond a one-dimensional view of agro-ecosystems - their genetics, agronomy, edaphology, and so on, - to embrace an understanding of ecological and social levels of co-evolution, structure and function. Instead of focusing on one particular component of the agro-ecosystems, agro-ecology emphasizes the interrelatedness of all agro-ecosystem components and the complex dynamics of ecological processes.

Agro-ecosystems are communities of plants and animals interacting with their physical and chemical environments that have been modified by people to produce food, fibre, fuel and other products for human consumption and processing. Agroecology is the holistic study of agro-ecosystems, including all environmental and human elements. It focuses on the form, dynamics and functions of their interrelationships and the processes in which they are involved. An area used for agricultural production, e.g. a field, is seen as a complex system in which ecological processes found under natural conditions also occur, e.g. nutrient cycling, predator/prey interactions, competition, and symbiosis and succession changes. Implicit in agro-ecological research is the idea that, by understanding these ecological relationships and processes, agro-ecosystems can be manipulated to improve production and to produce more sustainably, with fewer negative environmental or social impact and fewer external inputs.

Agro-ecology techniques and designs function as an “ecological turntable” by activating and influencing key components and processes of the agro- ecosystem:

- Enhance recycling of biomass and optimize nutrient availability and balance nutrient flow.
- Secure favourable soil conditions for plant growth, particularly by managing organic matter and enhancing soil biotic activity.
- Minimise losses owing to flows of solar radiation, air and water by way of microclimate management, water harvesting and soil management through increased soil cover.
- Species and genetic diversification of the agro-ecosystems in time and space.
- Enhance beneficial biological interactions and synergisms among agro biodiversity components thereby resulting in the promotion of key ecological processes and services.

These principles can be applied by way of various techniques and strategies. Each of these will have different effects on productivity, stability and resiliency within the farm system, depending on the local opportunities, resource constraints and, in most cases, on the market. Agroecological principles and practices combine time-proven farming methods, new ecological science, and local farmer knowledge to enhance the yields, sustainability, and social benefits of farming. Agroecology has been applied mainly but not exclusively by small-scale and resource-poor farmers, making their farming more productive, affordable, and reliable.

3.2. AGRO-ECOLOGY PRACTICES

There are several types of agroecological practices and resource-conserving practices that can be used to improve the stocks and use of natural capital in and around agroecosystems. These are:

A. ORGANIC FARMING

Organic farming refers to the type of farming that is done without the use synthetic chemicals such as pesticides, fertilizers, fungicides and insecticides or genetically modified seeds. The organic farmers use a range of techniques that help sustain ecosystems and reduce pollution, while improving both the production and quality of nutrition, linked to improved social and economic viability. In case of plant production it involves the use of crop rotation, natural, composting, approved environmentally friendly pest control and homeopathic remedies to produce food that is free of all artificial additives. In case of animal production, the animals raised on organic farms must be allowed to range as freely as possible and eat only organically produced feeds. Most critically, organic food production is based on genuinely sustainable systems.

B. BIODYNAMIC FARMING

Biodynamic agriculture is the first (1924) scientific method of organic farming. It uses specially prepared compost and field preparations and the farm is treated as a unified and individual organisms, emphasizing balancing the holistic development and interrelationship of the soil, plants, animals as a self-nourishing system minimizing external inputs insofar as this is possible.

Biodynamic agriculture advocates the combination of animal husbandry and crop production (mixed farming) and it uses biodynamic field and compost preparations (naturally occurring plant, animal and mineral materials which are combined in specific recipes) in order to vitalize the soil and to enable it to transmit this vitality through life-processes to plants and subsequently to animals and human beings. As a methodology all activities such as seed sowing, cultivation and harvesting are timed according to cosmic and seasonal rhythms. Biodynamic agriculture is based on anthroposophy and the ideas formulated by the Austrian Dr. Rudolf Steiner (1861 – 1925). The maintenance and furtherance of life-processes in the soil and in nature in general as well as the harnessing of cosmic energy and other formative influences from the sun, the stars, the moon and other planets, are basic principles.

C. PERMACULTURE

Permaculture is an approach towards designing human settlements and agricultural systems that mimic the relationships found in natural ecologies. The intent is that, by rapidly training individuals in a core set of design principles, those individuals can design their own environments and build increasingly self-sufficient human settlements that reduce society's reliance on industrial systems of production and distribution that had been blamed as fundamentally and systematically destroying earth's ecosystems. In permaculture, practitioners learn from the working systems of nature to plan to fix the damaged landscapes of human and agricultural systems. Permaculture practitioners apply everything deemed necessary to build a sustainable future.

Modern permaculture is a system design tool. It is a way of:

- looking at a whole system or problem;
- observing how the parts relate;
- planning to mend sick systems by applying ideas learned from long-term sustainable working systems;
- seeing connections between key parts.

D. BIOLOGICAL FARMING

Biological farming is a system that uses nature and science to build the quality of the soil with the understanding that healthy soil will be able to support healthy crops and livestock. It takes advantage of natural processes, which promote good soil, healthy crops, and healthy animals. These natural processes include: crop rotations; best tillage methods; growing green manures; proper livestock manure use; reducing toxins; promoting soil life, and balancing the soil's minerals. These terms mean using natural systems to improve soil structure; control weeds, pests, and diseases, and improve crop quality.

Biological farming works with natural systems and methods to build optimum soil, plant and animal health, while incorporating the best of conventional farming methods to maintain production levels and quality. Ultimately it also looks for outcomes in food nutrition and improved ecosystems. Biological farming methods present a viable way of producing high quality, nutritious produce without the use of non-organic fertilisers, pesticides or gene modification.

E. NATURAL FARMING

Natural farming involves the use of all inputs from natural materials, observes the law of the Nature and respects the rights of crops and livestock. Natural farming heals the soil slashed by chemicals, herbicide and machines. Basic idea of nature farming is to keep the soil as pure as possible, without using artificial fertilizers of any kind, chemical or non-chemical. Where natural farming is practiced, the soil and water become clean and ecology is recovered.

Natural farming is about working with natural energies rather than trying to conquer wild nature. The problem of agriculture long pre-dates modern industrial farming methods. Everywhere farming has been widely practiced soils have been eroded and depleted and the natural biodiversity has been reduced. Understanding of soil is central to natural farming. Soil is far from an inert substance, it is a complex living ecosystem comprising innumerable microorganisms that enable plants to take up nutrients essential for their growth and help defend them against diseases and insects.

F. TRADITIONAL FARMING

Traditional farming is an indigenous practice of cultivating land to produce crops, breeding, and raising livestock while managing natural resources in order to produce nutritious and continual food supply without external contribution but using self-reliance and locally available resources. Traditional knowledge is knowledge that has been preserved from generation to generation through oral and practical means. For many years our ancestors have tried to find ways of making good use of natural resources, to appreciate our natural environment, and learn to preserve it. From the use of herbs/plants for medicine to the utilization of astrological movements to tell time and weather, these traditions where ever they might have originated has become part of our culture and has contributed to who we are, how we learn, and has shaped our views.

Traditional farmers developed sustainable agriculture practices which allowed them to produce food and fiber for thousands of years with few if any outside inputs. Many of these practices have been forgotten or abandoned in developed countries, but are still used by many traditional, subsistence, or partially subsistence farmers in rural areas of South Africa and in some of the developing countries. Most traditional methods of agriculture were developed through millennia of trial and error, natural selection, and keen observation. These practices aim to conserve energy, maintain natural resources, and eliminate chemical use. Today, perhaps over half of the worlds' arable land is farmed by traditional farmers. Many of their techniques are unknown or poorly understood, but have allowed them to produce crops and animals with minimal or no purchased inputs. Traditional farming systems often resemble natural ecosystems. Their striking diversity gives them a high degree of stability, resilience, and efficiency.

G. CONSERVATION AGRICULTURE

Conservation Agriculture (CA) 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. CA is characterized by three principles which are linked to each other i.e. continuous minimum mechanical soil disturbance, permanent organic soil cover, particularly through the retention of crop residues and diversified crop rotations and associations. It is a set of resource-conservation that conserves, improve and make more efficient use of natural resources through integrated management of available soil, water and biological resources combined with external inputs. CA methods enhance natural biological processes above and below the ground by reducing interventions such as mechanical soil tillage to an absolute minimum. Conservation agriculture offers a powerful option for meeting future food demands while also contributing to sustainable agriculture and rural development. CA methods can improve the efficiency of input, increase farm income, improve or sustain crop yields, and protect and revitalize soil, biodiversity and the natural resource base.

3.3 BENEFITS / IMPACT OF AGRO-ECOLOGY

3.3.1. MITIGATION AGAINST CLIMATE CHANGE

Agro-ecology has a significant role to play in addressing one of the world's biggest and most urgent challenges, namely climate change. Climate change mitigation and adaptation and adaptation inherent beneficial characteristics of agroecology must be taken seriously by all stakeholders. Agroecology has well established practices that simultaneously mitigate climate change, build resilient farming systems, reduce poverty and improve food security. Agroecology emits much lower levels of greenhouse gases (GHG), and quickly, affordably and effectively sequestrates carbon in the soil. In addition, Agroecology helps to make farms and people more resilient to climate change, mainly due to its water retention efficiency, resilience to extreme weather events and lower risk of complete crop failure. Correct systems approaches to ecological agriculture can also make significant additions to materials and energy for other non–food uses.

Agroecology reduces greenhouse gases, especially nitrous dioxide, as minimal chemical nitrogen fertilizers are used and nutrient losses are minimized. It stores carbon in soil and plant biomass by building organic matter, encouraging agro-forestry and forbidding the clearance of primary ecosystems. It minimizes energy consumption by 30-70% per unit of land by eliminating the energy required to manufacture synthetic fertilizers, fossil based fuels and by using internal farm inputs, thus reducing fuel used for transportation.

3.3.2. ADDRESSING ENVIRONMENTAL CHALLENGES

Reports indicate that agro-ecology enhances soil structures, conserves water, and enhances sustained biodiversity. Through its holistic nature, agro-ecological farming integrates wild biodiversity, agro-biodiversity and soil conservation. It takes low-intensity farming one step further by eliminating the use of chemical fertilizers, pesticides and genetically modified organisms. This is also of benefit to associate off farm biotic communities.

Agroecology reduces the need for external inputs (usually expensive and mostly imported) by controlling pests and diseases naturally. Leaching of fertilisers into water systems are said to be the cause of eutrophication which is the suffocation of aquatic plants and animals due to rapid growth of algae and the building up of nitrates, phosphates and sulphates in the underground water reserves is a real danger for our national potable water assets. Many lakes, rivers and other bodies of water are facing this problem. Some herbicides and insecticides are founding their way into food systems and thus posing health problems for human beings. Agroecology, on the other hand is reported to have minimum impact on the environmental balance and ecosystems and protecting the health of people, farm workers, local communities and all the way through to consumers.

3.3.3. STABLE ECOSYSTEMS

Agroecology provides guidelines to develop diversified agro-ecosystems that take advantage of the effects of the integration of plant and animal biodiversity such integration enhances complex interactions and synergisms and optimizes ecosystem functions and processes, such as biotic regulation of harmful organisms, nutrient recycling, and biomass production and accumulation, thus allowing agro-ecosystems to sponsor their own functioning. The end result of agro-ecological design is improved economic and ecological sustainability of the agro-ecosystem, with the proposed management systems specifically in tune with the local resource base and operational framework of existing environmental and socioeconomic conditions. In an agro-ecological strategy, management components are directed to highlight the conservation and enhancement of local agricultural resources (germplasm, soil, beneficial fauna, plant biodiversity, etc.) by emphasizing a development methodology that encourages farmer participation, use of traditional knowledge, and adaptation of farm enterprises that fit local needs and socioeconomic and biophysical conditions.

3.3.4. RESILIENT ECOSYSTEMS

Improving ecosystem management and biodiversity can provide a number of ecosystem services, which can lead to more resilient, productive and sustainable systems that may also contribute to reducing or removing greenhouse gases. Services include, control of pests and disease, regulation of microclimate, decomposition of wastes, regulating nutrient cycles and crop pollination. Enabling and enhancing the provision of such services can be achieved through the adoption of different natural resource management and production practices.

3.3.5. GENETIC RESOURCES

Genetic make-up determines a plants and animals tolerance to shocks such as temperature extremes, drought, flooding and pests and diseases. It also regulates the length of growing season/production cycle and the response to inputs such as fertilizer, water and feed. The preservation of genetic resources of crops and breeds and their wild relatives is therefore fundamental in developing resilience to shocks, improving the efficient use of resources, shortening production cycles and generating higher yields (and quality and nutritional content) per area of land. Generating varieties and breeds which are tailored to ecosystems and the needs of farmers is crucial. Genetic diversity reduces the risks of crop failure and allows farmers to improve their own seed stocks.

3.3.6. SOIL AND NUTRIENT MANAGEMENT

The availability of nitrogen and other nutrients is essential to increase yields. This can be done through composting manure and crop residues, more precise matching of nutrients with plant needs, controlled release and deep placement technologies or using legumes for natural nitrogen fixation. Using methods and practices that increase organic nutrient inputs, retention and use are therefore fundamental and reduces the need of

synthetic fertilizers which, due to cost and access, are often unavailable to smallholders and, through their production and transport, contribute to GHG emissions.

4. PROBLEM STATEMENT

4.1. LOW AWARENESS LEVELS

Information is a key to successful farming. Farmers need information on agro-ecological practices, and marketing for proper decision making. Availability and accessibility of appropriate information is a serious challenge for the agricultural, particularly the small-holder farmers. There is a shortage of appropriate information about this type of farming for farmers that will enable them to make sound decisions on their farming operations. There is also a problem with regard to dissemination of available information. Factors contributing to this are illiteracy, inaccessibility, etc.

4.2. UNSUSTAINABLE PRODUCTION PRACTICES

Agricultural practices, however, can have negative effects on human health and education. Over-exposing farm workers to dangerous chemicals remain a problem in the agricultural sector. Pesticides and fertilizers used in agriculture can contaminate water. Misuse of pesticides can have immediate and health effects on farmers and consumers. Persistent pollutants can cause harm to ecosystems both locally because of their chemical properties, and at great distances where they are applied. Unsafe food, especially due to microbial contamination, is a major problem for domestic consumers and is emerging as a key issue in international markets.

4.3. HIGH COMPETITION FOR LAND AND WATER RESOURCES

Agriculture is facing a never-increasing competition for land from mining, residential, manufacturing and golf estates. Most of the agricultural land is been lost to mining on an increasing scale. Provinces that are worst affected are Gauteng, Western Cape, Mpumalanga, Kwazulu Natal and Limpopo. The loss of land from the agricultural sector would put pressure on existing land to support increased food production due to increased demand as a result of increase in country's population. Mining had also been blamed for increased incidences of pollution of irrigation and household water.

4.4. POLLUTION PROBLEMS

Pollution of water resources threatens the livelihoods of the poor, particularly in rural areas, where they rely on them. Increasing poverty, in turn, limits the range of available options with regard to the sustainable management of these finite resources. The challenge is made more difficult by increasing population densities and the effects of climate change. Polluted water is also unsafe for irrigation purposes.

Main sources of water pollution are:

- Inadequate sanitation
- Poorly maintained sewerage systems

- Fertilizers and pesticides
- Effluent from factories and other manufacturing facilities
- Chemicals and other pollutants from the mines and abandoned mine dumps
- Eroded soil that is washed into the country's river systems.

4.5. HIGH LEVELS OF SOIL DEGRADATION

South African soils are characterised by low fertility. Land degradation is the most important environmental problem affecting many areas of South Africa. The main effects of soil degradation are soil impoverishment and greater susceptibility of vegetation to drought. Factors that have contributed to this, particularly in the commercial sector, are monoculture cereal production, intensive tillage, and limited crop rotation. Excessive fuel wood collection, inappropriate land use, population density and overgrazing are the main causes of soil degradation in the communal areas, on the other hand. Several processes are contributing to declining quality of land resources. Soil erosion is responsible for about 50 per cent of land degradation, while irrigated land in some areas has been damaged by water-logging or salinity. Extreme poverty and hunger push people onto marginal lands and more fragile ecosystems characterized by drought stress and low soil fertility. Yield growth has slowed down and environmental stress increased.

4.6. LOW RAINFALL LEVELS

Rainfall in South Africa is generally low, erratic, unevenly distributed and unreliable. Nearly 80% of the country is considered to be arid, semi-arid and dry sub-humid. South Africa's available freshwater resources are already almost fully utilized and under stress. At the projected population growth and economic development rates, it is unlikely that the projected demand on water resources in South Africa will be sustainable. Water will increasingly become the limiting resource in South Africa, and supply will become a major restriction to the future socio-economic development of the country in terms of quantity and quality. At present many water resources are polluted by industrial effluents, domestic and commercial sewage, acid mine drainage, agricultural runoff and litter.

5. INTERVENTION MEASURES

5.1. AWARENESS PROGRAMMES

Many studies and surveys had shown that consumers are not well informed about the principles and the benefits of agro-ecology. In order to broaden the information available about this type of production system, it is important that objective and reliable information is made available by government and other stakeholders. Information campaigns about the principles, the practices and the environmental and other benefits of agro-ecological farming should be developed and implemented. They should target consumers as well as farmers, but also operators in the processing industry, retailers, large-scale kitchens as well as schools.

Key strategy actions are:

- Development and implementation of information and promotion campaigns aimed at informing consumers, public institutions, schools and other stakeholders about the benefits and merits of agro-ecology.
- Development and implementation of a website, radio programs and targeted videos dedicated to agro-ecology.
- Establishment of knowledge networks between government departments, provinces, universities and commodity groups.
- Development and distribution of promotional material (posters, brochures, pamphlets, etc.).

5.2. TRAINING PROGRAMME

Training and capacity building forms the basis for human resource development to address skills shortage and to enhance competitiveness of the sector. Enhanced training of farmers is of critical importance for improved adoption of agro-ecological farming practices. The training programmes shall include aspects of production from propagation until post-harvest handling. Length of training shall be determined by the needs of targeted groups. The short-course training programme shall be tailor-made for the farmers and extension officers.

Key strategy actions are:

- Development and implementation of training programmes for extension officers and farmers.
- Implementation of effective mentorship programmes.
- Refocusing and re-orientation of curricula of training institutions in line with the needs of the country (both universities and colleges).

5.3. ADOPTION OF SUSTAINABLE PRODUCTION PRACTICES

Agro-ecology is a form of agriculture when and where properly implemented provides all the solutions for soil fertility, natural parasites, pest and weeds control and remediates the challenges of irrigation. The principle of agro-ecology is that a healthy soil enables healthy pastures, and crops, hence animal production. Agro-ecological practices are using sustainable grazing, when all the challenges presented by the livestock sector in South Africa, is largely due to over grazing, a consequence of breeding for money, rather than to produce to keep the land sustainable.

Key strategy actions are:

- Promote integrated production systems, incorporating both plants and animals;
- Develop and adopt where appropriate, alternative crops and cropping systems suitable to the circumstances of farmers and climatic and soil conditions of a particular area;

- Promote the integrated management of pests, diseases, and weeds;
- Encourage the reduction of dependence on inorganic fertilisers and agro-chemicals through the increased use of organic alternatives;
- Address nutrient depletion, especially in communal areas, through appropriate interventions, like liming, promotion of the use of organic manures, etc;
- Encourage innovative approaches including cover crops, minimum tillage, crop rotation, inter-cropping and incorporation of agricultural by-products and residues to increase soil organic matter;
- Support and promote the utilization of indigenous knowledge in crop production, natural resource management and plant protection;

5.4. ZONING

South Africa faces competing needs for land from various sectors of the economy. If the situation is left unchecked the country might find itself with a situation where there are food shortages as well as those of the raw materials that are used in the manufacturing sectors. In order to mitigate against these challenges there is a need for decisive intervention by government.

Key strategy actions are:

- Mapping of the whole country the location of mines, factories, residential areas and other forms of infrastructure.
- Development of a database of all suitable agricultural land.
- Identification of areas in the country that should be dedicated for agriculture.
- Promulgation of legislation to enforce zoning of identified land.

5.4. INCENTIVE PROGRAMMES

An important means of promoting agroecology is to eliminate existing constraints that discourages new entrants. The government should use various incentive schemes to support the development of this sector and its farmers.

Key strategy actions are:

- Setting up of dedicated support systems at both national and provincial levels.
- Development and implementation of special incentive schemes for farmers practicing agro-ecology.
- Setting up a special fund dedicated to agro-ecology sector.
- Establish voluntary carbon credit systems to reward farmers for their contribution to climate mitigation through carbon sequestration activities.
- Financing mechanisms to provide positive incentives for the implementation of climate-friendly agricultural practices and technologies.
- Funding mechanisms for vulnerable farmers to help them adapt to climate change.

5.5. RESEARCH AND TECHNOLOGY DEVELOPMENT

South African agriculture needs a well-developed research system for agro-ecology. This will ensure optimization of all available resources and involvement of as wide a spectrum of role players as possible, and focus on the research challenges of sustainable development. Agricultural productivity growth requires technology development, dissemination and adoption by farmers. Research will have to be publicly funded where its outputs are such that people who have not paid for them cannot be stopped from enjoying their benefits. Examples include integrated pest management (IPM) practices, measures to raise the organic matter content of soils, biological nitrogen fixation to improve fertilizer use efficiency and genetic resource conservation.

Key strategy actions are:

- Improve public and private funding for research in agro-ecology.
- Support efforts to strengthen agricultural research and natural resource management capacity and dissemination of research results to the farming communities;
- Integrate and strengthen national research and extension services and farmer organizations.
- Facilitate farmer-to-farmer exchange on good practices and information on environmentally sound, low-cost technologies, with the assistance of government and other stakeholders;
- Facilitate capacity building among producer organizations to contract research and extension services and provide farmers with technology options.
- Promote research targeted at serving the needs of poor farmers with focus on such topics as improving drought tolerance and yield response to scarce plant nutrients and building pest and disease resistance.
- Develop research policies, which focus on identifying and removing constraints to the adoption of practices that promote optimal use of existing technologies.
- Develop programmes aimed at making agricultural extension, education and communication more responsive to farmers' needs.

5.6. MARKET DEVELOPMENT

Access to markets is critical for sustainability and profitability of agro-ecological farming. Resource poor farmers should be assisted to participate in the local and international markets. Rural agricultural communities must also obtain greater access to credit. These communities can become better organized through cooperatives, which can help provide a range of necessary rural facilities, including those relating to input and output marketing, and financial services. Cooperatives provide a perfect linking mechanism, allowing farmers to collectively access the marketplace, both to market their crops and to access farm inputs at reasonable rates.

Key strategy actions are:

- Facilitate off-take agreements between farmers and retail outlets.

- Supporting agro-based processing and rural entrepreneurship.
- Strengthening local market organizations and institutions.
- Promoting agricultural services through cooperatives and rural agricultural education.
- Promoting access of farmers in developing countries to international markets.
- Provision of reliable and up-to-date information on marketing opportunities and trends.

5.7. DEMONSTRATION CENTRES

Demonstration centres are important in terms of promoting the adoption of new technologies by farmers. The centres will also serve as training centres in some areas.

Key strategy actions are:

- Establishing a national demonstration centre in Gauteng.
- Establishment of a demonstration centre in each of the provinces.

6. MONITORING AND EVALUATION

The implementation of the strategy will be monitored and implemented through the following performance indicators:

KEY OBJECTIVES	INDICATORS	MONITORING TOOLS	FREQUENCY
To facilitate broad participation in the agro-ecology sector.	Increased number of black farmers entering the agro-ecology sector.	• Reports • Surveys • Meetings	• Monthly • Quarterly • Annually
To promote adoption of agro-ecology practices	Increased number of farmers adopting agro-ecology practices	• Reports • Surveys • Meetings	• Monthly • Quarterly • Annually
To promote the production of high quality and safe agricultural products for both local and export markets.	Increased volumes of products produced from agro-ecology	• Reports • Surveys • Meetings	• Monthly • Quarterly • Annually
To improve of soil organic matter and biological activity.	Increased organic matter content and microbial activities	• Reports • Surveys • Laboratory tests	• Monthly • Quarterly • Annually

To increase of soil cover and crop competitive ability.	Increased yields.	• Reports • Surveys	• Monthly • Quarterly • Annually

7. INSTITUTIONAL ARRANGEMENTS

The implementation of the strategy and its intents shall be achieved through the establishment of the following institutions:

- National Agro-ecology Forum [DAFF, DEA, DTI, DST, PDAs, ARC, industry, training institutions, etc]
- National Sector Body [producers, retailers, processors, etc]
- Provincial Department of Agriculture or structures.

8. BUDGET

The financial implications for the implementation of this strategy will amount **R300 000.000.** What is needed is the refocusing of notional budget allocations at the national, provincial and local government levels in order to attain the purpose and objectives of this strategy.

PROGRAMMES	**NOTIONAL BUDGET** **R'000**
Awareness	10 000
Training	10 000
Adoption of sustainable production practices	10 000
Zoning	10 000
Incentives	20 000
Research and technology development	20 000
Market development	10 000
Demonstration centres	200 000
GRAND TOTAL	**300 000**