

# THE ROLE OF SUSTAINABLE AGRICULTURE TO SUSTAINABLE DEVELOPMENT A CASE STUDY OF RWANDA

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**Abstract:** Sustainable agriculture sustains the economic viability of farm operations. It satisfies human food, fiber and energy needs. It maintains or enhances the resource base upon which it depends by emphasizing soil conservation, nutrient recycling, biologically based-pest management and biodiversity. It takes advantage of the knowledge and skills of farmers. It is durable and resilient to disturbance, pest outbreaks and market variability. It makes the most efficient use of nonrenewable resources and on-farm resources. It integrates, where appropriate, natural biological cycles and pest control tools with production practices. Sustainable Development is measured based on goals established by the Commission on Sustainable Development of United Nations such as Poverty reduction, Governance, Health, Education, Demographics, Natural hazards, Atmosphere, Land, Ocean- seas and coasts, Freshwater, Biodiversity, Economic development, Global economic partnership and Consumption and production patterns. Other consideration in measuring Sustainable Development is composed of eight Millennium Development Goals such as: To Eradicate extreme poverty and hunger; Achieve universal primary education; Promote gender equality and empower women; Reduce child mortality; Improve maternal health; Combat HIV/AIDS, malaria and other diseases; Ensure environmental sustainability and Develop a global partnership for development. Using the Qualitative and Quantitative Methods, the present research aims to describe the Sustainable Agriculture and to analyze the Role played by Sustainable Agriculture on Sustainable Development in Rwanda.

**Keywords:** Agriculture, Development, Sustainable Agriculture, Sustainable Development, Millennium Development Goals (MDGs).

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## I. INTRODUCTION

Sustainability is not an optional issue, it is fundamental to achieving future growth in agriculture. Agriculture is sustainable when it balances ecological, economic and socio- political trade-offs, both today and in the future. Sustainable agriculture is about more than organic or low-input farming. It must also take into account the contribution of agriculture to growth and poverty reduction and the needs of consumers (DFID, 2005).

Every day, agriculture produces an average of 23.7 million tones of food, including 19.5 million tones of cereals, roots, tubers, fruit and vegetables, 1.1 million tones of meat, and 2.1 billion liters of milk. Capture fisheries and aquaculture harvest daily more than 400 000 tones of fish, while forests provide 9.5 million cubic meters of timber and fuel wood. In one day, crop production uses 7.4 trillion liters of water for irrigation, and 300 000 tones of fertilizer. The total value of that one day of agricultural production is estimated at USD7 billion (FAO, 2012; FAO, 2013; World Bank, 2008).

In addition to meeting humanity's basic needs for food, feed, fiber and fuel, agriculture employs more than one in three of the world's workers, and provides livelihoods for rural households totaling 2.5 billion people (FAO, 2013). It contributes to social cohesion in rural areas, and preserves cultural traditions and heritage (Huylbroeck et al., 2007). It also makes important, but largely unrecognized, contributions to landscape and wildlife management, the protection of wildlife habitats, water management and quality, flood control and climate change mitigation.

The world's population is projected to grow from around 7.2 billion today to 9.3 billion in 2050 (United Nations, 2013a). That population increase and the expected dietary changes associated with income growth indicate that, by 2050, agriculture will need to produce 60 percent more food globally, and 100 percent more in developing countries, if it is to meet demand at current levels of consumption.

In the past, technological innovation and improvements in institutions have led to significant gains in agricultural production and productivity.

The past agricultural performance is no longer a guarantee of future returns. While supplies have been growing, the current trajectory of growth in agricultural production and productivity is unsustainable.

Sustainable agriculture comprises site-specific ranching and farming practices designed to meet current and future needs for food, fiber, energy, and ecosystem services including, but not limited to, soil conservation, clean water and biodiversity. Sustainable agriculture emphasizes production and food systems that are profitable, environmentally sound, energy efficient and improve the quality of life for both farmers and the public.

The present research, taking into account Rwanda as a case study, targets to establish the real role of sustainable agriculture to sustainable development. The following section consists of a clear understanding of Sustainable Agriculture. This section will be completed by the second section where the research lists key indicators of Sustainable Development. Rwanda's agriculture being targeted to be analyzed, it will be the object of the third section. The fourth section consists of an analysis comparing Rwanda's Agriculture Achievements to Indicators of Sustainable Development. The research will be concluded by the Conclusion and Recommendations for improvement because Sustainability is a process that never end.

## II. THE CONCEPT OF SUSTAINABLE AGRICULTURE

### 2.1. Definition:

According to WCED, 1987 Sustainable agriculture is an approach to agriculture that focuses on producing food in a way that does not degrade the environment and contributes to the livelihood of communities. Agriculture must balance production, environmental, and community development goals.

The USDA Farm Bill (1990) states that the term sustainable agriculture refers to an integrated system of plant and animal production practices having a site-specific application that will over the long term: Satisfy human food and fiber needs; Enhance the environmental quality and natural resource base upon which the agricultural economy depends; Make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; Sustain the economic viability of farm operations; Enhance the quality of life for farmers and society as a whole (Kluson, 2012).

Sustainable agriculture aims to: Produce safe and healthy food (Farms produce high quality, safe and healthy food); Conserve natural resources (water, soil and air are kept in good condition for future generations); Ensure economic viability (Sustainable farms help to strengthen the economy and contribute to balanced territorial development); Deliver services for the ecosystem (Agriculture delivers valuable services, such as water and nutrient retention, soil conservation, amenity and carbon storage); Manage the countryside (Farms manage the land, preserving valuable habitats and biodiversity and maintaining attractive landscapes which would not otherwise exist); Improve quality of life in farming areas (by providing employment; improving living conditions and social and by creating an environment that is also attractive for tourists); Ensure animal welfare (EU, 2012).

## 2.2. Key components of sustainable agriculture:

UN, 2009, describes three major components of Sustainable Agriculture:

### *Economic Profitability:*

Agriculture plays a fundamental role in the economic growth and the development prospects of a vast majority of developing countries (Pingali, 2006). Up to 70% of their populations live in rural settings and rely on farming for their livelihoods. To be truly sustainable, a farm must be economically viable. Production costs can be variously affected by sustainable methods. Fertilizer and pesticide costs are generally reduced on a sustainably managed farm because, for example, legumes and crop rotations tend to be less expensive than their synthetic alternatives. ATTRA lists the following indicators that a farm is achieving economic sustainability: The family savings or net worth is consistently going up; The family debt is consistently going down; The farm enterprise is consistently profitable from year to year; Purchase of off-farm feed and fertilizer is decreasing; Reliance on government payments is decreasing.

### *Environmental Stewardship:*

Biodiversity refers to the wide variety of flora and fauna found in nature (wild plants, animals, insects and micro-organisms). Biodiversity also supports a number of natural ecosystem processes and services. Some ecosystem services that benefit society are air quality improvement, climate mitigation, water purification, disease control, biological pest control, pollination and prevention of erosion. The protection of biodiversity has become a major concern in agricultural practices.

Sustainable agriculture is frequently described as: ecologically sound practices that have little to no adverse effect on natural ecosystems. More than that, sustainable agriculture also seeks to have a positive impact on natural resources and wildlife. A key to successful sustainable production is healthy soil, with a central tenet that management practices “feed the soil and the soil feeds the crop.” Ecologically, this means that soil fertility is provided by adequate soil organic matter and biologically based inputs that feed soil organisms, which release nutrients to plants. Sustainable methods of enhancing soil fertility and improving soil health include: using nitrogen-fixing legumes, green manure, and animal manure; minimizing or eliminating tillage; and maintaining year round soil cover. ATTRA lists the following indicators that a farm is achieving environmental sustainability: There is no bare ground; Clean water flows in the farm’s ditches and streams; Wildlife is abundant; Fish are prolific in streams that flow through the farm; The farm landscape is diverse in vegetation (University of Kentucky, 2012).

### *Social Responsibility:*

Social sustainability relates to the quality of life for those who work and live on the farm, as well as those in the local community. Treatment of workers, positive farm family relationships, personal interactions with consumers, and choosing to purchase supplies locally (rather than from a more distant market) are just some of the aspects considered in social sustainability. Agriculture - the largest industry on the planet - employs over one billion people worldwide. This means ensuring that farmers receive fair returns, and that good labor conditions prevail throughout the supply chain. In addition, businesses can facilitate access to education, training and health care for laborers and their families. ATTRA lists the following indicators that a farm is achieving social sustainability: The farm supports other businesses and families in community; Money circulate within the local economy; The number of rural families is going up or holding steady; Young people take over their parents’ farms and continue farming; College graduates return to the community after graduation.

## 2.3. Principles of Sustainable Agriculture:

The road to sustainability is long and complex. Each farm represents a unique combination of biological, climatic, soil and management conditions such that no single “silver bullet” exists to secure sustainability. However, there are principles that will help farmers move in the direction of more sustainable agro-ecosystems. Among them: Use water and nutrients efficiently; Keep soil covered throughout the year; Reduce or eliminate tillage in a manner consistent with effective weed control; Diversify your farming enterprise to spread agronomic and economic risk; Rotate crops to enhance yields and facilitate pest management; Use cover crops and green manure and/or animal manure to build soil quality and fertility; Protect water quality; Develop ecologically-based pest management programs; Integrate crop and livestock production; Increase energy efficiency in production and food distribution; Maintain profitability (Menalled et al., 2008).

#### **2.4. Vision for Sustainable Agriculture:**

The vision for sustainable food and agriculture is a world in which food is nutritious and accessible for everyone and natural resources are managed in a way that maintain ecosystem functions to support current as well as future human needs. In this vision, farmers, pastoralists, fisher-folks, foresters and other rural dwellers have the opportunity to actively participate in, and benefit from, economic development, have decent employment condition and work in a fair price environment. Rural women, men, and communities live in security, and have control over their livelihoods and equitable access to resources which they use in an efficient way.

#### **2.5. Strategies for Sustainable Agriculture:**

Achieving sustainable agriculture requires the development of strategies that make wise choices in order to reach those multiple objectives. Those strategies are:

- *A conceptual Model*

Through a conceptual model can we scrutinize our vision and propose ways to ensure transition towards sustainable food and agriculture.

- *Interactions and trade-offs*

A growing challenge to sustainability is to identify and balance interactions, benefits and trade-offs that result from different configurations of agriculture. Trade-offs occurs at three levels: between the human and natural systems, within both, and over time. Trade-offs between human and natural systems have gained the most attention – the human system’s level of consumption has grown to unprecedented levels, leading to the rapid depletion of natural resources and the disruption of ecosystem services through, for example, climate change and loss of biodiversity. Trade-offs within the natural system includes reducing land use through intensification, at the cost of increased water use, or choosing between production of food or bio-fuel. There are also trade-offs between the use of natural resources and ecosystem, at the cost of increased water use, or choosing between production of food or services. Intensification of production on cultivated land spares large areas of forest, but is also associated with pollution and high levels of energy and nutrient use.

Trade-offs in any of those categories occurs over time. Immediate benefits are often traded for later costs.

- *Cross-sectoral integration and synergies*

Past emphasis on individual agricultural sectors has allowed for focused productivity improvements, and most of improvements in agriculture’s products and services will continue to come from those sectors (crops, livestock, forestry, fisheries, and aqua-culture). However, their excessive separation has often created a “silo syndrome” in which crop production; livestock, forestry, capture fisheries and aquaculture compete with each other for space, political support and natural resources, often resulting in conflicts and in sub-optimal allocation and management of resources.

A holistic vision of sustainability must look beyond simply balancing trade-offs and explore, as well, opportunities for creating synergies that would reduce or even eliminate them, much as natural ecosystems already do. Important synergies and complementarities can be managed between crops and livestock, and between capture fisheries and aquaculture. All of them are supported by forests, which provide ecosystem services, especially soil formation, water purification, biodiversity conservation and climate regulation. Synergies between livestock and crop production are especially significant. Crops provide fodder and feed and grasslands contribute to sequestration of some of the greenhouse gases emitted by livestock. In turn, livestock produces manure that contributes to the productivity of crops and, by reducing the need for mineral fertilizer, improves sustainability (FAO, 2011). Manure can also be used to produce bio-energy, which reduces the need for fossil fuels in crop and aquaculture systems.

#### **2.6. Principles for the transition toward sustainable food and agriculture:**

FAO, 2014 established 5 principles for sustainability in food and agricultural that the social, economic and environmental dimensions of sustainability in agriculture, and provide a basis for developing policies, strategies, regulations and incentives to guide the transition to sustainability, while promoting resilience through an adaptive response to shocks and opportunities.

***Principle 1: Improving efficiency in the use of resources is crucial to sustainable agriculture***

Agricultural production is the transformation of natural resources into products for human benefit. That process requires management, knowledge, technologies and external inputs, with considerable variation in their relative importance and mix across production systems and regions of the world. The level and mix of inputs, and the type of technologies and management systems used, have major implications for the level of productivity as well as for the impact of production on natural resources and the environment.

***Principle 2: Sustainability requires direct action to conserve, protect and enhance natural resources***

While improved resource-use efficiency can help reduce pressure on ecosystems and natural resources, it also increases profitability, which can lead, in turn, to the expansion of production and a subsequent increase in resource depletion and degradation. The degradation of agro-ecosystems directly affects the food supply and income of the poor, increasing their vulnerability and creating a vicious cycle of poverty, further degradation and hunger (UN, 2013).

That is why direct action is needed to conserve, protect and enhance natural resources.

***Principle 3: Agriculture that fails to protect and improve rural livelihoods, equity and social well-being is unsustainable***

Agricultural development is, by definition, unsustainable if it fails to benefit those whose livelihoods depend on it by increasing their access to resources and assets, their participation in markets and their job opportunities. Since 75 percent of the world's poor live in rural areas, broad-based rural development and the wide sharing of its benefits are the most effective means of reducing poverty and food insecurity (World Bank, 2007).

***Principle 4: Enhanced resilience of people, communities and ecosystems is key to sustainable agriculture***

Resilience has emerged as a key factor in sustainability. It is defined as the ability of a system and its component parts to anticipate, absorb, accommodate or recover from the effects of a hazardous event in a timely and efficient manner, by ensuring the preservation, restoration or improvement of its essential basic structures and functions (IPCC, 2012).

In the context of sustainable food and agriculture, resilience is the capacity of agro-ecosystems, farming communities, households or individuals to maintain or enhance system productivity by preventing, mitigating or coping with risks, adapting to change, and recovering from shocks.

***Principle 5: Sustainable food and agriculture requires responsible and effective governance mechanisms***

Good governance is needed to ensure social justice, equity and a long-term perspective on the protection of natural resources (IFAD, 1999). When sustainability processes are dominated by abstract environmental concerns, without adequate attention to social and economic dimensions, they are unlikely to be implemented. A transition to sustainable agriculture that follows the five principles requires enabling policy, legal and institutional environments that strike the right balance between private and public sector initiatives, and ensure accountability, equity, transparency and the rule of law.

**2.7. Pillars for Transition to Sustainable Agriculture:**

Guiding the transition towards sustainability requires flexibility, autonomy and creativity on the part of those who implement it (FAO, 2014). The following pillars should underpin the design of practical interventions "on the ground":

***Pillar 1: Integration across scales and disciplines***

The need for national approaches: Inter-sectoral integration should be promoted by the adoption, at national level, of an overarching approach. An integrated approach facilitates collaboration among sectors and ensures that policies and programs for sectoral development are compatible. Work on agricultural sustainability needs to be embedded in Country Programming Frameworks, National Strategic Plans, or similar strategies that reflect countries' priorities, in order to encourage national buy-in and contribute to their development goals; Shared visions and values at local level: Implementation needs to be based on a national vision of sustainability – including issues, threats, values, principles and solutions – that is shared by all stakeholders from the outset; Multiple forms of knowledge: Evidence and management have co-evolved for more than a century; Multiple scales of intervention: Implementation will need to take account of



cross- scale interactions, paying particular attention to trans boundary impacts, whether imported by external drivers or exported in the form of positive or negative externalities from the sector or the area of sustainability initiatives; the long-term strategic implications of short-term operational measures; and interactions between governance systems, at inter-sectoral level and across jurisdictional scales, from local to global.

***Pillar 2: Collaboration***

Participative processes and co-construction: The world’s farmers, foresters and fishers will ultimately determine whether our vision of sustainable food and agriculture is realized. Policy-makers and innovators can only facilitate it by providing legal and institutional frameworks, incentives, rights, and infrastructure and support services. Field implementation should ensure ownership by the communities that will ultimately decide the relevance of the issues identified and the legitimacy of the responses proposed; Partnerships: Effective delivery calls for partnerships, coalitions and creative modes of collaboration. Stakeholders in agriculture at the community and country levels may need to work together in new ways. Partnerships will bring together actors from the public and private sectors, producers, research and academic institutions, civil society and community organizations.

***Pillar 3: Transparency***

The entire process, and particularly assessments, options analysis, decision-making and performance evaluation must be transparent.

***Pillar 4: Adaptability***

The strategy, institutions and approaches adopted must, therefore, have the capacity to adapt to changing conditions, selecting actions that are most robust to error, leaving room for local adaptation, mainstreaming impact and risk assessment, and institutionalizing performance assessment.

**III. THE CONCEPT OF SUSTAINABLE DEVELOPMENT**

**3.1. Definition:**

Sustainable Development is the development that meets the needs of the present without compromising the ability of the future generations to meet their own needs (WCED, 1987).

The concept of sustainable development encompasses three dimensions of welfare —economic, environmental and social - and involves complex synergies and trade-offs among them (Stevens, 2005). Sustainable Development is defined as development that satisfies the needs of the present without compromising the ability of future generations to satisfy theirs. Sustainable development implies the fulfillment of several conditions: preserving the overall balance, respect for the environment, and preventing the exhaustion of natural resources. Reduced production of waste and the rationalization of production and energy consumption must also be implemented. Sustainable development is presented as a more or less clean break from other modes of development, which have led and are still leading to worrying social and ecological damage on both a worldwide and a local scale. In order to be sustainable, development must combine three main elements: fairness, protection of the environment, and economic efficiency (Kates, Parris & Leiserowitz, 2005).

**3.2. CSD Indicators:**

The Commission for Sustainable Development (CSD) of United Nations (UN) has established 50 indicators of sustainable economic development classified according to the following themes or goals (UN, 2007):

- Poverty Reduction
- Governance
- Health
- Education
- Demographics
- Natural hazards
- Atmosphere
- Land
- Oceans, seas and coasts
- Freshwater
- Biodiversity
- Economic development
- Global economic partnership
- Consumption and production patterns

(ILO & ICA, 2015)

Those indicators are likely to be mirror of sustainable development of any country.

#### IV. RWANDAN TOWARDS SUSTAINABLE AGRICULTURE

##### 4.1. Introduction:

The Government perceives the agricultural sector as the major engine of growth: (i) Rwanda is the most densely populated country in Africa. For 2004 the population is 8.5 million people on a surface area of 26,338 Km<sup>2</sup> – including water surface. The population density is 325 people per square kilometer. Even if one would admit that annual population growth will progressively go down after 2010 up to 2.2 % in 2020 as foreseen, the growth rate of 2,5 % per annum in 2002 will lead to a population of about 12-13 million in 2020, bringing about 50 % increase in the space of 16 years; (ii) The Rwandan economy is based predominantly on agriculture. The population engaged in agriculture was 87 % in 2002, it provided employment to 88 % of the population, and it contributes 47 % to GNP and accounts for 71 % of the country's export revenues. The quasi-totality of agricultural production is realized from about 1.4 million households. The average size of a family farm is 0.76 ha, 66 % of the total food production is for family consumption. The food that reaches markets (34 % of the total food production) feeds non- farmers- (estimated at about 11.4 %), but also farmers who do not produce enough and have to buy more from the market to satisfy their needs.

The absence of minerals and other natural resources, the landlockedness, the current low level of industrialization, and the low purchasing power of the population largely explain why agriculture and animal husbandry will, in the period covered by Vision 2020 and the National Poverty Reduction Strategy, be the main engine for accelerated economic growth and sustained development. Typology and characteristics of agricultural farms three types of farmers with specific characteristics and strategies were identified: TYPE A: “the small dependent farmer” with a small piece of land- his homestead, which cannot produce enough food for the family's subsistence – he has to engage in other activities (trader, hauling, crafts) or sell his labor to someone else to complement his farm output; TYPE B: “The self-sufficient farmer” This type has just adequate farmland and labor to satisfy his family's food needs. Other activities outside farming (trade, handicrafts) are an addition to his farm output and important to the family as extra income; TYPE C: “production system using capital” is more heterogeneous.

A first sub-group is close to type B but has more production factors whereas a second sub-group is composed of absentee farmers (businessmen, civil servants) who pursue land acquisition and accumulation strategies.

Ministries share the following responsibilities: policy formulation, strategies, operational programmes for agricultural policy (MINAGRI); planning of Agricultural Public Investment Programmes (MINECOFIN), natural resource management related to agriculture such as land, water, environment (MINITERE); road infrastructure and energy to facilitate intensification and modernization of agriculture (MININFRA); coordination of development activities at Provincial and District levels (MINALOC); gender promotion, and capacity building for women engaged in agricultural activities (MIGEPROF); training in modern agricultural techniques and other professional training (MINEDUC).

Among the main public or autonomous semi-public institutions involved in the agricultural sector are: the RIEPA, which promotes local and foreign investors in the agricultural sector, BNR which ensures the supervision of credits and savings financial services in the agricultural sector, and the Rwanda Development Bank (BRD), which is the spearheading institution in the financing of agro-industry, and the “Union des Banques Populaires” (UBPR), which is specialized in mobilisation of rural savings and small – scale credits.

Parasitical and other support structures include: research institutions (ISAR, IRCT), teaching institutions (Faculty of Agriculture at the National University of Rwanda, KIST, ISAE Busogo), some NGOs involved in research (development research) as well as offices responsible for the management of tea and coffee (OCIR-THE, OCIR-CAFÉ).

##### 4.2. Programs and Achievements (MINAGRI, 2013):

###### *Vision 2020*

MINECOFIN, 2000 defines Vision 2020 as the primary socio-economic policy document on which all national and sectorial policies and strategies are based. It describes modernization of agriculture and animal husbandry as one of the six pillars for building a diversified, integrated, competitive and dynamic economy. Vision 2020 seeks to transform Rwanda's economy through a rapid increase in growth and a significant reduction in poverty. By 2020 it is expected that the country will reach middle-income status with per capita GDP of US\$ 1240 from US\$ 220 in 2000. Other goals include

a reduction by more than one-half in the incidence of poverty and extreme poverty and improvements in a range of standard of living indicators. Agriculture is a priority sector, with an emphasis on moving the sector from subsistence to commercial production through attracting increased investment. The target for agricultural growth until 2020 has been revised upward to 8.5 % per year. The key national and agricultural sector-related targets of Vision 2020 are shown in Table 1. Vision 2020 recognizes that the private sector will drive the economy and the State's responsibility will be to initiate, pilot, co-ordinate and monitor efforts. Some Vision 2020 goals, such as GDP per capita and the percentage of farmers using fertilizers, were exceeded in 2010, and have been revised to drive further improvements.

**Table 1: Selected national and agriculture-related goals in Vision 2020**

Indicator	2000	2010	2020
Population (million)	7.7	10.1	12.71
GDP/capita (constant 2000 US\$)	220	400	1240
Poverty (%)	64	40	20
Agricultural GDP growth (%)	9	8	8.5
Agriculture as % of GDP	45	47	25
Agriculture as % total population	90	75	50
Land under "modernised" agric (%)	3	20	40
Fertiliser application (kg/ha/annum)	0.5	8	45
% banks' portfolio to agric. Sector	1	15	20
Soil erosion protection (% total land)	20	80	90
Agricultural exports	n.a	n.a	"5-10 times 2000 value"

Source: MINECOFIN, Revised 2012

### ***The Economic Development and Poverty Reduction Strategy (EDPRS)***

In 2007 the Government of Rwanda developed the first Economic Development and Poverty Reduction Strategy, EDPRS I, from 2008-2012 and EDPRS II, from 2013-2017. Economic Development and Poverty Reduction Strategies of Rwanda aims at increasing economic growth by investing in and modernizing agriculture. It recognizes that food crops constitute a major component of agriculture and national GDP. It clarifies that the slackening in GDP growth is due to limited increments in farm outputs. EDPRS thus aims to increase the production of food crops which is constrained by several factors such as land use patterns, soil quality and supply of technology and infrastructures in rural areas. EDPRS particularly targets to improve the agricultural productivity and increase the profitability of small farm holds. EDPRS intends to encourage increased participation of the private sector in transfer of technology to farmers, after the initial transfer by the public sector. It insists that the government will assist the private sector by improving the investment climate, so that Rwandan produces become competitive in regional and world markets. EDPRS intends to encourage surplus production of farm produces by subsidizing the acquisition of key inputs by farmers. To improve the quality of production, EDPRS aspires for significant improvements in quality and standards (MINECOFIN, 2007)

EDPRS II is built on four thematic areas: Economic transformation, Rural development, Productivity and Youth employment and Accountable Governance. The first three are particularly of relevance to the agricultural sector. Each EDPRS II thematic area lists key priorities for different sectors to achieve thematic outcomes.

Those priorities which relate to agriculture are: Economic Transformation (Diversification of the economic base and better external and internal connectivity; Private sector investment in value chains and agri-processing facilities); Rural Development (Increased agricultural productivity to reduce poverty; Rural infrastructure development to connect farmers to markets); Youth and Productivity (Skills development and sensitization, focused on youth; Support entrepreneurship, access to finance and agri-business development); Accountable Governance (Institutional development to generate improved service delivery; Transparency and increased participation) (MINECOFIN, 2013).

### ***Strategic Plan for the Transformation of Agriculture in Rwanda – Phase II***

The programs of the Strategic Plan for the Transformation of Agriculture in Rwanda - Phase II (PSTA II) for the period of 2009-2012 forms the operational framework for implementing agriculture's contribution to the EDPRS. Taking a sector wide approach, the PSTA II is also aligned with regional frameworks of NEPAD/CAADP and Rwanda Vision



2020. It envisions significant increases in productivity of priority crops to ensure food security. The four main programs of PSTA II include the intensification of sustainable production systems in crop cultivation and animal husbandry, building the technical and organizational capacity of farmers; promoting commodity chains and agribusiness, and strengthening the institutional framework of the sector at central- and local levels. The program 1 of PSTA II identifies a series of actions to intensify and develop sustainable production systems in agriculture under different ecosystems. PSTA II acknowledges that raising agricultural productivity and ensuring food security in a sustainable manner is the key to reducing poverty (MINAGRI, 2009).

#### ***National Post Harvest Staple Crop Strategy (PHSCS)***

In consultation with MINAGRI, MINICOM and MINECOFIN, USAID has drawn national strategies for strengthening the value chains of staple crops through a policy framework on harvesting, post harvest handling, storage, and marketing. PHSCS aims to develop an efficient post harvest system driven by private sector to ensure food security of staple crops. The elements of PHSCS include (i) rendering basic market data available to public- and private stakeholders, (ii) placing transport infrastructure that could support movement of staple commodities, (iii) facilitate appropriate technologies at the production and aggregation points along the value chain, (iv) engaging the private enterprises through facilitation of training and infrastructure, (v) increase the investments and financial services, (vi) improve the structures and grading of farm outputs, and (vii) leverage the management of strategic grain reserve to create a fair and transparent market for staple crops in the country (MINAGRI, 2011).

#### ***The Crop Intensification Program (CIP)***

Crop Intensification Program (CIP) is a flagship program implemented by the Ministry of Agriculture and Animal Resources to attain the goal of increasing agricultural productivity under PSTA II. CIP aims to accomplish this goal by significantly increasing the production of food crops across the country. CIP currently undertakes a multi-pronged approach that includes facilitation of inputs (improved seeds and fertilizers), consolidation of land use, provision of extension services, and improvement of post harvest handling and storage mechanisms. Started in September 2007, the CIP program focuses on six priority crops namely maize, wheat, rice, Irish potato, beans and cassava (UNEP, 2010).

#### ***The Millennium Development Goals***

In September 2000, at the United Nations Millennium Summit, world leaders agreed to a set eight Millennium Development Goals (MDGs) that aimed to make substantial progress in solving the problems of poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women. Those eight MDGs which are mirror for sustainable economic are: Eradicate extreme poverty and hunger; Achieve universal primary education; Promote gender equality and empower women; Reduce child mortality; Improve maternal health; Combat HIV/AIDS, malaria and other diseases; Ensure environmental sustainability; Develop a global partnership for development (Birchall, 2003; UN, 2014).

Rwanda has committed to meet certain target by 2015 under the Millennium Development Goals (MDGs). The majority of targets do not relate directly to agriculture, although agricultural growth and rural development are essential contributing factors. Significant progress has already been made, often driven by agricultural interventions. Production increases and greater food security mean that between 1990 and 2010/11 the proportion of underweight children under 5 was reduced from 29% to 11%, and the under- five and maternal mortality rates have fallen.

The proportion of the population using an improved source of drinking water rose from 64% in 2006 to 73.6% in 2011/12, partly driven by rural development programmes. These achievements illustrate Rwanda's potential to achieve the ambitious targets set by national and international policies.

#### ***Government Program (2010-2017)***

Government of Rwanda aims to change Rwanda into a middle income country by 2010- 2017. The government program intends to build on the four pillars: Good governance, Justice, Economy and Social well being of Rwandans. The program acknowledges that the pace of economic development shall become sustainable when the recent increases in agriculture production become sustainable. It shall be noted that most of the recent increases in national agriculture production has come from the initiatives of crop intensification program. The program intends to raise the profits of farming by modernizing the practices. Land use consolidation will be promoted and the acreage under consolidation

will be increased from 18% to 70%. Such initiative from the program will provide a vital support to CIP in accomplishing its goals. Besides putting efforts in irrigation and mechanization, the government program seeks to set up seed production nurseries and raise the fertilizer use from 14 Kg/Ha to 45 Kg/Ha. It intends to set up crop collection centers and marketing outlets in all districts and thereby enhance the storage capacity to 20,000 tons. By setting up a development bank for agriculture sector, the access to finance by farmers will also be increased to 8%. Through such integrated efforts, the program intends to increase the volumes and quality of production, and thereby also increase off-farm jobs in agriculture sector (Republic of Rwanda, 2010).

**4.3. Goals and Strategic Priorities for Rwandan Agriculture**

**Goals**

The primary goals of PSTA III are: To transform Rwandan agriculture from a subsistence sector to a market-oriented, value creating sector, and to grow as rapidly as possible, both in relation to production and commercialization, in order to increase rural incomes and reduce poverty

**Strategies**

Key pillars for rapid sector growth are: Land, irrigation, inputs and infrastructure; Soft skills and farmer capacity; Value chains and markets; Private sector investment

To support these pillars, PSTA III highlights different areas compared to PSTA II. The new focus is on: Increased scale, Increased exports, Investment, Quality, Professionalization of farmers, Modernization, New research orientations, New sub-sectors, Access to finance, Agro-processing

These activities will increase production per hectare, generating income and food security for rural households to facilitate realization of EDPRS II and the goals of Vision 2020.

Private investments should drive value chain improvements including farmer advisory services, input provision, and quality control and value addition. The public sector will still have an important role. First, to provide public goods, which are unattractive to the private sector but have major positive impacts (such as irrigation and terracing). Second, public resources should be channeled to the sector in ways that are designed to promote efficiency, and catalyse private sector investment, such as infrastructure development (feeder roads and post harvest facilities), strengthening human capital, building entrepreneurial skills, and increasing availability of finance. Finally the government needs to play a monitoring and regulatory role and facilitate partnerships.

**V. THE ROLE OF SUSTAINABLE AGRICULTURE TO THE SUSTAINABLE DEVELOPMENT IN RWANDA**

**Table 2: Sustainable Agriculture and CSD indicators**

CSD Indicator	Role of Sustainable Agriculture
Poverty reduction	<p>Agriculture sector contributed 34 percent of the GDP in Rwanda in 2014 while the Services sector contributed 47 percent of GDP, the industry sector contributed 14 percent of GDP, and 5 percent was attributed to adjustment for taxes less subsidies on products (The World Bank, 2008).</p> <p>Sustainable agriculture jointly produces food and other goods for farm families and markets, but it also contributes to a range of public goods, such as clean water, wildlife, carbon sequestration in soils, flood protection, landscape quality. It delivers many unique non-food functions that cannot be produced by other sectors (eg on-farm biodiversity, groundwater recharge, urban to rural migration, social cohesion) (Byerlee, Janvry &amp; Sadouletl, n.d).</p> <p>Rwandan agriculture in the last five years has been driven mainly by improvement in land management (soil erosion mitigation and terracing), irrigation, input provision, and increasing the national livestock herd. Developing and strengthening cooperatives has increased the sector’s human capacity, accompanied by targeted extension, for example to improve the quality of coffee for export. There are also emerging initiatives to kick-start the market and facilitate commercialization. However, the first four areas, land, water, fertilizer and cattle, have driven the major increases in sector productivity, improved rural incomes and reduced poverty (CAADP, 2015).</p>

Governance and gender equality	<p>The Agriculture sector establishments in Rwanda had a total of 30,044 labor units employed as managers, professionals (engineers), liberal professionals, technicians and artisans. In terms of gender, men constitute 56.6% and women 43.4% of the total labor units (Jenkins, 2006).</p>
Education	<p>Training institutions in Rwanda offering agriculture related courses include universities, Integrated Polytechnic Regional Centers (IPRC), Vocational Training Centers (VTC) and Technical Secondary Schools (TSS). Courses offered include Agricultural Economics &amp; Agribusiness, Animal Science, Crop Science, Soil Science and Environmental Management, Animal Production, Crop Production, Human Nutrition &amp; Dietetics, Rural Development &amp; Agribusiness, Agricultural Mechanization, Agricultural Engineering, and Agri-business among other courses. The output from the training institutions is about 1,200 graduates (both Bachelor degrees and diploma certificates) annually (Baligira, 2008).</p> <p>On the other hand, farmers finance education for their children so in primary, secondary and university schools (RDB, 2012).</p>
Health	<p>Sustainable agriculture has the potential directly and indirectly to influence the health of people. In the first instance, improved food supply throughout the year has a fundamental impact on health, which in turn allows adults to be more productive, and children to attend school and still be able to concentrate on learning. In many projects, for example, raised beds in kitchen gardens have improved domestic food supply by producing a year-round supply of vegetables – and children are often the main beneficiaries. In some cases, a more sustainable agriculture can also help to remove threats to health in the environment by allowing farmers to be equipped with appropriate equipments fighting against those threats.</p> <p>Sustainable agriculture can also have an indirect effect on reproductive health: Where women are organized into groups, such as for microfinance delivery (credit and savings), livestock raising or watershed development, such social capital creation offers opportunities or ‘entry points’ for other sectors to interact closely with women (USAID, 1996).</p>
Food security and Good nutrition	<p>Nutrition impacts are most likely to occur from agricultural interventions when (1) household members regularly consume the food commodity being produced, (2) the intervention includes explicit nutrition counseling, (3) the intervention includes home gardens, and/or (4) the project introduces micronutrient-rich plant varieties.</p> <p>Food security is a prerequisite for good nutrition. Here are ways that agricultural can be more effective in promoting household food security for the populations:</p> <ol style="list-style-type: none"> <li>(1) Give priority to agricultural activities that generate employment. Increasing employment of unemployed and underemployed population groups almost always translates into improved food security.</li> <li>(2) Carefully watch the effect on food prices. Policies or interventions that affect food prices have an impact on food security; how much usually depends on whether poor households are net sellers or net purchasers of those commodities. Lower prices are a boon for net purchasers but can hurt net sellers; higher prices help net sellers but cut into the incomes of net purchasers.</li> <li>(3) Be particularly careful with projects that promote cash crop production. Despite introduction of cash crops frequently has a negative effect on household food security in a sense the crop goes outside the home, money income from cash crop production serves in many other ways.</li> <li>(4) Encourage small-scale agricultural processes and beware of projects that involve labor-displacing mechanization. In some cases agricultural interventions that displace labor through large-scale mechanization are more likely to negatively affect food security, but in general, mechanization allow more production and affect positively food security and good nutrition.</li> <li>(5) Increase production of foods that are eaten by at-risk population groups. The poor tend to disproportionately consume specific foods—often less-desirable crops. When the production of these crops decreases, poor households must pay more for the foods, or may be forced to consume more expensive crops.</li> <li>(6) Involve women. Improvements in women’s income are more likely to translate into improved food security than are improvements in men’s income—as long as women have adequate time for child and family care (USAID, 2011; GoR, 2013).</li> </ol>
Demographics	<p>Farmers gathered in Cooperatives get skills that contribute to the regulation of population growth rate.</p>

<p>Access to water and sanitation</p>	<p>Water is at the core of sustainable development. We won't be able to achieve sustainable development without securing water. Water is also linked to health, agriculture and food security, biodiversity, desertification, land degradation and drought.</p> <p>Rain water in Rwanda occupies important place in agriculture and hence in the national economy. 70% of this water is used for rain fed agriculture.</p> <p>Surface water in Rwanda is mainly defined as lakes and rivers. The hydrological rivers regime is affected by the geographical and temporal rainfall distribution.</p> <p>Ground water in Rwanda has two main origins. The first category includes ground water formed from rainwater infiltration into soils; this water is generally low mineralized.</p> <p>The second type of ground water is highly mineral-bearing with a relative high concentration of chlore; the water is located in greater depths and is formed by condensation (Baligira, 2008).</p> <p>Agriculture uses water for production and generates income with allows farmers to be equipped with water and sanitation facilities.</p>
<p>Sustainable Energy</p>	<p>Wood, charcoal, and agricultural wastes constitute the bulk of the traditional biomass resources. Agriculture requires energy at all stages of production. Energy is used by agricultural machinery (e.g., tractors and harvesters) and irrigation systems and pumps, which may run on electricity, diesel, or other energy sources. Energy is also needed for processing and conserving agricultural products, transportation, and storage.</p> <p>Agriculture consumes significant quantities of energy, especially in industrialized countries. Farmers use energy directly to heat and cool buildings, operate equipment, pump irrigation water, and transport products to market. Agriculture also consumes large quantities of fossil fuel indirectly as inputs for fertilizer (a prime ingredient of which is natural gas) and pesticides (made from petroleum and natural gas). Food processing and long-distance shipment consume additional energy (GoR, 2006).</p>
<p>Employment creation, livelihoods and equitable growth</p>	<p>The Agriculture sector establishments in Rwanda had a total of 30,044 labor units employed as managers, professionals (engineers), liberal professionals, technicians and artisans. In terms of gender, men constitute 56.6% and women 43.4% of the total labor units. 85.2% of the employees were agricultural artisans, 10.8% technicians and 2.4% managers. Scientists, professionals and liberal professionals constituted 0.7% and 0.9% respectively (RDB, 2012).</p> <p>Sustainable agriculture through agriculture mechanization generates jobs, promotes livelihoods and equitable growth. In Rwanda, currently there are relatively low levels of domestic mechanization and manufacturing of the required tools. Only about 12% of farm operations are mechanized, and the target is to achieve 25% mechanization by 2017.</p> <p>Mechanization has many benefits: It contributes to improving productivity of cultivated land and facilitates expansion of cropping areas, improving overall food security. Mechanization also eases labor constraints including seasonal shortages, and reduces the requirement for physical drudgery, leading to both improved production and lifestyles for farmers. Agro-processing and value addition through mechanized equipment can also generate employment and raise rural incomes (FAO-ILO-IUF, 2005).</p>
<p>Biodiversity and natural resources management</p>	<p>Traditional agricultural systems generally have less adverse impact than the models with high inputs and intensification. Indigenous farmers often maintain ecologically sensitive agricultural and natural resource management practices based on accumulated experiences of interacting with the environment, and without access to external inputs, capital or scientific knowledge (Altieri, 1999.)</p> <p>Healthy soils contain enormous numbers of diverse living organisms, and assembled in complex and varied communities. They range from the myriad of invisible microbes, bacteria and fungi to the more familiar macro-fauna such as earthworms and termites (Jaradat, n.d). Plant roots can also be considered as soil organisms in view of their symbiotic relationships and interactions with other soil components. These diverse organisms interact with one another and with the various plants and animals in the ecosystem, forming a complex web of biological activity. Environmental factors, such as temperature, moisture and acidity, as well as anthropogenic actions, in particular, agricultural and forestry management practices, affect to different extents soil biological communities and their functions.</p> <p>Soil and its living organisms are an integral part of agricultural and forestry ecosystems, playing a critical role in maintaining soil health, ecosystem functions and productivity. Each organism has a</p>

	<p>specific role in the complex web of life in the soil:</p> <p>.The activities of certain organisms affect soil structure - especially the so-called “soil engineers” such as worms and termites - through mixing soil horizons and organic matter and increasing porosity. This directly determines resilience to soil erosion and availability of the soil profile to plants.</p> <p>.The functions of soil biota are central to decomposition processes and nutrient cycling. They therefore affect plant growth and productivity, as well as the release of pollutants in the environment, for example, the leaching of nitrates into water resources.</p> <p>.Certain soil organisms can be detrimental to plant growth, for example, the build up of nematodes under certain cropping practices. However, they can also protect crops from pest and disease outbreaks through biological control and reduced susceptibility.</p> <p>.The activities of certain organisms determine the carbon cycle - the rates of carbon sequestration and gaseous emissions and soil organic matter transformation.</p> <p>.Plant roots, through their interactions with other soil components and symbiotic relationships, especially Rhizobium bacteria and Mycorrhiza, play a key role in the uptake of nutrients and water, and contribute, through their growth and biomass, to soil quality and organic matter content.</p> <p>.Certain soil organisms can also be used to reduce or eliminate environmental hazards resulting from accumulations of toxic chemicals or other hazardous wastes. This action is known as bioremediation (GoR, 2011).</p>
<p>Promotion of stable and peaceful society</p>	<p>The culture of farmers to associate under cooperative structure is strong in Rwanda. Cooperatives have long been serving local farmers by facilitating various inputs, outputs and knowledge dissemination in the past. Cooperatives are institutions where members share live and experience in a peaceful climate. Crop Intensification Program can also assist cooperatives and thereby smallholder farmers in establishing their collective bargaining power, gender equality, market analysis, climate change and sales through advocacy.</p>
<p>Atmosphere</p>	<p>Solar radiation, temperature, and precipitation are the main drivers of crop growth; therefore agriculture has always been highly dependent on climate patterns and variations. Since the industrial revolution, humans have been changing the global climate by emitting high amounts of greenhouse gases into the atmosphere, resulting in higher global temperatures, affecting hydrological regimes and increasing climatic variability. Climate change is projected to have significant impacts on agricultural conditions, food supply, and food security.</p> <p>Overall, climate change could result in a variety of impacts on agriculture (NEPAD, 2013). Some of these effects are biophysical, some are ecological, and some are economic, including: A shift in climate and agricultural zones towards the poles; Changes in production patterns due to higher temperatures; A boost in agricultural productivity due to increased carbon dioxide in the atmosphere; Changing precipitation patterns; Increased vulnerability of the landless and the poor.</p> <p>However, agriculture is itself responsible for an estimated one third of climate change. It is generally agreed that about 25% of carbon dioxide emissions, are produced by agricultural sources, mainly deforestation, the use of fossil fuel-based fertilizers, and the burning of biomass. Most of the methane in the atmosphere comes from domestic ruminants, forest fires, wetland rice cultivation and waste products, while conventional tillage and fertilizer use account for 70% of the nitrous oxides.</p> <p>Agricultural processes comprise 54% of methane emissions, roughly 80% of nitrous oxide emissions, and virtually all carbon dioxide emissions tied to land use. Deforestation for land cleaning purposes also affects regional carbon reuptake, which can result in increased concentrations of CO<sub>2</sub>, the dominant greenhouse gas. Worldwide, livestock production occupies 70% of all land used for agriculture, or 30% of the land surface of the Earth.</p> <p>Sustainable Agriculture maintains atmosphere which is destroyed by deforestation.</p>
<p>Land</p>	<p>. Most sustainable agriculture projects and initiatives seek both to reduce soil erosion and to make improvements to soil physical structure, organic matter content, water holding capacity and nutrient balances. This can be achieved through the adoption of a wide variety of physical and biological soil conservation measures, use of legumes and green manures and/or cover crops, incorporation of phosphate-releasing plants into rotations, use of composts and animal manures, adoption of zero-tillage, and use of inorganic fertilizers.</p> <p>. Sustainable Agriculture uses terracing to protect land and make it more productive.</p>



	<p>. By 2017, Rwanda targets soil conservation infrastructure covering 91% of the relevant land area. Extension will ensure farmers know how to utilize and maintain structures.</p> <p>. Agro forestry program works in coordination with agricultural research, marketing and the provision of technical advisors for tree crops (including leguminous trees). Farmers are advised on agro forestry packages.</p> <p>In Rwanda, new agro-forestry species is developed, and up to 90% of farmers will use agro-forestry by 2017.</p> <p>. Principles of Land use consolidation: Reduces volume/cost ratio, logistics and transportation costs of inputs and outputs; Increases accessibility of inputs, by providing a focused market for farm inputs as the agro dealers can have a larger coverage; Facilitates a concentrated market for farm produces; Provides increased coverage of proximity extension services; Enables equitable distribution of natural resources such as soil and water and; Increases land- and crop productivity (MINIRENA, 2004).</p>
Oceans, seas and coasts	<p>Rwanda has no access to oceans, seas and it has no coast. But it maintains water by developing Irrigation. This was identified as a key strategic activity developing agriculture. Rwanda signed the Comprehensive Africa Agriculture Development Program (CAADP) compact which establishes in its Pillar I on Land and Water management that the Government should allocate at least 2% of public funds for irrigation development. Irrigation is important to increase agricultural productivity through allowing multiple cropping and reducing vulnerability to weather shocks. This plan therefore proposes continued investment in irrigated agriculture, to harness Rwanda's fresh water resources and increase production, and provide security to rural households.</p> <p>The total area under irrigation was just over 25,590 ha in 2012, including 2,490 ha of hillside irrigation, 23,000 ha of marshland irrigation and around 100 ha of small scale irrigation (garden plots with rainwater harvesting). New irrigation will drive up productivity and make farmers more resistant to weather shocks. Considering the potential impacts of climate change, irrigation infrastructure will also make rural households more resilient and adaptable to longer term shifts in seasonal rainfall. This irrigation development will take place in line with the National Irrigation Policy, the law on Water Users Associations and the Irrigation Master Plan (MINAGRI, n.d).</p>
Global economic partnership	<p>The process of achieving Sustainable Agriculture, engaged Rwanda in global partnership by different programs such as the New Partnership for Africa's Development (NEPAD) which serves a framework for development programs of the African Union (AU) that aims at driving economic integration in Africa; Comprehensive Africa Agriculture Development Program (CAADP) CAADP acknowledges that the high economic growth rates envisaged by NEPAD can be realized if agricultural production is significantly increased. 4 pillars of CAAD: (i) sustainable land and water management, (ii) market access, (iii) food supply and hunger, and (iv) agricultural research. Global Economic Partnership is also engaged through exportation of agricultural products.</p>
Consumption and production patterns	<p>Agriculture consumes energy either in farmers' houses or in their daily activities. Farmers consume different materials and water. Farmers are engaged in transportation of goods (Clay, Kelly, Mpyisi &amp; Reardon, n.d) .</p>

## VI. FINDINGS

Rwandan agriculture has made major advances in the last decade. Productivity and production for a number of crops have sharply increased and improved rural incomes. It is vital to continue this rapid progress to further reduce rural poverty. The primary role of this Strategic Plan is to set guidelines for scaling up recent successes in the Agricultural sector in addition to reviewing challenges and defining program and policies that will further increase sector growth.

In the recent past there has been significant expansion of interventions which drive productivity gains, including successful land consolidation, increased areas under irrigation and protected against soil erosion, and expansion of cultivated terraces. Access to important services including agricultural finance and proximity extension services has been improved, and farmers are now more likely to use specific crops according to agro-climatic zones. There has also been an increase in the use of inputs, including agrochemicals and improved seeds. Distribution of livestock through programs such as Girinka has expanded the animal resource sector. Since the implementation of the Crop Intensification Program, yields have also grown significantly.

Post-harvest infrastructure investments and subsidized transport has improved product quality and market accessibility. As a result of these interventions, production of maize, wheat, roots and tubers, soybeans, rice, cassava, horticultural products and meat and milk has increased.

Overall production of export crops has also increased, as has the value of premium products on the international market. The unit value of Rwandan coffee has increased generating substantial increases in incomes among coffee smallholders even though the production volume has declined. Coffee and tea command quality premiums and are Rwanda's largest exports by a wide margin.

Production increases have had a positive impact on both sector growth and reducing rural poverty. The overall agricultural growth rate between 2000 and 2010 was 5.8% per annum. It is also noteworthy that in 2010 68.2% of rural households had access to livestock with most rural households having goats (53%) cattle (47.3%), chickens (45.5%), and pigs (24.1%). Over the last five years, extreme rural poverty fell from 39.5% to 26.4% (EICV III) driven largely by interventions to move agriculture from subsistence to a market economy. Malnutrition also declined between 2006 and 2009, where households with food shortages or in borderline nutritional conditions declined from 34.6% of the population to 21.5% (NISR). However, as noted in the EDPRS II, many poor Rwandans continue to live below the poverty line. 80% of the rural population consists of subsistence farm families with an average land size of 0.59 ha. Therefore progress in reducing poverty must continue to come largely from the agricultural sector.

## VII. CONCLUSION

The agriculture in Rwanda is not yet mechanized meanwhile the agriculture modernization as clearly expressed in the Vision 2020 document, the PRSP and the National Agricultural Policy, encourages the private sector to invest in agriculture, through which production will increase. The dynamic self-organization demonstrated by farmers and their desire to take over the development of the agricultural sub-sectors and their commitment in marshland management give guarantees for the sector sustainable development. Furthermore, the establishment of an agricultural sector financing mechanism (e.g. the Agricultural Guarantee Facility) will help put agricultural financing back on track.

The government has undertaken several lands management policies reform. After projecting the future in the Vision 2020 document, the Government prepared a National Poverty Reduction Strategy whose implementation is based on the preparation of plans for the core economic sectors. Thus, MINAGRI drafted a National Agricultural Policy (NAP) and an Agricultural Processing Strategy Plan (APSP) in 2004 (validated in January 2005) which offers clear guidelines for the development of the agricultural sector in the years ahead. Six specific objectives are defined in the APSP: (i) provide adequate supply of agricultural products and food security to the population; (ii) increase family income and diversify its sources; (iii) maintain, protect and improve water resources and land management; (iv) contribute to macro-economic balance and growth; (v) contribute to finding solutions to social issues related to gender, youths, the landless/other vulnerable groups and AIDS; and (vi) transform the mission and role of various actors (the Government, farmers, the civil society and the private sector) to enable them to adapt to the new vision.

The decentralization policy empowers Districts and CDC to organize farming on state-owned lands. The Common Development Fund (CDF) was established by Law No. 20/2002 of 21st May 2002 and became operational in October 2002. CDF aims at financing and implementation of development projects and programs at the District levels. The projects are prepared by Districts, submitted to CDF for financing and approved by the Board of Directors of the CDF according to different criteria, including viability of the project and the principle of equitable distribution. To be valid, all transactions must be registered with the registry. National Commission of Soils Conservation was created by the government. In the conjunction with Provinces and Districts, the National Commission put in place an action plan for soils and water conservation in different Districts.

At international level, Rwanda is actively involved in the implementation of the Second National Report on of the Climate Change Convention (CCC). Rwanda has ratified the CCC convention of the 22/10/1998 by committing itself to combine its efforts with those of the other countries signatories of the aforesaid convention in the protection of its natural and environmental inheritance in order to fight against the progressive projection of the turning into a desert. The environmental protection constitutes an important indicator for country sustainable development and exploits several factors like water, the lands, the forests, the marshes, the lakes and the rivers like their biological diversity.

## International Journal of Novel Research in Marketing Management and Economics

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Concomitantly, each ministry was seen assigning a province where it will exert a regular follow-up of the activities of soils conservation.

In order to address gender inequities in access to land, concrete measures were taken to eliminate the social and legal constraints that prevent women from participating in the country's political, social and economic life. Currently, the law establishes constitutional equality for both men and women. Moreover, it is mandatory under the Constitution that women occupy 30% of seats in Parliament. Considerable progress has been made in terms of girl's enrolment (85% in 2002) and women's participation in governmental bodies (32.3% of ministries in 2006). Official statistics confirm a 42% women representation at the policy-making level, thus improving women's participation in decision-making.

### VIII. RECOMMENDATIONS

#### ✓ Public Sector

To develop basic growth factors, sector skills and knowledge

To develop Programs to catalyze investment,

To remove barriers to market efficiency

#### ✓ Private Sector

To invest in high value traditional and emerging export crops

To identify profitable new opportunities and adding value

#### ✓ Development Partners

To align with government implementation plans

To support achievement of indicators for poverty and malnutrition

#### ✓ Civil Society/Farmers

To implement key program

To participate in budgeting, planning and monitoring of strategic implementation

To provide labor and cost contributions

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