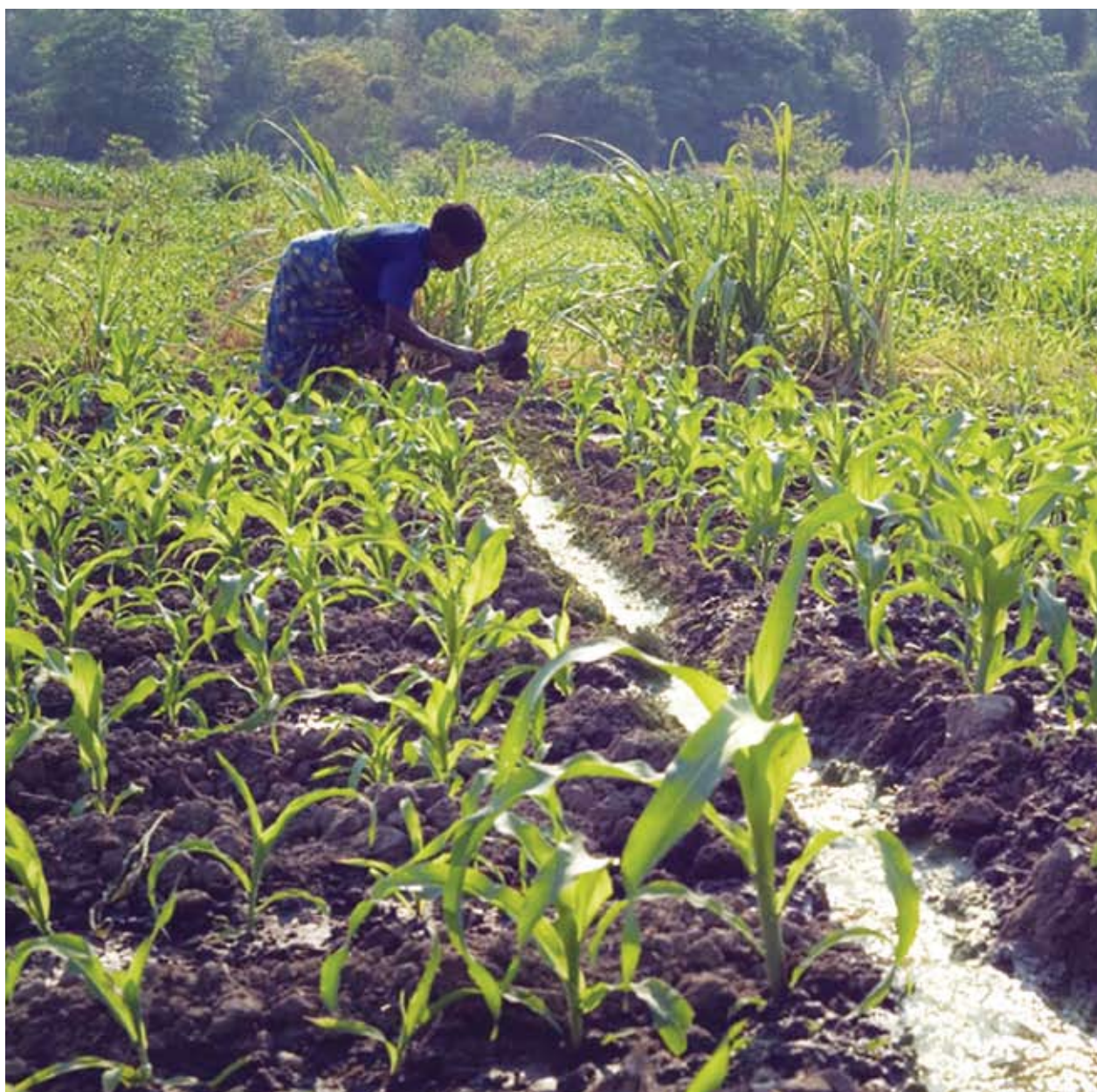


# IRRIGATION AGRICULTURE IN KENYA

Impact of the Economic stimulus programme & Long term prospects for food security in an era of Climate Change

Research and Written by  
Francis Z. Karina & Alex Wambua Mwaniki



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## **Impact of the Economic Stimulus Programme and Long-term Prospects for Food Security in an Era of Climate Change**

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## ABBREVIATIONS

AfDB	-	African Development Bank
AFC	-	Agricultural Financial Cooperation
ARD	-	Agriculture and Rural Development
ASALs	-	Arid and Semi Arid Lands
ASDS	-	Agricultural Sector Development Strategy
EEC	-	Europe Economic Commission
ERA	-	Economic Review of Agriculture
ERS	-	Economic Recovery Strategy
ESP	-	Economic Stimulus Programme
FAO	-	Food and Agriculture Organization of the United Nations
FY	-	Financial Year
GDP	-	Gross Domestic Product
GoK	-	Government of Kenya
Ha	-	Hectares
HHs	-	House Holds
ICT	-	Information and Communication Technology
IDB	-	Irrigation and Drainage Branch
KEWI		Kenya Water Institute
KSC	-	Kenya Seed Company
Kshs	-	Kenya Shillings
MoA	-	Ministry of Agriculture
MoCMD-		Ministry of Cooperative and Market Development
MENR	-	Ministry of Environment and Natural Resources
MoF	-	Ministry of Finance
MoFD	-	Ministry of Fisheries Development
MoL	-	Ministry of Lands
MoLD	-	Ministry of Livestock Development
MoPH	-	Ministry of Public Health
MoPND	-	Ministry of Planning and National Development and Vision 2030
MoRD	-	Ministry Regional Development
MoT	-	Ministry of Trade
MPER	-	Ministerial Public Expenditure Review
MoWI	-	Ministry of Water and Irrigation
NARC	-	National Rainbow Coalition
NBI	-	Niles Basin Initiatives
NCPB	-	National Cereal and Produce Board
NIB	-	National Irrigation Board
NWCPC-		National Water Conservation & Pipeline Corporation
PEV		Post Election Violence
PRSP	-	Poverty Reduction Strategy Paper
RDA	-	Regional Development Authorities

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SAGAs	-	Semi-Autonomous Government Agencies
SGR	-	Strategic Grain Reserve
SP	-	Strategic Plan
SRA	-	Strategy for Revitalizing Agriculture
SSI	-	Small-Scale Irrigation
SSIU	-	Small Scale Irrigation Unit
UNDP	-	United Nation Development Programme
WB	-	World Bank
WUA	-	Water Users Association
WAB	-	Water Appeals Board
WASREB		Water Services Regulatory Board
WSBs	-	8 Regional Water Services Board
WRMA	-	Water Resources Management Authority
WSTF	-	Water Services Trust Fund

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To all I say THANK YOU and GOOD BLESS YOU..

**Francis Karin, consultant**  
**Sower Solution**

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## EXECUTIVE SUMMARY

In recent years, Kenya has experienced food shortages arising from declining farm productivity owing to low fertility levels, high input costs and unreliable weather in the face of a rising population. Major among these is the weather unreliability which is experienced as an effect of Climate Change and the fact that Kenyan agriculture is heavily dependent on rain fed systems. This has put the majority of Kenyans in status of requiring food relief and farm input subsidies and a rising concern among public and social institutions as public funds otherwise meant for investments programmes are diverted to this cause. This means that variability of performance in food production systems especially with the predicted climatic change will affect the rate investments and therefore slowing down economic development with consequences on employment creation in the country. On the other hand, expanding irrigation has been touted as one of the important strategies out of this situation, because in many locations rain-fed agriculture is no longer able to generate adequate crop yields. Falling food production makes the Food Security situation in the country precarious and vulnerable. Climatic change has aggravated the food security situation, since rainfall is projected to decrease yet only a small fraction (1.8%), of the crop land is currently under irrigation (Ministry of State for Planning and Vision 2030:Public expenditure review, 2010).

The country has an estimated irrigation potential of 1.3 million hectares, both irrigation and drainage with about 30 %t of this possible production development with the available water resources while the rest will require water harvesting and storage to be realized. Of the 125,000 hectares currently under irrigation, Smallholders represent 43%, public at 18% while the private large scale farms represent 39%.

Food production in the country has been declining in the recent past and that of maize (an important component of both urban and rural household's meals) rock-bottomed in 2008 to about 26 million bags from 36086406 in 2006, some 16 million bags short of the national consumption, estimated to be 42 million bags (MoA, the national study on cost of maize production, 2010). This was occasioned by a number of factors, including declining or no rainfall in most parts of the country, low use of improved farm inputs and the Post Election Violence (PEV) of 2007/08. By 2009, the country faced a looming food crisis of major proportions. Due to the strategic importance of the maize as a staple food, the government rolled out a plan to produce maize and rice under irrigation to enhance the national grain strategy reserves under the National Economic Stimulus Project on food production under irrigation. The project to double up as to broadly agricultural production systems, promote use of locally available labour & other resources in the sector.

This undertaking succeeded to put about 40,436 acres maize (8686) and rice (31750) slightly higher than the targeted 35,550 acres of maize (14,600) and rice (20,950) under irrigation. The two crops yielded a total of 782,662 bags, made of 147,662 bags of maize and 635,000bags of rice. This represented 40% and 101% respectively. The area cultivated under maize was 8686 acres and rice 31750 acres out of the targeted 14600

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and 20950 acres respectively. The value the achieved production was estimated as Ksh 251,025,400 from the maize grain and 1,587,500,000 from rice both estimated at 66% of the targeted revenue of Ksh 2,798,000,000. These achievements were way off the mark especially that of maize which realized only 40% of the target production and 28% of expected revenue.

Rice performance was fairly on target, achieving only 1% above the targeted production and 84% of the anticipated revenue. These shortfalls were attributed to higher projected produce prices than the actual market prices and an over estimation of the yields during the planning exercise. The market prices for maize averaged at Ksh 1800 per bag of 90 Kg against the projected of Ksh 2,500 per bag. Similarly, the yields were estimated at 25 bags per acre against the achieved 17 bags/acre of maize and 30.3 bags/acres of rice. The projected yield for rice was 30 bags/acres estimated to be sold at Ksh 3000/bag.

Under the ESP, the executing agency/implementing organ of the project is the Ministry of Water and Irrigation (MoWI) through the Irrigation, Drainage and Water Storage Department in collaboration with the ministry of Agriculture, ministry of Youth Affairs and Sports and ministry of Regional Development. At the national level, a Project Steering Committee (PSC) was established to oversee project implementation. The PSC was chaired by the Permanent Secretary, MoA, and not the MoWI and will comprise representatives from the Ministry of Finance, Ministry of Water and Irrigation, Ministry of Agriculture, Ministry of Gender and Sports, Ministry of Regional Development. This is likely to be a cause of conflict and jittery where the implementing ministry takes orders from another ministry at the Steering Committee level. Further, although, the expansion of land under irrigation remains a faster and feasible solution, water availability for irrigation in the country is scarce. Kenya has four main drainage areas namely: Lake Victoria, Kerio Valley and Inland lakes, the Tana and Athi River basin, and the Ewaso Ng'iro North basin whose irrigation infrastructure has not been adequately developed. In addition, out of the internal renewable surface water resources estimated at 20.2 km<sup>3</sup>/year, only 3.5 km<sup>3</sup> is being exploited annually. It is estimated that about 10km<sup>3</sup>/year of water leaves the country via trans-boundary rivers unutilized.

The water availability in some catchment towers in Kenya is predicted to be severe in future because of the effects of climate Change and interference of human activity on the environment .The melting of glaciers on Mt. Kenya, which in 1900 had 18 glacier peaks and now having only 7 (GOK, National Investment Brief, 2008) is testimony of what the country expects. This explains the decline in water levels in Athi and Tana Rivers and subsequent load shedding programme as the country's main source of electricity was hydro-based. On the other hand, extreme climatic changes that cause flooding and drought have an immense negative impact on both the social and economic fronts. In the recent past, there has been an increase in frequency, magnitude, extent and severity of disasters that are weather based.

The past government approach to disaster management has been disaster response as opposed to disaster risk reduction. Kenya needs a consistent and reliable supply of

water regardless of changes in climate. Inadequate water harvesting and storage and lack of on-farm conservation measures have resulted in parts of the country having a lot of run-off during rainy seasons and little or no water during dry periods. Improved water harvesting and storage infrastructure will therefore be necessary in exploiting the proposed irrigation potential in the country and in providing more water supply to agriculture and energy generation. Improved water harvesting will also provide opportunities for the communities in the Arid and Semi Arid Lands (ASALs) to achieve and sustain food security.

Several initiatives are inevitable towards coping with the changing weather patterns. These include: formulation of comprehensive policies to address irrigation and drainage/ water harvesting and national food security. A policy component that addresses production within the ESP will be critical to provide the necessary safety net against losing the investments already in place. In addition, sensitization and training of farmers on climatic changes and their implications on production should be mainstreamed into all production oriented programmes. This would also include innovative schemes for farmers & pastoralists like micro-insurance and financing in this era of severe weather changes and climate change. This will enable them deal with the challenges posed by Climate Change and reap maximum benefits from the ESP programme. Some of the policy actions needed would include systematic implementation of the National Land Policy, redirecting agricultural research to address the adaptation mechanisms and improvement of public-private partnerships in the public schemes. These in turn would be expected to reflect on putting the land and water resources to compatible use, enhancement of sustainability in farming activities, and compliance to environmental management practices.

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## 1.0 INTRODUCTION

The World concern on access to adequate and nutritional food for a growing population has triggered the emerging of a number of strategies for different environments and under varied leaderships, programmes and partnerships. One among many is seeking for ways of increasing agricultural productivity through irrigated systems, especially under smallholder managed irrigation schemes that mainly produce food products for direct consumption or trading in the rural spot markets. On the other hand, large scale irrigation setups, with more sophisticated technologies concentrate on products for export, processing and/or niche markets. The rising need for irrigation arises from the apparent inadequacy of soil moisture to support a wide range of crops that are depended upon for food needs and sometimes incomes. It is a common experience to producers to show interest for irrigation facilities even in areas where irrigation was not a necessity up to recent years. This scenario is convincingly experienced as a result of global warming manifesting itself through a number of climatic change effects. Such effects as erratic torrential rainfall, wide temperature differentials both on land and water surfaces, speed of wind, unexpected short seasons, increased pests and diseases among others have been witnessed to be responsible for changes in crop yields, reduced soil fertility and increased erosion on farm land.

Human reactions to these effects has been: searching for technological solutions that can combat the resultant food deficits, change of eating habits, adoption of new techniques, etc. This is however to be accompanied with appropriate technological packages which may be affordable or not, less known to the producers or difficult to comply with. Primarily, irrigation can promote increment of yields of most crops by between 100 and 400 per cent. It is therefore expected that, over the next 30 years, 70 per cent of the grain production will be generated from irrigated land in the world. Food and Agriculture Organization (FAO) estimates that irrigated land in developing countries will increase by 27 per cent in the next 20 years, but the amount of water expected for agriculture will only increase by a mere 12 per cent if the existing potential for conservation and storage is not adequately exploited. The potential existing in harvesting runoff water, conservation of valley bottom reservoirs and lowland bonds has been known to supplement crop water requirements without installation of complicated equipment or with only modest investments.

Increment of productivity being a function of yield and price, it is commonly easier for producers to target higher yields than prices that are normally determined the competitiveness of the products.

To achieve the objective of increasing yields therefore, irrigation per se cannot show significant results. Other recommendations that go with the water resource availability should be observed and these include the land resource use, management and control; soil fertility management; disease and pest control and selection of suitable crop varieties. This is where producers and a number of supporting institutions get trapped; ending in 'business as usual' i.e. low yields with consequential food shortages and nothing for the

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market.

### **1.1 Back ground**

Food security in Kenya is weak despite the government's long time commitment in provision of extension services and farm input subsidies. These have been going along with core investments in elaborate research into drought and disease resistant crop varieties to be able to address the fact that most of Kenya's agricultural production systems are dependent on rains. It has come to a time now when the demand for food has outstripped the production. This puts food security at stake and more so with the already experienced effects of climate change on food production. Since rainfall is projected to decrease and precipitation patterns uncertain, it has become necessary to go beyond the normal intensification thinking to sustainable water management as well as the expansion of irrigated agricultural production as the most critical issues for successful adaptation of the agricultural sector to climate change.

In 2009 therefore, the Government of Kenya acknowledged the relevance of irrigated agriculture and made its expansion a prominent aspect of the Economic Stimulus Programme (ESP), designed to address the impacts of the world-wide economic downturn.

This fact is important in its own right; furthermore, it provides an opportunity to evaluate, empirically and "in real-time", the impact of measures for the support of irrigated agriculture in the institutional and policy setting of Kenya today and checking the efficacy of such measures.

This study undertakes to analyze the position of the irrigation expansion strategy as a measure of increasing food security and securing livelihoods in Kenya. It will also assess the strategy in terms of its role as a measure to adaptation to climate change in relation to other measures like selection of crop varietal suitability, environmental conservation through afforestation, agro forestry and land use management and practices. While the strategy is articulated to the issues at hand, of major concern the efficiency with which the expansion of the schemes will be done in the light of institutional and governance realities witnessed in many chambers in the country at this time. The study will give some insights on how related policies would look like in order to facilitate the implementation of the strategy.

## **2.0 SITUATIONAL ANALYSIS**

### **The role of irrigation in Promotion of Food Security**

Over years, empirical experience has shown that irrigation increases yield of most crops by between 100 and 400 per cent (FAO, 2009). It is expected that, over the next 30 years, 70% of the grain production will be from irrigated land in the world. The Food and Agriculture Organization (FAO, 2009) estimates that irrigated land in developing countries will increase by 27% in the next 20 years, but the amount of water expected to be available for agricultural production will only increase by a mere 12 per cent.

In Sub-Saharan Africa, only 4% of crop land is irrigated compared to 1.8% for Kenya.

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However, in many parts of the world, there are large untapped reserves of ground water. In addition, there is great potential for harvesting runoff water for farming especially in the lowlands and valley-bottoms that store water naturally. With reasonable investments, this potential could be unleashed for increased food security in this era of food insecurity and deteriorating natural resources and production conditions as a result of climatic changes. Table 1 below testifies a possibility of reducing food insecurity by adopting production technologies under irrigation conditions:

**Table 1: Irrigation expansion trends in the low and middle income countries**

Country	Irrigated land (% of cropland)		
	2000	2001	2002
<b>Kenya</b>	1.6	1.6	1.6
<b>Uganda</b>	0.1	0.1	0.1
<b>Egypt</b>	100	100	99.9
<b>Sub-Saharan</b>	3.6	3.6	3.6
<b>Korea, Rep.</b>	45.9	46.6	47.2
<b>Low Income</b>	13.8	14.7	14.9
<b>Middle Income</b>	22.9	21.3	20.7
<b>Countries.</b>			

*Source : World Bank 2008*

Reference to the expansion of irrigated land in a sample of low and middle income countries indicate trends that relate irrigation growth to the level of economic development. The cases presented however, do not fall in the same category of agro ecological zones or their economies may not be dependent on agriculture as such but investment in irrigation may have been driven by the food security needs.

The table below compares Kenya and Uganda with Egypt on grounds of irrigated land as percentage of crop land available. The two East African countries have just come to the realization of the importance of irrigation in food security after a growing population has triggered the demand for food, a situation where Egypt may have been by the time of signing the Nile water use treat. The water that has made the later to develop irrigation to 100% of cultivable land and meeting the necessary food requirements is the same water that the East African countries are not putting to effective use. Korea's irrigation expansion has shown the same trend as it has more land under irrigation than the entire sub Saharan Africa. This demonstrates that expansion of irrigation to a good extent helps in securing food and saving for economic development related investments.

The middle income countries' irrigation expansion may be predicted to go up as a measure to adapt to climate change, achieve food security and save for investments. In the event of exhausting their water reserves, there is an opportunity to supply farm products from irrigated smallholder farms as does the large irrigated farms in Kenya. Apart from achieving the targeted food security status, there are opportunities to export more farm products to the countries whose irrigation potential will have been overstretched to the maximum. This should motivate the Kenyan irrigation stakeholders to promote

government initiatives through the ESP and foster development of realistic value chains to takeover irrigation expansion especially for export farm products.

## **2.1 Kenyan Economic Performance and Welfare**

Data on output from key economic activities show that the real GDP grew at a rate of 6.3% in 2006 compared to 5.1 and 5.9% in 2004 and 2005 respectively. In 2007, 7.1% growth rate was experienced followed by a sharp drop to 1.6% in 2008 recovering to 2.6 in 2009. The agriculture and forestry sector showed contraction at a rate of 2.6% compared to 4.1% of 2008. However, in general, the inflation rate went down to 9.2% in 2009 compared to the 16.2% of 2008.(Economic Survey 2010). The trend observed after 2007 can be blamed mainly on the effects of PEV and to some extent unfavourable weather conditions. Despite of the figures showing growth and contraction rates of the GDP, the growth periods are too short that it is sometimes not easy to see a remarkable difference in the livelihood of the Kenyan citizens as poverty remains to manifest itself through lack the basic needs of health and hygiene, nutrition, education, housing, food security and capacity for income generation among the majority of households. Causes for this scenario cannot be limited to any specific factor but generally the common culprits are lack of social, economic and political empowerment to negotiate contracts, institutional failure, poor regulatory framework for enforcement of contracts, inadequate mechanisms for competition, corruption, and poor access to markets. As a result the poor generally have poor access to productive resources, land, water, finance, market infrastructure, technical expertise, education and training, hence inequitable access to institutions and economic opportunities.

## **2.2 Kenyan Macroeconomic Policy and Agriculture**

Over the last decade, the Government has put in place stable macroeconomic environment through tight fiscal and monetary policies. There has been a slow but steady implementation of progressive macroeconomic reforms, including liberalization of input and output markets, dismantling or privatization of parastatals and moving government towards a smaller regulatory and quality function. Service and performance contracting are examples already witnessed in public service provision. The Government has introduced and implemented many policies and programmes geared towards prudent economic management in order to achieve rapid and sustainable economic growth. Through these economic reforms, foreign exchange controls and almost all trade restrictions have been eliminated; commodity markets have been liberalized and all price controls abolished, many non-strategic government enterprises are being privatized; processes for public sector reforms and related restructuring of Government Ministries and institutions have been initiated with the ministry of agriculture restructured into four technical departments under one coordination office and an agriculture sector coordination unit established to oversee concept development and other relevant initiatives with the sector ministries. In all these policies and programmes, the underlying intention is to reduce direct government participation in the economy and to create an enabling environment for private sector development, management of production

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and marketing. The government has also sought to rationalize its expenditure through biased allocation in favour of core functions of government viz. maintaining law and order and administering justice, financing broad-based education and health services, providing economic infrastructure and supporting agricultural research and extension, and protecting the environment, with varying degrees of success.

However, implementation and performance of these initiatives have been affected by inadequate commitment, competitive politics, and corruption. Whereas there was significant recovery of the economy's growth rate from 0.5% in 2002 to 7.1% in 2007, the momentum could not be sustained because of the aforegone. This is indicative of the inherent difficulties of poor sequencing the reform process and lack of professional approach to appointments in key positions that matter in service delivery. Adopting a fiscal policy that not only reduces the budget deficit but also substantially increases the development share of public expenditure has been difficult to achieve, and will require more stringent measures at prudent financial governance to facilitate consolidation of gains, albeit modest, already made in reductions of public sector employment and the rationalization of budget. Without this, mere deficit reduction without a pro-rata increase in development budget has not produced the envisaged environment for growth.

Climatically, Kenya is endowed with a diversity of climate attributes ranging from the tropical coastal to alpine. This affords the country a potential for growing a variety of crops and raising of animals of a diverse nature. The all year warm climate also gives the country a comparative advantage in the growing of high value horticulture that allows her to take advantage of the northern winter to supply to these markets when no other comparable country is able to.

Although only 20% of the land is suitable for rain fed agriculture, there is a potential to increase available land by 10%, through irrigation. This however remains unexploited due to technological constraints, inadequate capital among the farming communities and lack of capacity for user managed irrigation schemes. To ensure both food security and export growth, the available irrigable land resource has to be put to optimal use through appropriate technology of improved seed, fertilizer and producer-friendly policies. Although this sounds common knowledge, it has unfortunately not been initiated to reach a threshold or involve a critical mass of producers as to achieve dependable results. As such, Kenya continues to languish in a state of perennial food shortages and poverty.

### **2.3 Human Resource for Agricultural Development**

The population of Kenya stood at about 38 million last year, having increased from 29 million 1999 and 21.2million in 1989. The adult literacy rate in 1999 was 78.1% (The Economist 1999) and projected to reach 80% by 2002 (GoK PRSP 2000). The urban population has been steadily growing such that, it currently stands at about one forth of the total population. This trend, coupled with the fast rate of urbanization has serious implications for rural development, agricultural production and marketing. The need to create satisfactorily remunerative urban employment will be needed to generate adequate purchasing power for rural and agricultural produce if rural agriculture is to be



sustained.

Although Kenya has made impressive strides in improving the literacy of the population, recent developments are beginning to undermine gains already made. Paramount among these is the incidence of HIV/AIDS which is already the leading killer among the productive and best-educated segment (ages 15 to 49) of the population. This is more in areas that serve as income generation points like high value crop growing areas, irrigation schemes, large estate labour lines and high population urban slums.

The farming systems in Kenya are variable depending on altitude and climate. The key export and commercial commodities, coffee, tea, maize, sugar and dairy are produced in the high to medium potential zones usually in a mixed farming with little or no fertilizer application. Fertilizer application is still heavily skewed in favour of cash crops and among larger commercial producers. This partly explains the low levels of food production. In the arid northern Kenya, the predominant enterprise is beef production on extensive low input ranching. This sector as will be noted later could become the major income provider for the rural poor but is beset by a myriad of problems, least of which is policy neglect.

Technologically, as noted above, the vast majority of the rural poor still has inadequate access to technological advancement that would improve their productivity. The bulk of the Ministry of Agriculture and Rural Development sector budget has been dedicated to the numerous parastatal organizations with low attention to smallholder farm development. Far be it, most of this budget is for personnel emoluments and not to productive capital development. As a result there is inadequate technology development and transfer mechanisms that would benefit the smallholder sector. The promise to Kenyans at the time of implementing structural adjustment programmes was that the resources saved from offloading excess personnel would be recycled to development does not appear to have materialized.

## **2.4 Infrastructure as a Factor in Competitive Agricultural Production**

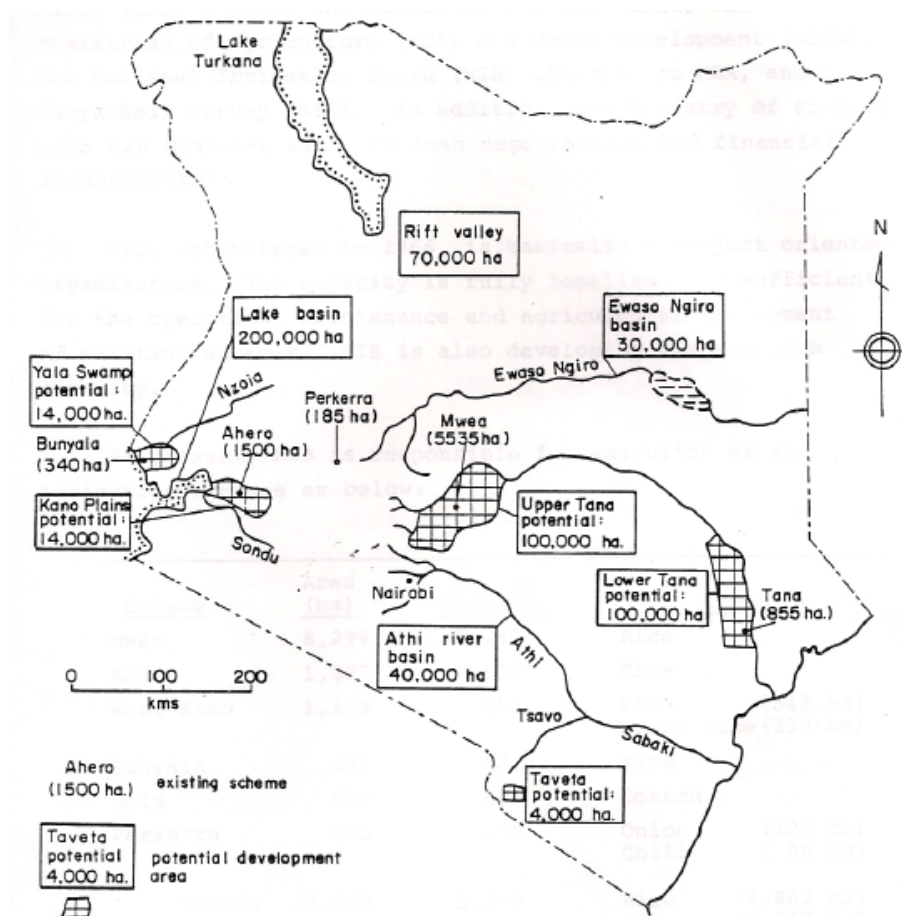
Adequate and well-maintained infrastructure is an important precursor to economic growth. Unfortunately the state of access roads to agriculturally productive areas, especially over the last decade or so has been a hindering factor to produce market linkages development. Production and business concerns continue to incur high transaction costs as a result of the dilapidated or non-existent infrastructure. As a result, production costs of a substantial number of business concerns have risen rendering them less competitive.

## **2.5 Irrigation Practices and Potential in Kenya**

The main irrigation schemes in the country are distributed over various agro ecological zones and regions, giving rise to unique opportunities for diversification, crop disease and pest control, low product market competition or gluts and less competition for water resources. The map below shows the location of the government managed schemes and the existing potential in various parts of the country.

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**Figure 1: Location and size of existing public schemes and irrigation potential in Kenya**



According to the World Bank report, 2008, Kenya's irrigated land as a percentage of Cropland is quite low and has stagnated at 1.6% since the year 2000 and rising marginally to 1.8% in 2003. The main irrigated crops are rice, maize, sugarcane, vegetables, bananas, citrus, coffee, tea, cotton and flowers. Some of these crops like maize, sugarcane, coffee, tea and cotton, technically, require large scales of operation for economic returns to be realized. As the ESP initiatives are being implemented care will have to be taken to guide the smallholders on the right crop for prevailing production systems. In this case, the implementation of ESP should go hand in hand with provision of adequate and focused extension, land use management, water use efficiency and environmental conservation in order to realize the anticipated results. Achievement of results normally would be the most reliable way of stimulating growth of irrigation that seems to be stagnating in Kenya.

Introduction of fees or tariffs payable by water users is a sound decision to promote sustainability. The fees payable by the gravity water abstraction systems is pegged at Ksh 2000 per crop season whereas those who depend on pumping pay Ksh 4000 per crop season. These rates seem to have been arbitrarily decided as they do not change with

the change of diesel prices or the margin is high enough to absorb the price changes. Much more revenue can be generated from the schemes if appropriate technologies and cost effective designs could be put in place to improve scheme water use efficiency and save the producers of costs that are incurred due to low efficient systems.

## **2.6 The Irrigation Status in the Country**

Recent policy guidelines bringing on board various water management and user associations under the Ministry of Water and Irrigation are expected to improved water use efficiency to enable farmer put more land under irrigation. Even though, research institutions and other irrigation promoting agencies need to explore and introduce to the farmers yield improving technologies particularly in relation to improved seed, cultivation, harvesting and post harvest handling equipment. The present practices lack harvest equipment, yields achieved are low, postharvest losses are high and water supply is insufficient. Expansion by 4000 acres in Mwea scheme has been reported but production is done in rotational turns posing challenges of inability of NIB taking up critical issues as priority before expanding to other areas where the same constraints are likely to be realized soon after setting up costly systems. The water user and management associations have not been innovative enough to be able to tap the water resource from seasonal runoffs by way of storage and appropriate exploitation of the aquifer. Recurrent food insecurity among Kenyans has made scholars and institutions to look for solutions to alleviate the problem in the country. The issue of increasing cultivable land comes foremost since out of the 576,000km<sup>2</sup> only 17% is a high rainfall zone, receiving more than 1000 mm of rainfall annually and is arable enough to support farming without irrigation. The existing irrigation and drainage potential of 1.3 million and 600,000 ha respectively are within the second production zone that is characterized by medium rainfall of 750-1000 mm per year occupying between 30 -35 percent of the country's land area. Hitherto, 114,600 hectares are under irrigation and 30,000 ha drained. It is believed that out of the potential hectarage, 540,000 ha can be developed with the available water resources while the rest will require harvested and stored water.

The land mainly under private smallholder irrigation is devoted to production of vegetables and fruits for export and the local market. These include Asian vegetables, Tomatoes, Spinach, Kales, brinjals, melons, corgets and chillies. Fruits include Mangoes, paw paws, bananas, custard apple and citrus. The returns from the commodities are relatively high and productivity is satisfactory. They are clustered along and around water sources which may have been developed with support from either the government or NGOs. The land parcels are commonly individually owned or rented. A number of these schemes have been produce collection points by exporter companies under various agreements but other producers are free to deliver their vegetables direct to major market like the Wakulima and Kongowea in Nairobi and Mombasa respectively. Those who are not in cluster agreements, do sell their produce at farm gate but even with marketing costs adding onto the produce price, they still make attractive margins which motivate them to continue production.

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Although, this has been a popular organizational model of a number of privately operated schemes in the country, it has had some challenges including the environmental factors and climatic changes especially the water scarcity and lack of farmer capacity to handle the technological advancement in the enterprises. Quality control also has not been easy except where individual exporter companies have developed supervision and extension provision arrangements to be able to achieve the standards required for export farm products.

Water use management and maintenance of water delivery structures is done by the cluster management committees who also pay part of their proceeds at agreed rates to the regional based water users' association under the Ministry of Water and Irrigation. These category of irrigators experience very little influence from government quarters since scheme expansion is spontaneous depending on water availability. At times the irrigating farmers reduce irrigation activities to be able to attend to their rain-fed land parcels where they grow maize, beans, sweet potatoes, green grams, cassava and pigeon peas. This is their strategy of ensuring food security. Examples of these schemes can be seen in most districts of Kieni (Central province), Kajiado and Oloitokitok (Rift Valley), and Yatta, Kibwezi, Mtito Andie (Eastern province), Msambweni and Kaloleni (Coast Province)

The large scale category of irrigators is individual or company owned with massive production for export and the local market. Their main market outlets are export companies, super markets chains, and deliveries to the market directly or through proxies.

The farms are normally under no obligation to produce any crop that is not their choice. The farms provide significant employment in terms of casual labour especially those involved in vegetable and flower production. Some of the farms operate mixed production systems which depend on ground or river water or both. Examples these farms can be seen in Laikipia and Naivasha, Yalla, Thika, etc

These category has no constraints of extension service because they employ own personnel and procure any equipment the deem necessary as long as economic returns are foreseeable the rate collapsing of this

The irrigation schemes that are government managed through the NIB include:- Mwea, Perkera, Bura, Hola, Ahero, West Kano and Bunyala. The schemes work under a relatively closed management by the NIB and are traditional rice growers with little or no rotation. They have a long history of management failures and a myriad of other problems that stem from the inability to self governance. They have not been able to exploit the available land fully at any one time and plans on what do next are all dependent on the NIB's board decisions. The area per scheme, location and crop in season are tabulated table 2 below:

**Table 2: Public Irrigation Schemes**

	<b>Scheme</b>	<b>County</b>	<b>Area</b>	<b>Main Crop</b>
1	Bura	Tana	5000	<b>Seed</b>
2	Hola	Tana	1240	<b>Seed Maize</b>
3	Perkerra	Baringo	1200	
4	Mwea	Kirinya	15000	<b>Rice</b>
5	Ahero	Kisumu	3000	<b>Rice</b>
6	West	Kisumu	2250	<b>Rice</b>
7	Bunyala	Busia	534	<b>Rice</b>

*Source : NIB, Area in **Acres***

Among the critical challenges experienced by producers in these schemes include: inadequate water storage structures, inadequate drying facilities, low recoveries of operational and maintenance costs, inadequate extension services and farmer dependency syndrome.

Because of the dependency syndrome, some of the schemes have been supported with irrigation pumps, seed, and revolving funds but still that is perceived as not being enough. This attitude coupled with difficulties to recover operational costs otherwise meant for repairs of water channels, construction of water storage facilities and any other equipment necessary for improvement of productivity will not be favourable for possible expansion of the land under irrigation. Unless this spoon feeding approach is changed, the ESP will draw strategies and allocate resources but it may remain a “*business as usual*” scenario.

Last year, Hola and Bura schemes went for commercial maize production but did not realize economical returns as will be discussed later. This year the schemes including Perkerra are under seed maize production contract. It is expected that with the prices offered for seed production they will be business and indirectly contributing to the food security objective that is underlying the ESP.

Whereas expansion of land under irrigation is thought to be one of the solutions to the food insecurity in the country (Agricultural Sector Development Strategy (ASDS) 2010-2020), the apparent inadequacy of water, location of the potentials land and/or water, lack of independence in decision making by the operators and the scales of operation of individual producers may curtail realization of the dream. This is because about 40 per cent of the irrigated land belongs to private large farms that do not necessarily produce food stuffs for direct consumption, 42 per cent belong to smallholder farmers who are in own vegetable production business, and 18 per cent, government managed schemes. The fraction under government influence is too small to make significant contribution to the food security requirements given the challenges outlined above. More so, yields obtained from the public supported schemes are not optimal enough to sustain continued production in long term basis.

An attempt to compare the income margins from other crops that can compete well

with the resources devoted to rice revealed that the majority of the crops require low investment costs in terms of variable costs and generates better incomes compared to rice. This is the most critical consideration in business which NIB should consider if the land and water resources have to be put to rational use. Farm production practices also insist on aspects of crop rotation and fertility management not to mention the benefits of crop diversification especially in risk management. Table 3 below summarizes these results

**Table 3: Performance of competitor crops under irrigation conditions**

<b>Crop</b>	<b>Variable costs (Ksh/acre)</b>	<b>Margin (Ksh/acre)</b>
<b>Rice</b>	25,150	39,650
<b>Passion fruit</b>	36,710	143,290
<b>Tomatoes</b>	55,920	119,080
<b>Cabbages</b>	53,170	76,830
<b>Kales</b>	21,770	49,727
<b>Bananas</b>	16,695	127,305

*Source : Author's compilation*

### **3.0 FOOD SECURITY**

#### **World Cereal Production Outlook**

Cereals make the bulk of what is commonly consumed among many African communities. Reduction of cereal stocks actually reflects an anticipation of hunger among these communities. This therefore draws concern from crusaders of hunger alleviation worldwide triggering reactions towards carrying out surveys to establish benchmarks for estimating food requirements.

FAO's first forecast for world cereal production in 2010 stands at 2,286 million tonnes, marginally up from last year's level. A reduction is forecast for wheat while output of coarse grains and rice are seen to rise this year. Early indications for cereals in the 2010/11 season point to near record world production, further build-up of cereal inventories, a modest increase in world trade and overall, a fairly comfortable cereal supply and demand outlook. International prices of all cereals showed a downward pressure during the second half of the 2009/10 season.

World cereal stocks for crop seasons ending in 2011 are forecast to increase to 533 million tonnes, up 1% from their opening levels and the highest since 2002. Most of the increase is expected to be driven by larger rice inventories; however this would depend on whether the current forecast for larger grain in 2010 materializes. Based on current expectations,

the world cereal stocks-to-use ratio in 2010/11 would remain stable at around 23%, up nearly by 4% from its position in 2007/08. The FAO Cereal Price Index averaged 156 points in May 2010, down nearly 9%, or 15 points, from December 2009 and as much as 43% below its April 2008 peak of 274 points. International prices for all major cereals have fallen considerably since the beginning of 2010 in view of ample export supplies and prospects for large grains in 2010. Wheat and rice prices have declined while maize prices increased in recent weeks, mostly in reaction to unexpected large purchases by China.

### 3.1 Country Food Crop Performance Trends

The cropping pattern in the country has mixed achievements over the last five years. In 2008, the output for most of the crops was the lowest. The main reason for this being the PEV and the onset of the fertilizer and input prices increase. The country's production levels of food crops are still below consumption estimates. To mitigate this, the government has enhanced campaigns in the providing seed and fertilizer subsidies and supporting distribution of the same including and the promotion of the orphaned and traditional crops. This explains the growth in production of some of these crops in table 4 below.

**Table 4: Cereals Production Trends (Tonnes), 2005-2009**

Year	2005	2006	2007	2008	2009	2010
Crop Production (Tons)						
Maize	2,918,157	3,247,777	2,928,793	2,369,569	2,442,823	2,139,575
Wheat	365,696	358,061	354,249	336,688	219,301	160,043
Rice	375,820	531,800	383,900	261,137	465,363	20,181
Sorghum	150,127	131,188	147,367	54,316	94,955	225,782
Millet	59,481	79,207	11,599	38,462	56,417	99,124

*Source : Economic Review of Agriculture, 2010, countrystat ([www.kilimo.go.ke](http://www.kilimo.go.ke))*

### 3.2 Food Crops Production in Kenya

Food crop production performance has continued to decline, necessitating importation and reliance on cross border trade to cover for the deficit. Maize, which is the main cereal staple, exhibited a decline in production of 12% from 2.25million tons in 1999 to 1.98million tons in the year 2000. This is the second consecutive decline and resulted in the importation of about 0.4million tons for both relief and commercial purposes (GoK, Economic Survey 2001). Expansion in productivity of maize is currently constrained by inadequate smallholder technology high cost of improved inputs poor infrastructure and inconsistencies in the produce pricing policy environment.

Maize output during the 1st quarter of 2010 made a dramatic recovery with actual harvests of 11,989,321 bags. Recovery was particularly conspicuous in the Eastern region which recorded a bumper harvest of 5,388,584 bags. This was attributed mainly to the

well distributed short rains of October-December, 2009. The farmers were also supported by government input subsidies (seeds and fertilizers) under the Economic Stimulus Programme (ESP). Empirical data also indicates that the long-rains performance will be equally good with an estimated production of 25,937,976 bags. Accuracy of these figures may be questionable taking into account that no structured surveys are commissioned to collect data realistically. It may be noted that an estimate of 32 million bags of maize requirement to meet Kenya's food sufficiency for one year has been in place since the country's population was 30 million. It is 38 million and the figure does not seem to go up accordingly. Table 5 below provides projections based on data obtained through the same methodologies.

**Table 5: Maize production projections (2005 - 2010)**

Year	2005	2006	2007	2008	2009	2010
Area(ha)	1760618	1888185	1615304	1793757	1885071	2,140,455
Production (90kg bags)	32423963	36086406	32542143	26302219	27142475	43,352,180*
Tons	2918157	3247777	2928793	2369569	2442823	3901696.2
Price per bag (Kshs)	1,363	1,300	1,200	2,500	2,614	2000
Average yield (bags/ha)	18	19	20.1	14.7	14.4	20.3
Consumption (90kg bag)	32,120,000	33,105,000	34,098,150	36,000,000	36,000,000	42,000,000
Total Value (billion Ksh)	44.2	46.9	52.3	65.8	71	80.9

*Source: MoA Reports*

Rice production in the irrigated schemes has shown mixed performance. Agitation for greater autonomy by farmers especially in the major Mwea scheme in 1998, resulted in less produce sold to the government controlled rice mills. As a result payments to farmers from government showed marked decline, from KSh204million to KSh50million in 19997/98 and 1998/99 respectively, falling to a further KSh.0.5million 1999/00. The loosening of official clutches, combined with inadequate supply gave rise to better prices with the marketed value rising by 78.1% from KShs770million in 1998/99 to KShs1,370million in 1999/2000 and Ksh. 2.7 billion in 2007 The total rice production from both irrigated and rain-fed systems is 47,256 metric tons, still not enough to meet domestic demand now standing at 300,000 metric tons (MoA, National Rice Development Strategy, 2008-2018). The deficit is made through importation. The move towards a truly liberalized production and marketing coupled with technological development for rain-fed production offers the best chance to close the gap between production and domestic consumption.

Traditional food crops, mainly sorghums, millets, bananas, and tubers cassava and sweet potato have an enormous potential for food security and processing, which has not been exploited. Though generally drought escaping, and therefore suited to the expansive sub-



humid areas of the country, inadequate or non-existent research, extension and organized marketing arrangements for these crops have relegated them to no more than casual occupation by farmers. Cassava and small grains (sorghum and millet) are particularly suited to production for processing for both human consumption and livestock feed. This potential has however remained unrealized due to:

- Inadequate investment in research for suitable production and processing technologies;
- Biased extension priorities in favour of more “modern” crops like rice and maize.

### **3.3 Available Food Stocks**

National maize stocks as at 30th September 2010 stood at 19,948,745 million bags, of which, 3.2 million bags are held in the National Cereals and Produce Board (NCPB) stores, 12,709,730 million bags being the farmers’ stocks, 2,905,919 million bags belonging to traders and 1,218,819 million bags in the hands of millers. The National Strategic Grain Reserve requirement by end of this Financial Year 2010/2011 is expected to reach 8 Million Bags of maize, half in physical stocks and the other half in cash. This does not guarantee adequate stock given the demand from animal feed manufacturers and the damage through aflatoxin infestation experiences the country is experiencing.

Harvesting of wheat is estimated to achieve 4 million bags this year compared to last year’s 2.5 million bags. This is attributed to the favourable long rains that were adequate and well distributed during the season. Prices at farm level have been fluctuating, dropping to Ksh. 1,500 per 90 kg bag at one time. Despite the harvest, demand for wheat and wheat products goes beyond this quantity, meaning that the deficit has to be made through importation of the grain. Sometimes farmers feel that importation has to be done after they have sold their produce or else it interferes further with the commodity prices. This was the cause of the recent farmers’ dispute to the importation proposal made by the Finance Minister during the budget proposal of 2010/11. Hitherto, the reduction in volumes reaching world markets due to embargo on exports by leading producers like Russia, local prices have gone up to Ksh 2,500 per 90 kg bag. It therefore follows that the prices of wheat products such as bread are expected to increase gradually due to this increment of prices and reduction of wheat supplies in world markets.

### **3.4 Rationale of Expansion & Development of Irrigation Schemes**

Irrigation is required when rainfall is insufficient to compensate for the water lost by evapotranspiration. The primary objective of irrigation is to apply water at the right period and in the right amount. By calculating the soil water balance of the root zone on a daily basis, the timing and the depth of future irrigations can be planned. To avoid crop water stress, irrigations should be applied before or at the moment when the readily available soil water is depleted. To avoid deep percolation losses that may leach relevant nutrients out of the root zone, the net irrigation depth should be smaller than or equal to the root zone depletion. This is possibly too scientific for irrigating farmers to hear but it is necessary for the water resource controlling agencies to use this guideline while distributing and rationing water for various crops in a scheme.

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### 3.5 Existing Irrigation Potential in Kenya

The 540,000 Ha potential that is irrigable with available water sources is part of the 1.3 million hectares total potential. This fraction is located in areas that can, on average, be classified as being under UM 2-4 zones known for coffee production, bananas, maize, many types of vegetables, legumes and fruits. Tana and Athi River, Ewaso Ngiro and Kerio Valley basins are in these locations. Without influence from the government farmers can be guided to produce crops of high value that can make them realize their returns within a reasonable time. This approach will build reliable ownership among the producers just like the smallholder schemes in other areas. It may have to be born in mind that some of the areas like Tana and Kerio Valley are under relatively hot conditions and experiencing high evapotranspiration in longer periods of a year. These conditions may worsen with the experiences of climate change. It therefore would be prudent to start with the investments and advice that may help the farmers to adapt to climate change rather than planning to exploit the potential with the management of NIB instilled into the new systems. This will automatically work towards reducing sustainability of the production processes and farmers' organizational development. The location and size of the land earmarked for potential irrigation expansion using available water is shown in table 6 below:

**Table 6: Location and size of potential irrigation sites**

<b>Basin</b>	<b>Irrigation Potential (Ha)</b>
Tana	205,000
Athi	40,000
Lake Victoria	200,000
Kerio Valley	64,000
Ewaso Ng'iro	30,000
<b>Total</b>	<b>539000</b>

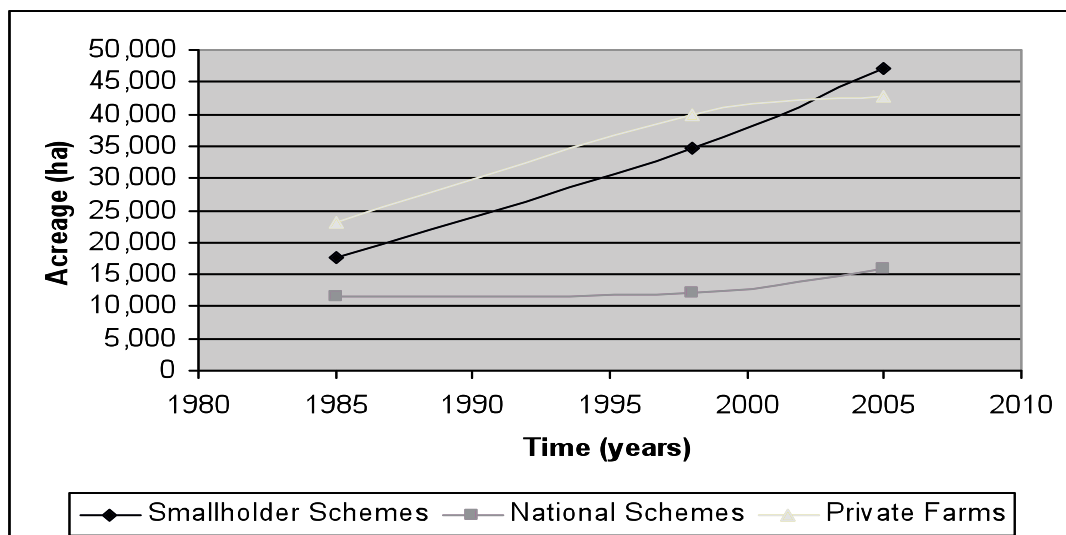
*Source: NIB Strategic Plan, 2008-13*

The physical environment of these locations is fragile and mainly in the 3rd production zone characterized with inadequate rainfall between 250-750 mm per year. It is uncertain whether the irrigation potential noted in the lake basin can really access water given the collapsed renegotiations between the East African states and Egypt concerning the Nile water originating from the basin.

Expansion and development of irrigated land has shown a declining trend of private large farms from about 1998 to date, a low rate expansion of public schemes and a considerable growth of the private smallholder schemes within the same period. The case of smallholder growth can be attributed to support from private sector organizations like SISDO that give support to individual smallholders in terms of loans and irrigation equipment and easy access to usable water resources as a result of registration of WUAs. The public schemes (national schemes) have shown some growth that can be attributed to the government, FAO, FRG and others efforts to revive the schemes. It is

probably too early to assess the impact of the ESP in the growth trend as shown below:

**Figure 2: Growth of irrigated land by various categories over years.**



Irrigation by large farms seem to be going down probably because of the high production costs resulting from the high input costs, supervision and extension services. With the EurepGAP conditions, production systems and practices have had to be thoroughly checked including mechanisms of ensuring traceability. This is mainly in relation to export products. Issues of competition in the world market may also be suspect for the reducing production in large irrigation farms, not to mention emerging approaches to business where some exporting companies contract smallholder to produce the desired products for specific markets.

The country has two main agricultural production systems that can be relied on for the alleviation of food insecurity. These are rain-fed and irrigated agriculture systems. About 84% of the country's 576,000 Km<sup>2</sup>, falls under arid and semi arid lands (ASALs) and not suitable for rain-fed agriculture due to unreliable and erratic rainfall (ASDS 2010-2020). About 16% is suitable for agricultural production, with high and medium agricultural potential and reliable rainfall. These ASALs are used as rangelands and agro-pastoralism and pastoralists. However, agricultural growth must be led by intensification and substitution towards more high-value products, and expansion of the cultivated area through irrigation.

According to the Agricultural Sector Development Strategy (ASDS) 2010-2020, Kenya is among countries classified as water-deficient and that water resources are unevenly distributed both in space and time. About 56% of all the country's water resources is in Lake Victoria basin, except the highlands which are endowed with springs and rivers. The inadequacy of water, inability to adopt irrigational efficient systems, unavailability of water storage facilities have been noted as factors that are limiting the country's irrigation-based agriculture. Large commercial farms and private smallholder irrigation schemes

account for 82% of irrigated land. The remaining 18% is under government managed schemes (MWI 2009-2010). These put together make only 4% of the irrigated land which is by far insignificant to make a notable difference in food security initiatives.

The 26% of agriculture's contribution to the country's GDP can greatly be improved if agricultural production is increased through expansion of cultivable land. However, this has to be accompanied with adoption of new production technologies, value addition to farm produce and market oriented farming. Apart from contribution to the GDP and alleviating food insecurity, desirable outcomes depicting sustainable growth of the sector will form the development envisioned by a number of strategies already formulated to guide the sector's development towards achievement of vision 2030. The strategies include the Strategy to Revitalize Agriculture (SRA) and the Agriculture Sector Development strategy.

### **Strategy to Revitalize Agriculture (SRA) 2004-2014)**

The policy paper actualizing the SRA was based on a broad objective of embracing a broad based growth and development of agriculture and by extension development of rural Kenya through activities aimed at improving agricultural and livestock production and real farm incomes, availability and access to food. The main deliverable was transforming subsistence farming to commercial production. Formulation of this sectoral strategy was triggered by the national policy of Economic Strategy for Wealth and Employment Creation (ERS). The policy orientation was to contribute to the achievement of Vision 2030.

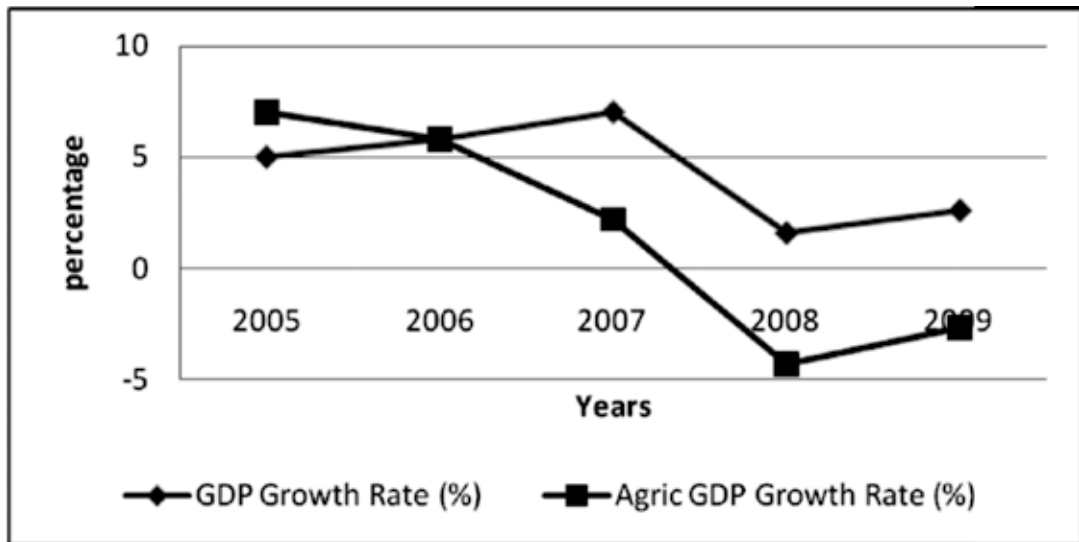
### **The Agriculture Sector Development Strategy (ASDS) 2009-2020**

Formulated to take over from the SRA and align the sector initiatives to Vision 2030 with due recognition of the achievement of the SRA. The policy formulated in context of global commitment and national policies and in comprehensively takes up the primary goal of CAADP of eliminating hunger, reducing poverty and food insecurity beside opening the way for export expansion.

During the period of the SRA implementation, the agricultural sector recovered from a growth rate of negative 3% in 2002 to positive 5.4% in 2006 (figure 2.1). After this achievement, the infamous PEV reduced the sectors growth rate to negative 1.6% due to its effects on the farming community in the early 2008, and the droughts of 2008 and 2009

Over many years, it has been observed that a drop in the Agriculture GDP proportionately affects the national GDP growth thus demonstrating the ultimate importance of agriculture in the performance the national economy (see figure 2.1).

**Figure 3: An influential relationship between the Agricultural GDP and the national GDP growth rate f (2005-2009)**



*Source: Economic Review of Agriculture (ERA), 2010*

Growth of the agriculture sector directly influences growth of the economy because of its primary functions of generation industrial raw materials, export earning and rural employment. The sector therefore deserves focused attention in terms of investments that can support improved productivity and sustainable growth. Such investments as development of irrigation structures, research, water harvesting and storage facilities would go a long way in increasing productivity and eventually growth of the sector and the economy at large.

The sector however, faces challenges related to productivity, land use management, linkage to markets and lack of value addition to farm produce. These challenges need to be addressed through a holistic approach that considers prioritized investments in irrigation development, capacity building of the stakeholders, organizational development of stakeholder entities, market development and product diversification among others.

### **3.5 Water Management and Agricultural Policy**

Past irrigation development strategies and approaches are contained in several policy papers on agriculture, food security and water development including the Sessional Paper No.4 of 1981 on National Food Policy, Sessional Paper No. 1 on Economic Management for Renewed Growth, Sessional Paper No.2 of 1994 on National Food Policy, the Economic Recovery Strategy (ERS) (2003 - 2007), Strategy for Revitalizing Agriculture (SRA<sup>o</sup>) 2004-2014, the Water Act (2002) and Vision 2030. Irrigation and drainage is identified in all these documents as key to the intensification of agriculture through increasing production and productivity of land currently opened for farming and utilization of the Arid Semi-Arid Lands (ASAL). Although opportunities existed for the implementation of the envisaged policy changes, little has been done in terms of initiatives to actualize the strategies as laid out.

Kenya, at the moment, does not have a national irrigation policy and strategy in place, and for this reason the 1966 Irrigation Act (CAP 347) and other separate pieces of legislature that created the NIB are still in force. This has allowed uncoordinated development in the irrigation sector for a long time. For instance, the Ministry of Agriculture (MoA) remains responsible for production activities under irrigation whereas the Ministry of Water and Irrigation (MoWI) has its own irrigation activities through the autonomous NIB and water management and control through a number water user associations which actually have little to do with the real users. The Ministry of Regional Development, on the other hand, does most of dam construction and desilting for irrigations in various parts of the country with little collaboration with the enterprise development agencies. This has led to lack of good enterprise selection prioritization, production standards, organization of producers and focus on external factors including environmental conservation aspects. The implications of such omissions are likely to keep producers in the state of dependency, inability to access credit facilities, low development of initiatives among producers, lack of interest from the private sector sphere and continued deterioration of the production environment. Realization of the need to foster private sector growth for faster development and relief on the government budget has however brought about the initiation of an irrigation policy formulation. Though the draft is at draft stage, reference to the document indicated viable objectives.

### **3.6 The Draft Irrigation Policy**

The draft policy's the key objectives include: Expansion of land under irrigation and drainage through increasing available water capacity from the present 5.3m<sup>3</sup> to 60m<sup>3</sup> per capita, mobilize resources for investments in the irrigation subsector, seeking partnerships with private sector, creation of an enabling environment for stakeholder participation, Promotion of multi-sectoral approach for enhanced innovations, research and technology adoption and capacity building and development of the stakeholders.

It is in this draft policy that vests irrigation, drainage and water activities with the Ministry responsible for water affairs in the country. The challenge is that there about 17 Government Ministries with some direct<sup>1</sup> or indirect<sup>2</sup> relationship and/or impact on irrigation, drainage and water storage.

It is anticipated that the reforms that saw the irrigation subsector transferred to the MoWI will institute an important institutional change that will influence growing responsibility in water resource development for expanded irrigation activities and coordination of investment activities in the sub sector. This along with change of perception will stimulate a more economic thinking towards a business oriented production and the importance of environment conservation of sustainable production.

With the new policy guidelines, government may not need to be involved intensively in the production activities but only facilitation of the activities if the objectives of seeking partnership and building and developing the stakeholder capacities are taken positively. This will relief NIB of the burden of having to regulate, enforce and operate the rice and seed maize growing scheme.

1 MoWI, MoA, MoLD, MoF, MoFD, MENR

1 MoL, MoPND, MoCMD, MoT, MoI, MoRD, MoPH, MoLG, MoPW, MoGY A&C,OP

<sup>o</sup> Now the ASDS 20102020

Thereby losing focus in an event of delayed financial obligations from the government budget. There is further need to harmonize the draft to take the present approach of sectoral development with clear responsibilities of the Ministries agencies like WUAs, NIB, WARMA and others in relation to food security policies and vision 2030.

### **3.7 The Water Sector in the Kenya**

Reforms that took place in the water sector through the Water Act of 2005 separated the water resources management and development from water delivery services. This was made possible through the creation and institutionalization of semi-autonomous agencies charged with unique roles and responsibilities leaving the Ministry with the core functions of policy formulation, implementation and monitoring. The sector has responsibilities to ensure that water requirements for irrigation, domestic and industrial use are met. The quality and quantity of water matters depending on the use it is put to. The MoWI, charged with the to the responsibilities of ensuring coordination in relation to present and future water requirements of the country, need to specifically consider the salinity aspects of water that are already affecting many irrigation areas. The Ministry's mandate generally include: management of the water resources, provision of domestic water services, provision of irrigation, drainage, and water storage services, land reclamation services and capacity building for water institutions. For the Ministry to perform the underlying activities to these mandate areas, strategic broad objectives have been formulated as:

- Development of legislation, policy and strategy formulation, sector coordination and guidance, and Monitoring and Evaluation (M&E).
- Overall sector investment planning and resource mobilization

These objectives are the basis for a number of semi-autonomous boards and associations institutionalized to oversee the investments and performance of various projects in the ministry. Respective action areas have been summarized in table 7 below:

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**Table: 7: Water Sector Players and their Functions**

<b>Ministerial institutions</b>	<b>Strategic Objectives</b>		
	<ol style="list-style-type: none"> <li>1. Development of legislation, policy and strategy formulation, sector coordination and guidance, and Monitoring and Evaluation (M&amp;E).</li> <li>2. Overall sector investment planning and resource mobilization</li> </ol>		
SAGA	Function	SAGA	Function
1. Water Appeals Board (WAB)	Deals with conflict resolution within the sector management under the Water Act 202	8 Regional Water Services Board (WSBs)	Manages water & Sewerage service provision in respective areas across the country by; i) contracting WSPs, ii) developing water & sewerage facilities, iii) regulating water services and tariffs.
2. Water Services Regulatory Board (WASREB)	Regulates water and sewerage service provision including; ( i) issuing of licenses; and ( ii) setting service standards and guidelines for tariffs and prices.	National Water Conservation & Pipeline Corporation (NWPC)	Contracts construction of dams & pans, boreholes, and rehabilitation of flood canals on behalf of MoWI
3. Water Resources Management Authority (WRMA)	Regulate water resource issues including; (i)water allocation; (ii) source protection and conservation;( iii)water quality management and (iv) pollution control and international waters	Kenya Water Institute (KEWI)	Provides training, research and consultancy services in the water and irrigation sector.
4. Water Services Trust Fund (WSTF)	Mobilizes financial resource for development and rehabilitation of water and sewerage services infrastructure, especially to poor under-served areas	National Irrigation Board (NIB)	Develops, promotes and improves irrigated agriculture through sustainable exploitation of available irrigation and drainage potential. Develops and manages National irrigation schemes.

*Source: Policy for Prosperity; 2010; MoPND*

These SAGAs are far too many and a likely source of conflict due duplication of roles. It is not easy for example, to distinguish the roles of district water offices from those of WSBs or WSPs. This confusion creates a contradiction to the spirit of reforms; the devolution of services and the efficient use of resources. Finally, not all these SAGAs have the potential



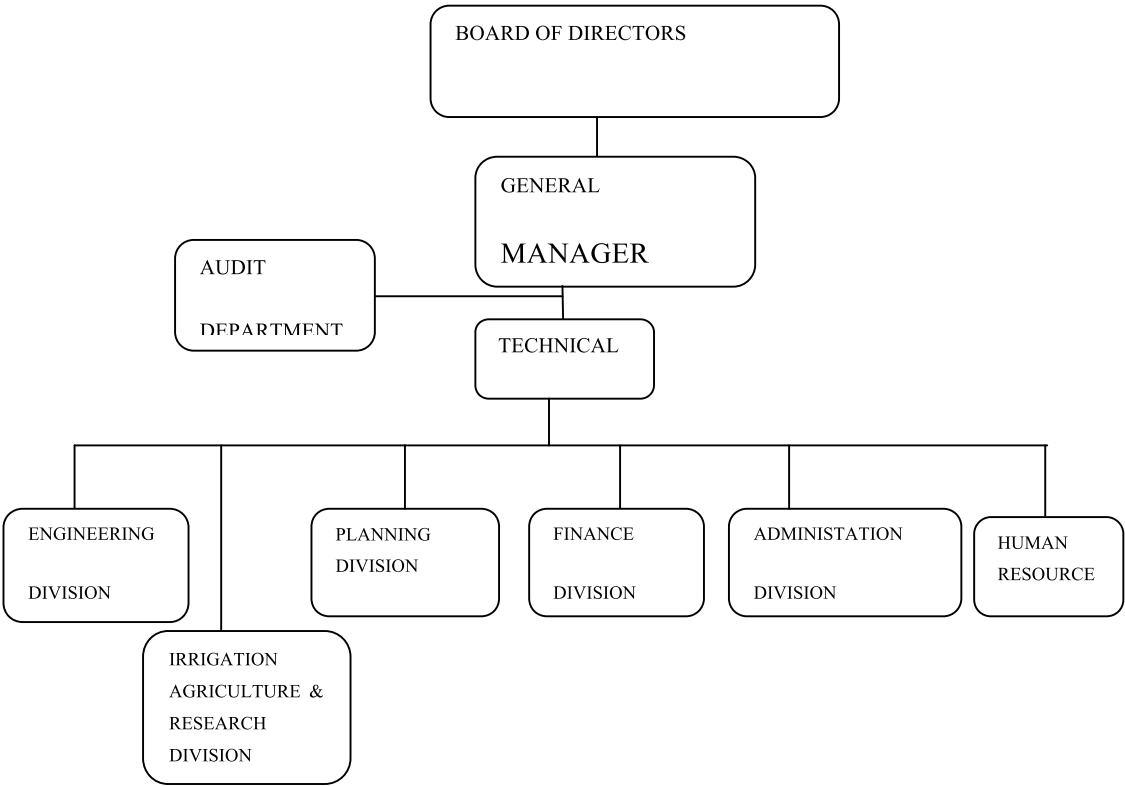
to generate their own funds raising the question of the adequacy of resources to finance the water sector organization and management structure.

**3.8 The National Irrigation Board (NIB)**

The NIB, notably an old establishment of 1966 was constituted to carry out the promotional activities of irrigation development and settlement of landless persons after the independence of the Republic of Kenya. The board has undergone various chronological developments to attain the status of a parastatal under the management of a board of directors through a General Manager assisted by an audit and technical departments who run the day to day activities.

Technical services are offered through three technical divisions, namely: Engineering, Irrigation & Research, and planning divisions. Administrative divisions include: Finance, Administration and Human resource Management as resented in the organizational structure below:

**Figure 4: NIB Organizational Structure**



*Source: National Irrigation Board SP, 2008-2013*

Notably the NIB operates as a policy organ and at the same time as an enforcer of the same; management and supervisory role is vested in the institution thus posing managerial challenges. Like any other government parastatal, influence from the parent ministry is inevitable and cannot be resisted. Top management appointments are influenced by the political class all the time. Such appointees are compromised and more often than not, lead to such boards working to meet vested interests of the appointing authorities. Cases of unqualified heads being hired and posted to manage NIB are not uncommon. This obviously leads to poor performance of the Board. This, coupled with the then prevailing poor governance, has resulted to public schemes recording poor productivity, lack of initiatives and skewed expenditure towards more of operations than investments and technology development.

NIB, in its Strategic Plan, admits that they do not have the requisite capacity to implement its Corporate Plan within existing resources and would require a range of partners and collaborators to help play different roles in the overall Plan. It is, therefore, expecting too much to imagine the parastatal can efficiently manage a huge project like the ESP when evidence of failure in smaller projects has already been witnessed. Such anomalies come about by failure of the central government to follow professional guidelines in project development and implementation procedures, where project are prepared, documented, appraised pilots carried out, if need be, before implementing full fledged project activities.

Perhaps a more efficient way of utilizing the ESP fund would have been through a Private Public Partnership (PPP), where development partners and smallholder farmers could have been mobilized to manage ESP in a semi-autonomy version. This is a model that would draw beneficiaries into selecting their priorities and enhance capacity building among them for more sustainability.

### **3.9 Agricultural Development Policies**

Well written policies on food production and agricultural development have been in place for many years. The first government policy dedicated to food production and agricultural development was the National Livestock Development Policy of 1980. The need for a livestock development policy arose out of the creation of an entirely new ministry from the then Ministry of Agriculture, the Ministry of Livestock Development. This Ministry was charged with: development of animal industry, production and marketing; provision of veterinary services and veterinary research; range development and range management; survey and control of tsetse fly and locusts and overseeing the management of Agricultural Development Corporation. The Sessional Paper No. 4 of 1981 on National Food Policy followed this immediately after, in 1981. This Food Policy was necessitated by the realization of government's inability to ensure food security subsequent to or during drought, following the disastrous famine of 1980.

With the onset of liberalization, following implementation of stabilization and structural adjustment policies, there emerged a need to revise the policy to facilitate production in a liberalized environment. This gave birth to the Sessional Paper Number 2 of 1994

on National Food Policy. Despite the varying reasons for enactment, the central theme running through all these policies has been the need to achieve broad-based food self-sufficiency and produce adequate surpluses of export. Though well written, these policies have not been able to realize their objectives due to structural and operational weaknesses as far as there has been a discernible lack of commitment on the part of government to see to their success. In the face of increasing population, declining dietary energy consumption and reduced yields for most commodities, the reduction in public sector funding to agriculture has been quite telling. Successful formulation and implementation will depend on pluralistic involvement of all stakeholders. In this regard, the current initiative by government, albeit with donor nudging, to review the national food policy with full participation of stakeholders is a step in the right direction.

How effective the emanating policy proves to be is dependent on the degree to which stakeholder consensus is built to address the mentioned constraints and contradictions. Some of the policies that never sought consensus adequately have not taken effect in the realization of their original objectives even to date. These include the role of the NCPB, Kenya Seed company, Agricultural Development Corporation and the Agricultural Finance Corporation in food security.

### **3.10 Agricultural Institutional Development**

Kenya has for a long time had a weak institutional framework for agricultural development. Indeed, most of the acts and legislation governing the sector were enacted either before or immediately after independence and were meant to cushion the colonial export farmer or the policy making African elite to whom most of the large sector farms were transferred (Argwings-Kodhek 2000). As a result, despite the various impressive policy pronouncements since independence, the performance of the sector has been unsatisfactory. The rules governing agricultural production in the predominantly small-scale sector were inadequate and sometimes contradictory to facilitate a coherent development of the sector. Further these policies have not been keeping pace with the demands of latter day liberalized market economy. Recently, there have been efforts to review, harmonize or rewrite the various pieces of legislation governing the sector. This, it is envisaged, will remove ambiguity and contradictions in the institutional framework and empower more stakeholder and private sector participation in development initiative. This is an uphill task as there are over 130 pieces of legislation or acts governing the sector, and all requiring substantial stakeholder input in the review process.

The challenge here has been, and still is, forging broad based consensus for managing the transition from a controlled to a liberalized economy. The capacity within and outside government to effectively manage this transition and mobilize the stakeholders in the reform process will be key to the success of these reforms and effective institutional development. So far the process has been painstakingly slow and expensive leaving loopholes that allow ad hoc subsidies that are sometimes politically influenced ending up in creating dependency and laziness among the citizens.

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### **3.11 Regional Integration and Agricultural Production**

Kenya's economic cooperation at the regional level currently revolves around the Common Market for Eastern and Southern Africa (COMESA), East African Cooperation (EAC) and the Inter Government Authority on Development (IGAD). The country is also signatory to the Abuja treaty on African Economic Cooperation for the eventual establishment of an African Economic Community. COMESA and EAC are regional initiatives, which will have direct economic impact on Kenya's development. Both work towards the creation of a single market with harmonized taxation and customs duty and tariffs. Differential implementation of tariffs has been noted to distort production in Kenya, where local taxes and duties put domestic products uncompetitive.

The preferential regional market offered by COMESA has seen impressive export growth since 1993. It is however worth noting that most of the growth within this COMESA arrangement was attributable to the Export Support Programme (EPPO) which provides duty exemptions to imported inputs for the production of exports and duty free goods for domestic markets. There is a possibility this might suffer as a consequence of tariffs and duty reductions by the partner states as the EPPO has been a major incentive to this trade (Glenday and Ndii 1999). Already, the implementation of COMESA tariff rates are at variance with the relatively higher rates within Kenya and are creating dissatisfaction as goods from other COMESA countries enjoy what is considered unfair concessions. The outcry in the sugar and wheat sub-sectors is a case in point. Production efficiencies coupled with judicious tariff reductions will be needed to foster competitiveness.

The EAC treaty signed in October 1999 was expected to consolidate the gains made in the facilitation of regional trade by facilitating access to wider markets that in turn enable the exploitation of economies of scale and attraction of foreign investment. However, success would only be realized if Kenya maintained a competitive edge considering that the three countries offer more or less the same product range into the international market. This has so far not happened but if it were to happen, production efficiency in the Kenyan economy coupled with streamlining of tariffs will definitely be necessary for continued survival.

### **3.12 Government Initiatives Towards Irrigation in Kenya**

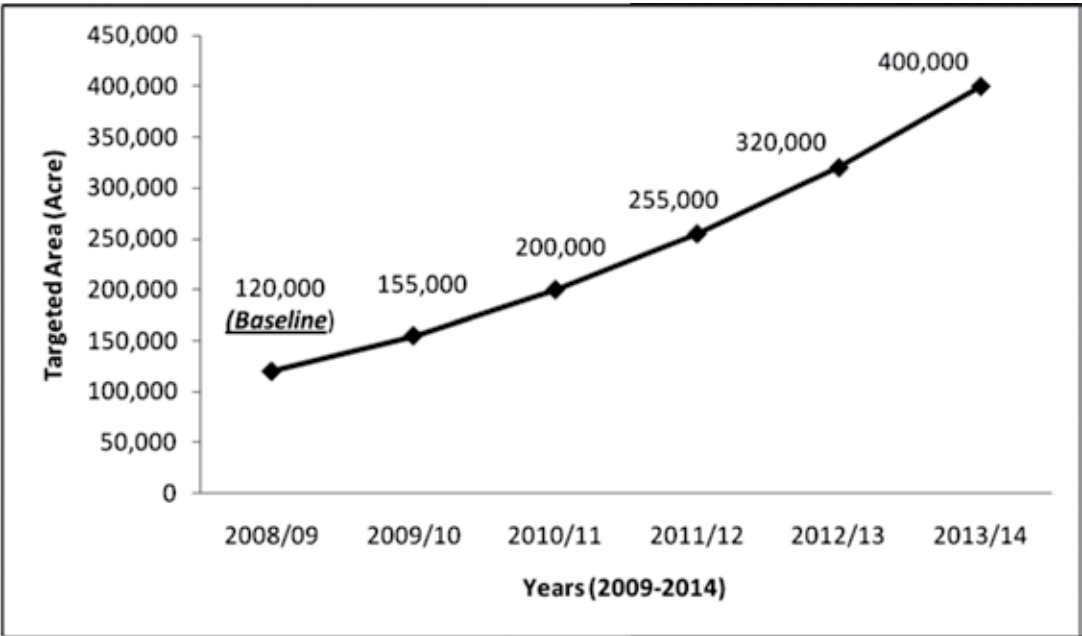
As a result of declining, little or no rainfall in most parts of the country, the country has a challenge to deal with a looming food crisis. In this pursuit, the Government has highlighted various interventions. The country's blue print, Vision 2030, has recognized irrigation as a key sector to spear-head economic development for the next 20 years through full exploitation of irrigation and drainage potentials in the country which is standing at 1.3 million hectares.

Food production in the country has been declining in the recent past and that of maize rock-bottomed in 2008 to about 26 million bags, some 10 to 12 million bags short of the national consumption. This was occasioned by declining, little or no rainfall in most parts of the country and the Post Election Violence (PEV) of 2007/08 (refer to my earlier comments). By 2009, the country faced a looming food crisis of major proportions. Due to

the strategic importance of the maize crop as security crop, the government was pricked on the need to enhance its production under irrigation, and thus the birth of the National Economic Stimulus Project on food production under irrigation. The programme addresses challenges in other sectors too, so as to balance on the effects of food insecurity.

For the ESP to counter the looming food crisis, the government undertook an emergency strategy to put additional 35,550 acres under irrigation. This effort led to the establishment of food production systems under irrigation starting with Hola and Bura irrigation schemes. The target projections for the production of Maize and rice under irrigation in the first phase were 14,600 acres of maize and 20,950 acres of rice, with expected revenue of Ksh. 912,500,000 and Ksh. 1,885,500,000 respectively. Achievements however, were way off the mark especially that of maize which realized only 40% of the target production and 27% of expected revenue. Rice performance was fairly good; achieving 10% above the target production and 84% of the anticipated revenue. When these achievements are taken into account, we get the picture that the government is being too ambitious in its projection. At the same time coordination among the parties steering the Vision 2030 failed to share with the ESP implementing agencies for possible harmonization of the targets and objectives in the light of available resources.

Figure5: Projected Area for Expansion of Irrigated Land (2009-2014)



Source: ESP Project Document

The government of Kenya proposes to increase the area under irrigation by 56,000 ha per year from the current 120,000 ha to 400,000 ha in 5 years as shown in the figure above. This target is higher than the Vision 2030 of increasing the area under irrigation by 32,000 ha per year to 300,000 by 2012. This is an ambitious project which whose success remains questionable. The history of expansion of irrigation schemes managed by the

government is riddled with failures and stagnation over the years (figure 5).. Between 1985 and 2005, the nationally managed schemes grew by 25% compared to the private farms and the Smallholder schemes which grew by 100% and 167% respectively over the same period.

To achieve the target therefore as shown in figure 5 above, a number of assumptions have to be born in mind including the probability that the water resource will not pose constraints despite the glaring climate change effects. Effective coordination and concerted efforts from the government, beneficiaries and other stakeholders will come by concurrently with adoption different approaches of doing business accompanied with modern technology. Key issues of funding and improvement on timely release of the funds will need to be addressed. Government officials have not been entirely transparent in their operations where accusations of corruption have been quite frequent. For the success of this ambitious programme, farmers' concerns need to be addressed through stakeholder management committees where the farmers are adequately and effectively represented. These are issues to do with scheme management, land allocation and use, marketing and payments. Land tenure issues need to be addressed concurrently to create an environment conducive to private investments and natural resource management.

Diminishing extension staff numbers will have to be supplemented from private advisory service provision domains to ensure that management of irrigation schemes is not perceived as an ordinary activity. The current staff to farmer ratio stands at 1:400 contrary to the FAO recommended ration of 1:200. This remains a big task for the ministry. There is also the issue of the high cost of inputs within the schemes which should be addressed to ensure that farming within the schemes remain profitable and attractive to the farmer. The other issue is the huge amount of water needed for the achievement of the targets and the diminishing water in the current schemes. The main challenge facing Mwea irrigation scheme and small-holder farmers around the scheme is water scarcity and the absence of a strategy for sharing the resource.

Unless these, among other issues, are adequately addressed, the ESP, as noble as it sounds is bound to fail.

### **3.13 Growth of irrigation in Kenya**

The growth of irrigation in the country has been slow owing to the fact that the investment cost is high and the fact that food commodities could be easily accessed from the so call grain basket regions. Equally true, not all communities viewed grain commodities as staple food, centrally to the prevailing dependence of the grain as a major source of food.

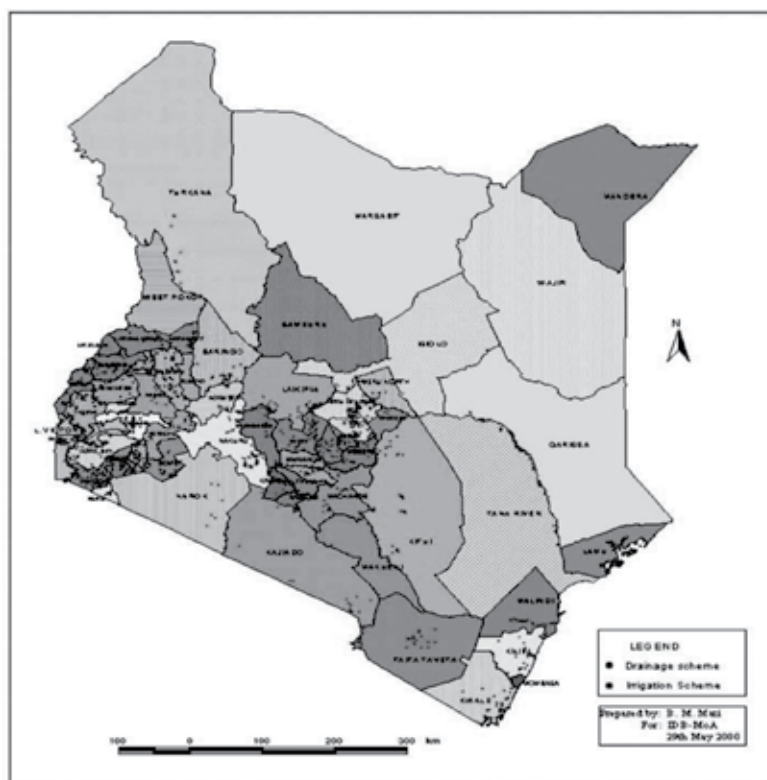
Influence of climate change has posed limitations to crop performance forcing the Kenyans to explore the opportunities in production under irrigation. Table 8 below gives an indication of the areas that are soon going to be under irrigation given the present demand for more land under cultivation.

**Table: 8: Irrigation Potential In Kenya**

Basin	Irrigation Potential (Ha)
Tana	205,000
Athi	40,000
Lake Victoria	200,000
Kerio Valley	64,000
Ewaso Ngiro	30,000
Total	539,000

*Source: NIB Strategic Plan, 2008-13*

Although, all the schemes managed by the government agencies have resumed cropping covering some reasonable proportion of the land available, most of them have had very severe problems in the past. These severe problems were mostly experienced in the late 1980s and early 1990s when most schemes ground to a halt due to complaints and uprising by farmers against the management of their schemes by NIB. Mwea farmers for example, kicked out NIB from its schemes and serious riots were experienced that led to some deaths and low productivity immediately after. This affected other schemes to an extent of closing down because the NIB became insolvent. Majority of these schemes are located in relatively good potential regions as shown in figure 5 below but because of the culture of dependence, there were no initiatives to restart until the government had to intervene once again.

**Figure 6: Location of smallholder irrigation & Drainage Schemes in Kenya**

Data available from the year 2001 indicates improved performance in some public schemes of schemes as tabulated in table 9 below:

**Table 9: Performance of the Public Irrigation Schemes, (2001 to 2009)**

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09*
<b>1. Mwea</b>							
Hectares cropped (ha)	15,800	10,000	10,000	10,332	8,325	7,806	7,431.0
Number of plots-holders	3,200	3,400	5,400	5,400	7,267	7,257	4,936
Paddy yields (Tonnes)	35,550	46,875	59,520	57,422	51,458	38,560	32,406
Gross value of output (Ksh millions)	889	1,250	1,786	1,775	1,544	2,121	1,782
Payments to Plot-holders (Ksh million)	573	0	1,066	1,009	919	1,450	1,341
<b>2. Ahero</b>							
Hectares cropped	100	200	219	956	623	0	1,568
Number of plots-holders	70	519	527	557	553	553	559
Paddy yields (Tonnes)	225	750	741	3,779	851	0	2,939
Gross value of output (Ksh millions)	4	20	22	102	29	0	103
Payments to Plot-holders (Ksh millions)	2	0	11.70	46	8	0	-
<b>3. Perkerra</b>							
Hectares cropped	515	300		652.00	527	1,941	579
Number of plots-holders	201	495		609.0	686	863	686
Seed maize (Tonnes)	0	1,321.00		2,898.0	1,946	2,674	1,720
Gross value of output (Ksh millions)	25	42		110.0	69	103	11
Payments to Plot-holders (Ksh millions)	18	28		54.0	40	75	-
<b>4. Bunyala</b>							
Hectares cropped	-		2,163.00	316	623	236	534
Number of plots-holders	134	134	133	163	133	134	133
Paddy yields (Tonnes)	-	-	1,068	1,010	682	567	1,161
Gross value of output (Ksh millions)	-	-	32.00	28	23	11	36
Payments to Plot-holders (Ksh millions)	-	-	16.00	16	14	4	-
<b>5. West Kano</b>							
Hectares cropped	-	-	396.4	245.0	233	1,000	714
Number of plots-holders	693	600	600	600	813	772	780
Paddy yields (Tonnes)	-	-	1,348	774	124	938	692
Gross value of output (Ksh millions)	-	-	-	40.40	21	8	28
	-	-	-	21.40	5	0 3	-



Payments to Plot-holders (Ksh millions)

**All Schemes**

Hectares Cropped							
16,415	10,580	10,832	12,501	9,626	9,092	10,072	
Number of plots-holders	3,713	5,014	6,660	7,329	8,766	8,716	8,931
Paddy yields (Tonnes)	35,775	47,625	62,677	62,985	53,115	40,065	37,198
Gross value of output (Ksh millions)	918	1,312	1,881	2,037	1,604	2,160	2,097
Payments to Plot-holders (Ksh millions)	593	881	1,115	1,131	941	1,457	1,535

*Source: National Irrigation Board and Kenya National Bureau of Statistics*

*\* Provisional.*

The period between 2002 and 2005 was the worst time for the national irrigation schemes as most of them were forced to close down due to a lack of funding and management problems. During this time, no production at all was carried out in Bunyala and West Kano Schemes. Limited production was carried out in Ahero and Perkerra schemes, where production in Ahero, for example, declined to about one third the 2001 production.

For quite some years, the irrigation schemes have been a department in the Ministry of Agriculture and ran like any other Government department; characterized by poor funds allocation and low budget absorption levels. Weak farmer-based institutions and low extension-worker support fueled below average outputs from these schemes.

Research activities for the rice had been neglected for some times and what was available was usage of the out-dated farming methods and recycled seed varieties. This, coupled with poor land tenure were huge challenges for the schemes to survive and hence their downfall. Lack of crop diversifications aggravated the crisis in some schemes. Over dependency on mono crop resulted to disease infestation and sometimes lack of food crops forcing farmer to move out of the schemes for alternatives.

The increment of the number of plots seems to causing decrease in yields. This is probably because of operations on too small plots that do not generate break even yields or marketable produce. The payment to plot owners however seem to be increasing despite the decrease in yields, meaning that the schemes would have done much better if yields trends were kept at an increasing trend. This would only be achieved if soil fertility management was given priority and use of improved inputs besides reducing post harvest losses. Payment to plot owners increasing is not a real indicator of success since could come about as a result of adulterations of the produce or over pricing of the rice which normally does not promote competitiveness.

With the advent of the National Rainbow Coalition (NARC) government in 2003, plans to address the challenges in the public irrigation schemes, and lay strategies to reverse the situation were mooted. These strategies included the improvement of the irrigation and drainage infrastructure, rehabilitation and improvement on the operational and maintenance services. Efficient water utilization was also another strategy to improve service provision in the schemes.

Despite these good intentions, nothing much has been achieved and the public schemes remain inefficient in the utilization of available water and management/governance problems run deep in most of these them.

The growth of the public schemes has not shown a stable growth trend, remaining at an average of 11,000 ha over the last 8 years; some years operating at about 9000 hectares. In 1985, the public managed schemes had some 12,000ha which increased to about 16415,000 ha 2002, an increase of 38%. By comparison, the privately managed schemes were at 22,000 ha while the Smallholder schemes had 18,000 ha. By 2005, these latter groups had increased their acreages by a whopping 100% and 167%, respectively. This may help to caution the public schemes of effects of rigid in decision making and lack of freedom to take risk in farm business development.

This poor performance by the public schemes can be attributed to poor governance which is manifested in lack of participation of beneficiaries in the decision-making process. The public irrigation schemes disempowered the farmers to the extent that they have no say in how their farming affairs are managed or even what crops to produce.

The opposite may be attributed to the splendid performance of the private farms and the Smallholder schemes. For the Smallholder sector, management is participatory with contributory cost-sharing. The farmers know what they expect from their investment in the schemes and who is supposed to do what. They therefore put maximum effort in their work and in turn the financiers help secure credit and help in marketing of their produce. Crop choice is diversified and farmers take full advantage of this freedom to grow the most profitable crops. The same applies to the private schemes where profit is the driving force behind their quest for success.

### **3.14 Public funding to the sector**

In real terms, public spending on agriculture in Kenya fell dramatically—by about half—from its peak in the late 1980s to the late 1990s since the year 2000, total public spending on agriculture has not exceeded 5% of the national budget. Reference to the present allocation projections (MTEF -2011/12 – 2013/14) indicate that the allocation may not be more than 5% in the next 3 years. For, the necessary investment to be put in place, sufficient allocation of public funds is the starting point. It was recommended and even a commitment signed to raise funds allocation to the sector to 10% in the Maputo Declaration of 2003 The declaration projection mirrors the emphasis on industry-led growth in Kenya's current development strategy, but not much has been done. The reason for this appears to be the recurrent food deficits that make the government to reallocate funds to importation of emergence food reliefs. The laws and

regulations under which the agricultural sector operates are administered by different departments and ministries creating unfavorable institutional framework for that cannot favour partnerships in sectoral investments. For instance, the ESP Irrigation component funds are scattered across the various ministries with little or no effective coordination of the activity implementation. All the ministries involved in the implementation of ESP projects (i.e. MoA, MoWI, MoED, MoLG) have the same objective; to increase the food productivity. This is likely to, and has actually, brought about duplication in the ESP. The delays in target achievements experienced in different project works were mainly due to difficulties in the coordination across the different ministries.

#### **4.0 CLIMATIC CHANGES AND AGRICULTURE**

Climate change is an effect of global warming that is manifesting itself in many ways including changing precipitation patterns, speed of wind, temperature differentials on both water and land surfaces, crop production conditions that are influenced by altitudinal limits characteristic of agro ecological zones that in turn are defined in relation to the rainfall and temperature patterns and ability to support farm productivity.

Areas with marginal production conditions are termed as unsuitable to specific crop varieties and types. Continued crop production in these areas will always result into yields below optimum levels. With the looming climate change and its effects it is expected that the marginality status will increase in a number of production zones rendering poor performance of crops and other agricultural enterprises. Deterioration of the critical conditions that support crop/plant growth especially with the increasing human activity on the environment will, in the long run, put off production of some crops in a number of production zones.

Challenges to reduce the rate of deterioration resulting from low soil fertility, increasing pests and diseases and soil erosion are already experienced through recurring food insecurity among a majority of Kenyans and many other countries in the world. Studies have shown that the number of hungry people in the world is estimated to be more than one billion (Climate Change and Food Security, FAO). To reduce the rate at which the natural productive resources are deteriorating, the users need to practice good agricultural practices including Land and water resource management, control and conservation, continuous monitoring of the impacts of climate change on land and food production, involvement of the rural population through creating links between producers and consumers, reviewing the existing tenure systems to suit smallholder production needs, available and affordable technological options, institutional interactions and planning efficiency.

Expansion of irrigation areas may come with diversification opportunities but it should not be seen as a solution to food insecurity until suitable crops varieties and the underlying technologies are selected for adaptation bearing in mind that the land resource should be put to compatible uses that ensure minimum inference to biodiversity and the ecosystems at large.

Similarly, changes to the earth's climate have direct effect on the global hydrological

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cycle hence on water. Climatic change adds another challenge to the world food supply systems and in part responsible for the many parts of the world already facing serious deterioration of production systems and the number of hungry people increasing to the present estimate of more than one billion (Climate Change and Food Security, FAO). Drastic improvements and concerted efforts globally are therefore of paramount necessity in the way we manage and utilize our natural resources. The present experience of about 90 per cent of all natural disasters afflicting the world being related to severe weather and extreme climate change events provides a comprehensive testimony of climatic change being one of the most serious threats to sustainable development globally. It is estimated that the impacts of the climatic changes will affect all the sectors in the country thereby requiring substantial investments and action to adapt agriculture, forestry and fisheries to climate change challenges to ensure food security and generally securing of livelihoods.

It has been observed that at least 20-25 years of exposing the land surface to the sun rays raises average temperatures by 1°C that is equivalent to 75- 100m rise of the longitudinal limit. This limit is lower for land surfaces that are under the forest canopies in most of the time. Changes in longitudinal limits are normally felt through the expansion of the lower production (marginal) zones and losing the higher (high potential) production zones (Jaetzold, Berthold and Shisanya, *Farm Management Handbook of Kenya, 2nd edition 2007*).

#### 4.1 Drought Conditions and Their Effects on Economic Development in Kenya

Monitoring of the frequency of dry conditions is an indicator of climatic change. This has been tabulated over a period of 123 years and summarized in the table below:

**Table 10: Frequency of Drought Occurrence in Kenya**

Year	Regions Affected	Year	Regions Affected	Year	Regions Affected	Population of livelihoods threatened
1883	Coast	1933-1934	Coast, Kikuyu Lands	1997	Countrywide	2 million
1889-1890	Coast	1942-1944	Kenya, Uganda	2000	Countrywide	4 million
1894-1895	Coast	1947-1950	Kikuyu Lands, coast	2004	Countrywide	2.3 million
1896-1900	Extended over most of East Africa	1952-1955	Kitui and other districts	2005	North Kenya	2.5 million

1907-1911	Lake Victoria area, Machakos, Kitui, coast	1969-1961	Maasai Lands, Machakos Kitui, Rift Valley	2008	Countrywide	4 million
1913-1919	Ethiopia, Kamba Lands, coast	1981	Eastern Province	2009	Countrywide	4 million
1921	Coast	1983	Coast, Kitui, Machakos, Kakamega, Nyanza.			
1925	Kerio Valley, coast	1984	Kenya			

Source: Compiled from different documents<sup>2</sup>

Reference to the historical management practices, the colonial government created district based betterment schemes that cushioned crop and livestock producers against the severe drought conditions. These included water supply systems, grazing land schemes and irrigation systems (*MoA, Animal Husbandry and Water resources, African Land Development in Kenya, 1946- 1962.*)

A close look at the drought frequency (Table 10) above, the frequency of drought in the 19th and 20th centuries used to be experienced in some parts of the country. In the early 1900, droughts were experienced on a 10-year interval, which reduced to 5 years in the mid/late 1990s and to 2-3 years in recent times. The floods have been more frequent, appearing more than once per since 1982.

Furthermore, in the 21st century, the trend of drought occurrence seems to be covering the entire country raising predictions that Kenya is already experiencing climate change effects are most likely to be more severe in the future. This is further qualified by floods that are becoming more frequent and more severe, changing precipitation patterns and the *el-nino* phenomena.

This observation may be used with certainty to project Kenya's economic growth for two main reasons. First, the economy is heavily dependent on climate-sensitive sectors and sub sectors, such as Agriculture, Fisheries and tourism. Secondly, the means to cope with climate hazards is weak and unrealized among majority of players in these sectors yet. Already, changing climate conditions are responsible for the melting of glaciers on Mt.

<sup>2</sup> e.g. Droughts in Kenya; Climate, Economic and Socio-Political Factors by Dr. Serge T. Kandji, among others.

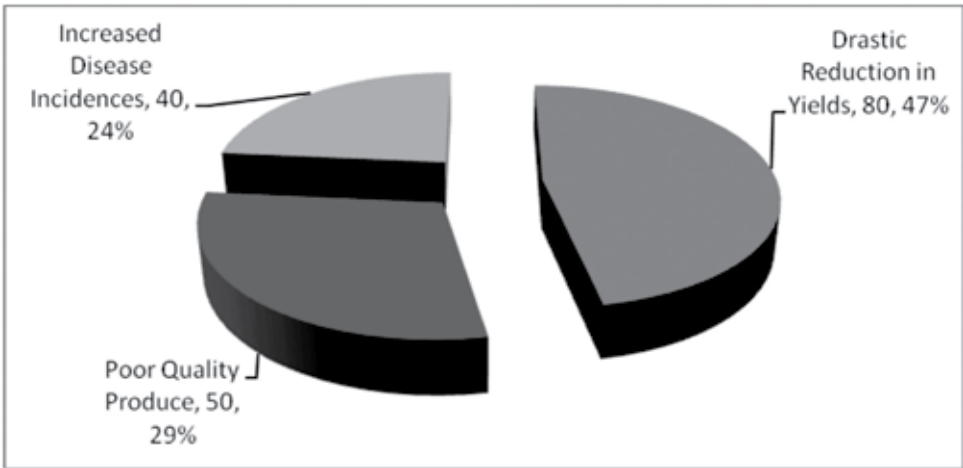
<sup>3</sup> Floods occurrence: 1925, 1937, 1947, 1951, 1957, 1958, 1961, 1962, 1978

Kenya, which in 1900 had 18 glaciers but now has only 7. This explains the decline in water levels in Athi and Tana Rivers and subsequent interruption in electricity generation.

Agriculture is one of the sectors faced with huge challenges by the direct climate changes. This is due to the fact that it has to ensure the food security that copes with an increasing number people expected to reach 9.1 billion by 2050 in the world. Meeting the demand of this ever growing population will put enormous pressure on the agriculture, forestry and fisheries, Livestock production subsectors to provide food, feed and fibre as well as income and poverty alleviation. These sectors therefore, must also respond to the challenges of climatic change in good time armed with the right strategies.

Climatic change affects all the four dimensions of food security . Namely: Availability, supply, accessibility and ability to utilize. Availability here in the context of food not being within reach by those in need whereas supply would refer to the suppliers getting biased to markets that pay a premium for the commodities supplied leaving out those whose purchasing power is low. On the other hand, one accesses food stuffs after having possibly sold non food items to pay for the nutritionally fit food stuff otherwise accessing unpalatable food may be as good as no access at all. Kenyan relief food suppliers have experienced maize supplied being exchanged with rice on their face.

**Figure7: Challenges of Climate change effects and other factors in the ESP rice projects**



<sup>4</sup> Food availability, food supply, food accessibility and ability of consumers to utilize food.

Source: Survey Data

Farmers highlighted drastic reduction in yields as one of the major climate change effects facing irrigation agriculture. However, even before the effects of climate change effects started being experienced, the yields weren't attractive enough due to non use of fertilizer and inadequacy of water, post harvest losses and diseases have also been reported as culprits to low saleable grain from the rice schemes as may shown in figure 6 above. Poor quality of produce was cited at 29% while the disease incidence was

recorded at 24%, attributed to climatic changes..

## **5.0 FIELD FINDINGS OF THE STUDY**

The field findings covered may not exhaustively cover all that happens or has happened but areas that catch the eye on visiting those schemes for the first time. This include: Challenges, gender bias, inappropriateness of the legal environment, budgetary allocations and the general profiles of the public irrigation schemes as elaborated below:

### **5.1 Challenges**

Interviews conducted among smallholder farmers revealed that challenges facing their schemes can be categorized into: Inadequacy of resources, Governance, High farm input prices, Infrastructure, Non supportive land tenure systems, Lack of effective farmers' organizational structures and Low technology adoption. A close look into these challenges disclosed details as follows:

1. Inadequate resources: Inadequacy of water, Infrastructure, land tenure systems and credit facilities rated high as factors curtailing production and productivity among farmers. These are factors whose availability cannot be influenced by individual farmers but the government. The farmers can only be held responsible for efficient use of these resources once availed.
2. Low technology adoptions, poor adoption of technologies are related to farmer empowerment that could only come about if production under contracts would be induced into the scheme production systems. The beginning point would be building the capacity of farmers and strengthening farmer managed systems this, in planning, value addition and marketing of farm produce. Besides an appropriate legal framework on natural resource conservation, soil fertility management, irrigation and practices thereof has to be in place.
3. Research and extension services were noted as another factor that need attention. This constraint automatically be attended to once the farmers get empowered enough since they can source services from private sector advisory services.

The crucial factors for NIB managed schemes comprise the need for a consistent implementation of the present reform plans and effective cooperation between NIB management and farmers. Prioritization of the activities being implemented with involvement of the farmers at planning stages would solve the conflicts between farmers and the NIB noted as a recurring problem. Some of the ways to address these conflicts is to allow farmers to have provisional land-use rights and help in building their capacities to play a participatory managerial role in activities affecting production. There is also the need to address the persistent bottlenecks of pump-supplied water in the NIB managed schemes; the financial sustainability of the schemes and the cost of maintain the pumps should be considered for long term purposes. It will be necessary also to address the declining level of waters that supply the entire schemes through creating awareness on the effects of climate change on water availability. This can be extended to ways of coping with the expected further reduction of water and deterioration of the environment due

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to floods, erosion, and agro-mining among others.

## **5.2 Bias to Gender and the Resource Poor**

Another key finding of the study was the gender issues in the management of irrigation water. Gates to most of these schemes are operated in some cases at night. Women expressed concern that this unholy hour is disadvantageous to their welfare and therefore a form of discrimination against them. There were also issues of favoritism by the Water Users Association (WUA) in their water sharing where men agitate to get water before women. This is happening more in the Ahero irrigation Scheme. The cost for registering as a member in some schemes is exorbitant; about Kshs.5, 000 which according to the SSI was too high and untenable. This requirement ends up locking out many households from accessing irrigation water.

## **5.3 Inappropriateness of the legal environment**

Stakeholdership, coordination and governance were noted to be thriving because of lack of clarity and contradictions posed by legislations some of which are too outdated to support modern management and coordination systems. There are over 130 pieces of legislation, all touching on agriculture and sometimes overlapping in their execution. There is need to revise them and consolidate for ease of implementation. For instance, in irrigation sector, about 100 laws and legislations have a bearing on irrigation and are fragmented and dispersed in several sectors. These laws do not take into account all the key issues related to the irrigation sector. The lack of a comprehensive legal framework has made the administration and regulation of public, smallholder and private irrigation schemes difficult and problematic, especially after the liberalization of the economy. There is therefore need to harmonize some of these legislations and repeal the Irrigation Act (cap 347), to provide for legal and new institutional arrangements, which will support a modern, well-coordinated, multi-sectoral and multi-stakeholder involvement in the sector for sustainable growth and improved performance.

## **5.4 Budgetary Allocations**

Due to low budgetary allocation to the sector ministries in the 1990s, as a result of the SAPs, there has been a decline in the provision of extension services which has impacted negatively on the agriculture sector, including irrigation. Low budgetary allocations have directly or indirectly limited the use of modern science and technology coupled with the small sizes of farms which do not allow for mechanization. Little care for soil and water management practices which are commonly associated with increased water transmission (absolute yield of blue water per unit rainfall), improved water quality, buffering of floods reduced sedimentation of reservoirs and waterways and soil salinity have also contributed to low productivity in the schemes. These are technical areas that need to be addressed as part of the extension service agenda.

Many PES schemes have focused on upstream forests to provide the buffer effect. Even though, the existing forests and the present rate of encroachment may not deliver for long. The government policy on 10% agro-forestry per piece of land under cultivation



has to be given immediate support through extension services to enhance the establishment of buffer zones and ultimately help to moderate the effects of climate change and equally create a desired environmental for agricultural and pastoral activities. This approach requires adequate capacity building and budgetary support.

## **5.5 The Public Irrigation Schemes Profiles**

### **a) Mwea Irrigation Scheme**

Mwea is the largest irrigation scheme in the country situated about 100 Kms North East of Nairobi in Kirinyaga district, Central Province. It is on the plains to the south of Mount Kenya, with an elevation of 1,159 m above sea level. The scheme forms part of the lower midland zone characterized with a bimodal rainfall regime of above average reliability and capable of supporting growth of a wide range of crops.

Farming in the scheme started in 1956 when the colonial government established a number of irrigation scheme including Hola, Perkera, Ishiara and Yatta under the African Land Development Unit (ALDEV). Initially, the scheme took advantage of cheap labour from *mau-mau* detainees under Mwea detention camp and with time the detainees were settled in the scheme.

The land tenure in the scheme is by tenancy arrangements where the land is held under trust deed by the government through NIB. In this case, every farmer owns an average of four acres. The reason for holding the land under trust deeds is to prevent land fragmentations which have been witnessed to reduce economical productive units meaningless parcel sizes congested with housing structures.

The scheme covers a land area of 30,350 acres out of which 16,000 acres (i.e. 53%) are developed for paddy production, leaving the rest for horticultural & food production and human settlement. The scheme grows paddy as its dominant crop once a year during the short rains period and supports close to 3,400 persons both directly and indirectly.

Following liberalization and economic reforms, farmers in the scheme rebelled against the NIB citing exploitation in 1998, resulting in the farmers delivering their paddy to their cooperative (Mwea Rice Growers Multi-purpose Cooperative Society). This paralyzed the operations of the NIB and services could not be rendered to the scheme as the cooperative too over the management.

It was during this period that the irrigable area of the scheme was expanded by about 4,000 acres resulting in serious water shortages. The management lacked skilled personnel, finance and machinery to maintain and manage the scheme, leading to neglect and an almost total collapse.

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<sup>5</sup> October to November

<sup>6</sup> NIB Strategic Plan, 2008-13

The management was reverted to NIB until today with specific responsibilities of:-

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maintaining the schemes' water delivery structures, coordination of irrigation activities, capacity building among the scheme operators and taking custody of land tenure trustee aspects in some schemes and maintaining the planting calendar.

Currently, the scheme is being run by National Irrigation Board (NIB), and the farmers Organizations, mainly the Water Users Association (WUA). NIB is responsible for all the main infrastructure, water management in the main and secondary canals, management of cropping program and land administration in the scheme. The WUA is responsible for water management in the tertiary unit, facility maintenance in the tertiary units except roads and farmers payment of Operations and Maintenance (O&M) fee. Marketing of rice is open for farmers to decide where to sell but farmers' society, the National Cereal and Produce Board (NCPB) are presently the main players in the buying of the cereals in country. At the moment farmers do not have a stable credit provider since their savings and credit society collapsed. Other constraints that directly affect productivity in the scheme include:-Poor access roads and water regulation and distribution structures, Low technical and managerial skill among the technicians, depleted soil fertility responsible for poor yields, and insufficient water.

### **Mwea Irrigation Agricultural Development (MIAD) Centre**

The centre, envisioned to be the leading institution in the development of efficient agricultural irrigation and drainage technology in Kenya, was started in 1996 under a technical cooperation agreement between GOK and the government of Japan. The centre is charged with conducting irrigated agricultural research and training (probably the consumers of research findings), development and transfer of technologies for sustainable exploitation of available irrigation and drainage potential.

Despite the existence of the centre and its rightly documented vision and TOR, it has been established that rice yields have been declining over the years ( see figure .....because of nutrient exhaustion resulting from agro-mining, seed recycling for many seasons and absence of cultural practices like fallowing and crop rotation. On the other hand, water bone diseases (Typhoid, Bilharzia and malaria) affecting the rice producers have been blamed for draining the cash obtained from rice, leading to inability to afford improved inputs. This scenario has kept producers in a vicious cycle of poverty for many years with MIAD centre, much in place and promising to be a leading institution in technology development to be achieved through it objectives namely:

1. To conduct research with a view to increase crop yields and quality.
2. Develop technology to increase utilization of available resources through crop intensification and diversification
3. Conduct research with view to reduce various crop production costs
4. Increase water use efficiency
5. Search for ways and means of improving farmer's health
6. Capacity building in irrigated agricultural water management.

The centre, knowing that other more elaborate research centre exist in the country like KARI has completely no objective to collaborate but rather reinvent the wheel. For the centre to achieve the listed objectives, a good number of qualified personnel is required whereas that capacity is not there, raising doubt if this is not the cause of the noticeable vicious cycle of poverty among the producers.

The scheme recorded the highest production of 38,560 metric tons of paddy in 2008 but with the normal challenges related to variations of climatic conditions and inadequacy of water, production went down by 16% in the year 2009.

### **b) Ahero Irrigation Scheme**

The scheme is located on Kano plains in Western Kenya, Nyanza province. It started operating in 1969, with an area of 1,540 ha of which 58% was put to productive use. The scheme currently supports an estimated 553 farmers, each owning a maximum of 1.6 ha.

The scheme operations stalled in the 1999 cropping season due to depletion of the revolving funds. The Ministry of Agriculture and FAO revived the scheme through the Rapid Results Initiative (RRI) efforts following the donation of two new water pumps at a cost of Ksh 20 Million. The commissioning of the rehabilitated Ahero Irrigation Scheme was held on the July, 2005. The Ministry of Water and Irrigation funded the installation of two additional flood lift pumps at a cost of Ksh 25 million to enable the scheme extract irrigation water from Nyando river.

For sustainable, reliable, and cost effective provision of irrigation and drainage services in the scheme, the NIB has engaged consultant services to explore the possibility of gravity flow diversion and conveyance facilities. An expansion programme with a target of 500 acres is underway.

Inadequate funding and lack of a cost-effective water supply system (pumping v/s gravity) is the main challenge for irrigation and drainage development. Other challenges include; recurrent flood damages/effects, erosion, fluctuation of the volume of water in the source river Nyando), lack of water storage to guarantee adequate supply during the dry spell, poor road network, inadequate partnership in irrigation, little or no participation by other relevant stakeholders.

### **c) West Kano Irrigation Scheme**

Situated in Kano plains, the scheme was established in 1974. It covers an area of 1,780 ha with 892 ha developed and a potential to expand to 2,000 acres. The scheme was not operational between 1999 and 2003 due to conflicts between farmers and the NIB. Its low lying topography allows it to draw water from Lake Victoria through canals.

Revival of the scheme in the year 2003 started with phase I that put 1,158ha under rice production out of the total 2,229 acres, yielding 1,615 tons of paddy. The phase II cropping targeted the entire 2,229 acres, of which 915 acres had been cropped before production was suspended to allow for installation of the new pumps.

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Major challenges in this scheme include access to credit, pests and diseases, high water abstraction and distribution, situation and the receding water levels.

#### **d) Bunyala Irrigation Scheme**

It is the smallest public irrigation scheme covering only of 216 ha with 213 ha developed. The schemes operations like the rest of the public scheme were stalled in the 1999. It was revived in July 2004 when 80% of the 133 farmers were expected to be provided with water for irrigation.

The scheme became operational in October 2004 under the management of NIB. Through sustainable exploitation of available irrigation potential, NIB in 2005/06 FY started a scheme expansion programme where 32 ha in Muluwa and 56 ha in Munaka were developed and supplied with water. In the following FY, infrastructure to irrigate an additional 40 ha in Muluwa was developed.

An additional 40 ha in Muluwa were developed in 2007/08 FY bringing the total expanded area to 168 ha. The scheme has benefited as a result of the Government policy to support irrigation development as stipulated in the National Development Plan (2002 – 2008) and the Poverty Reduction Strategy Paper (PRSP) (2001 – 2004), through the provision of development funds for procurement of new pumps and expansion. NIB has also embarked on development and improvement of irrigation and drainage infrastructure for Rwabwa Mudembi irrigation scheme. In 2006/07 financial year, two pumps were installed to boost water supply to a targeted area of 100 Ha. Unfortunately, these expansions start without having to polish productivity of the already established scheme areas. This give false promises producers as productivity would still remain low with technological challenges persistent.

#### **e) Perkerra Irrigation Scheme**

Perkerra Irrigation Scheme is situated 100kms North of Nakuru near Margat Township in Baringo District. It derived its name from the Perkerra River, which is the source of irrigation water and the only permanent river in the District. The scheme is in ASAL area ecologically.

The construction of the scheme started in 1954 after several feasibility studies, which showed that the Jemp flats were suitable for Irrigation. During the colonial emergency period, the detainees provide labor for construction of the scheme infrastructure. It has a potential irrigable area of 2320 ha but due to irrigation water shortages only 600 ha of land is cropped annually through gravity furrow irrigation.

The Scheme assumed horticultural production from the onset and was a major source of onions, dried chillies, watermelon, pawpaws and cotton in the past. However due to the marketing problems of the above crops seed maize crop was introduced in 1996 as a diversification measure. The seed maize crop is planted under agreement with Kenya Seed Company (KSC). With this assured market, better and prompt payments, the seed maize crop became a turning point for crop production in the Scheme.

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The main challenge in the scheme is inadequate water to sustain the present area under irrigation and expansion to the remaining part of the scheme.

#### **f) Bura Irrigation Scheme**

The scheme is situated along the Tana river in Tana River County, Coast Province. It is 50km North of Hola Town about 400 km North-West of Mombasa Town. The construction of BISP started in 1978 and was funded by the World Bank, ODA, EEC, UNDP, Finnish Government, the Netherlands and the Government of Kenya. The Project was set up with the following objectives: To settle the landless persons and to cater for the unemployed or the under-employed persons in the area.

About 6,700 hectares were targeted to be opened up in Phase I and another 5,000 hectares in Phase II. Plans for improvement and rehabilitating the environment by planting trees to provide fuel wood and building materials for the scheme's population and its surroundings were also put in place.

In 2003, the scheme management changed hands from the Ministry of Agriculture to the Ministry of Water and Irrigation. These change saw revivals that grew maize to enable farmers attain a state of food self sufficiency. For this purpose, one pump was revived while seeds and fertilizer were acquired and distributed free of charge to farmers. In December 2005, the Scheme was put under the management of NIB.

Bura Irrigation Scheme is presently faced with a number of challenges including:

- Frequent breakdown of the pumping unit.
- Silted canals ringed with *prosopis Juliflora sp* (popularly known as Mathenge in the region) bush which has been a big menace in the region and an environmental threat too
- Weak co-operative and other farmer's organizations.
- Inability of the users to internalize the changes in management i.e. from direct government to NIB's policy of Participatory Irrigation Management (PIM).

These challenges have made the farmers not to planted a crop for 15 years (from 1990-2005). Similarly they didn't plant even the maize for subsistence for 9 years (1994-2002). This resulted in famine, increased poverty levels and unemployment for the Scheme farmers and community.

One would expect lack of initiatives since the community hosting the scheme is not a farming community as such but pastoralist. More so their staple is not maize but rice. For the scheme to succeed plans should have been made on how to get labour and questions on for whom to produce should have been answered before implementation.

The scheme is now put under seed maize production irrespective of the original objectives.

#### **g) Hola (Tana) Irrigation Scheme**

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Hola (Tana) Irrigation and Settlement Scheme is amongst the oldest NIB Schemes having been started in 1953 by the colonial Government as a holding camp for detainee labor. The Scheme is located in Tana River County in the Coast Province. Its gazetted land area is 4,800 ha but the already developed area for farming purpose is only 900ha. Irrigation in the scheme is through pump fed gravity flow. The Scheme has 700 farming families settled in 6 villages.

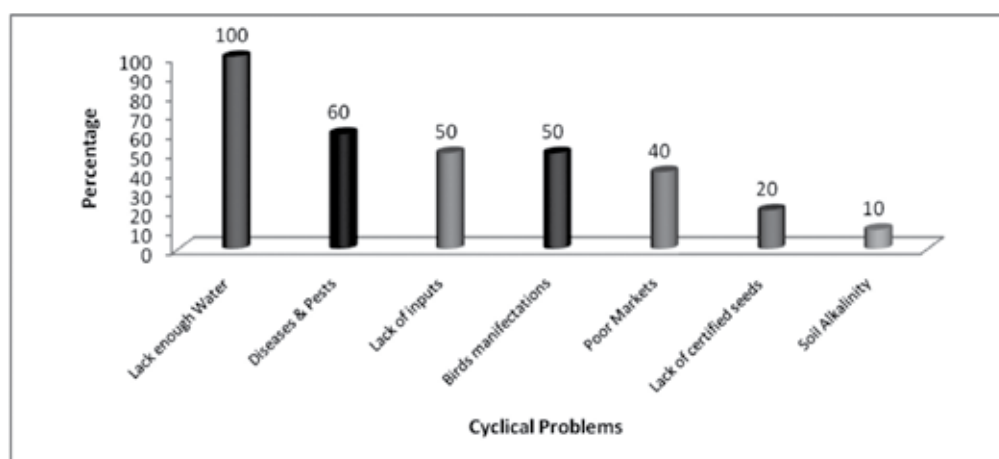
During the initial time main crop grown was cotton with other crops e.g. groundnuts, maize intercropped with cowpeas grown in small-scale as subsistence crops for farmers. Agricultural activities stopped way back in 1989 when river Tana naturally changed its course at the Laini water intake point thus leaving the scheme without water for irrigation.

Since 1989, the irrigation operations ground to a halt; all what remained was general maintenance of the NIB assets. Most of the farm families went gone back to their original homes. The entire Scheme infrastructure collapsed leaving behind a few structures which are in dilapidated condition.

Since 1990 when farming activities came to a standstill, the government has tried a number of measures in order to revive the scheme. The first step towards achieving this goal was realized when the government acquired funds from BADEA (An Arab Bank for Economic Development in Africa) to conduct a feasibility study for revival of the scheme (GIBBS 2003). After a successful feasibility study, the donor pledged to rehabilitate the scheme with funds in a tune of Ksh.500 million. This was to cover phase I of the rehabilitation programme, which focused on the earlier developed 900ha. There were further proposals to have the scheme expanded by developing an extra 2,500ha during the Phase II of the Schemes rehabilitation programme. Similarly plans are underway to consider developing gravity systems for the Scheme.

Generally, the schemes experienced almost similar constraints that, on average, can be represented as in figure 4.1 below:

**Figure 8: Weight of the cyclical constraints in the public managed schemes**



*Source: Survey Data*

## 6.0 ECONOMIC STIMULUS PROGRAMME (ESP) IN AGRICULTURE SECTOR.

The introduction of ESP was necessitated by the desire to cushion earmarked subsectors of the economy from the slump occasioned both by internal and external factors including the financial crisis and the rising high prices witnessed in 2008/09. The key objectives of the programme relevant to the agriculture sector are to:- boost the country's economic recovery and, return it back to the envisioned medium term growth path (10%), expand economic opportunities in rural areas for employment creation, promote regional development for equity and social stability, invest in the conservation of the environment and renewable energy and food Security (ESP hand book)

The ESP commenced implementation on July, 2009 with an expected completion date of 31st December, 2009 at an estimated total cost of Ksh 22 billion. By pumping such a huge amount of resources, the Government of Kenya aimed to revitalize the economy and set it back on the path of medium to long-term growth. As a high impact intensive programme, the ESP, was expected to stimulate economic activity at the local level by creating employment opportunities, spurring entrepreneurial activities and supporting the building blocks that anchor a healthy, educated populace.

In the Agriculture sector, the ESP was mooted by the Government with a major objective of increasing the availability and accessibility of maize and rice in order to enhance food security in the country. The other objective was to increase and stabilize the Strategic Grain Reserve (SGR) in the country. In the first phase the project focused on increasing the area under irrigation, through the rehabilitation of irrigation infrastructure. The expected output of all this was to increase employment opportunities in production, processing and marketing. The project was also expected to contribute to the reduction of the cost to consumers while enhancing the quality of the products consumed locally. The production projections against the budgetary allocations were given as in table 11 below:

**Table11: Target and achieved production and revenue in phase 1**

Crop	Target acres	Achieved Acres	% Achieved	Target production bags	Achieved Production -bags	% Achieved	Target revenue Ksh	Revenue achieved Ksh.	% Achieved
Maize	14,600	8686	59%	365,000	147,662	40%	912,500,000	251,025,400	28%
Rice	20,950	31750	152%	628,500	635,000	101%	1,885,500,000	1,587,500,000	84%
<b>Total</b>	<b>35,550</b>	<b>40,436</b>	<b>114%</b>	<b>993,500</b>	<b>782,662</b>	<b>79%</b>	<b>2,798,000,000</b>	<b>1,838,525,400</b>	<b>66%</b>

*Source: ERA, 2010 and Author's calculations.*

The target projections for the production of Maize and rice under irrigation in the first phase were 14,600 acres of maize and 20,950 acres of rice, with expected revenue of Ksh. 912,500,000 and Ksh. 1,885,500,000 respectively. Achievements however, were way off the mark especially that of maize which realized only 40% of the target production and 28% of expected revenue. Rice performance was fairly on target achieving only 1% above the targeted production and 84% of the anticipated revenue. Implementation of various projects under the programme started late due to the need for consultants on

the implementation framework. In addition to the money allocated to crop production projects, Ksh 11.4 billion was released for the expansion of fish farming and supporting livelihood in ASAL areas. These allocations put together forms a big fund, much higher than the total allocation to the MoWI in 2008/09 FY( Ksh 14.44 billion). The 1st phase allocation of Ksh 2 billion was disbursed to various implementing institutions with MoA receiving 12%, NYS 16%, TARDA 32% and NIB 40% (*ESP programme document*). The main criterion for disbursement was the proportion of the land size that was to be put under irrigation. Preliminary calculations and comparisons with the costs incurred by smallholder schemes showed a cost difference of only Ksh 100, 000 since the smallholder cost were estimated to be Ksh 170,000/acre.

Never the less, usage of government machinery and personnel should have made the public irrigation cost to be much lower that shown compared to smallholder schemes. Supply of inputs following government procedures is a little complicated as it has to be done through tendering. This increased the cost per acre to about Ksh 200,000 in some schemes. With this amount of money, the public irrigation schemes should be as efficient as the Smallholder schemes who allocate almost the same budget. The truth, however, is that public schemes still run at losses, thus calling to question the wisdom, or rationale, of channeling such huge amounts of resources through institutes deemed inefficient.

Empowering the ministry responsible for water development, management and supply seems to be the best practice world-wide. Examples from Tanzania, Sudan, Egypt and all successful irrigation agriculture countries indicate that there should be a leading agent to be answerable in the event things go bad and to be praised if on the contrary. The approach should be changed to entrust the Ministry of Water and Irrigation with the resources to generate expected results from irrigation schemes. Where extra support will be required, arrangement for attachment of personnel to specific schemes and assignments will be made in good time. Short contracts and internships will be embraced to foster dedication and performance based hiring of personnel. The MoWI will undertake to strengthen coordination of its institutional activities that would include capacity building, resource conservation and control, planning, monitoring and evaluation. At all costs, systems that will appear to be competing and policing on others rather than complementing forces, should be avoided for the sake of less bureaucratic and inefficiency in programme implementation.

### **6.1 Challenges to the Agricultural / Irrigation component of the ESP**

The 1st phase of the ESP programme was faced with a number of challenges that were posed by the hurry in which activities were being implemented. Some of the challenges include:

- Delays in setting up the site systems due to sourcing and mobilizing the plant and equipment for clearing and cultivation in some program areas;
- Lack of personnel capacity in implementation of the program by some Agencies;



- Inadequate facilities for post harvest handling, drying and storage of produce in some program areas, leading to huge post-harvest losses and the cases of aflatoxin widely reported.
- Purchasing of maize and rice grain by NCPB did not work as envisaged due to lack preparedness of the institution
- Little time was spent to create awareness among the beneficiaries since 60% of the respondents were not aware of programme existence, indicating lack of participation.

## **7.0 SUCCESS STORIES ABOUT THE IRRIGATION SCHEMES**

The presence of the schemes in rural areas is one initiative that has shown some improved rural employment and start up of businesses in the market centres at the proximity to the schemes. Some by products have been used to feed livestock and hence promotion of diversification in the production systems surrounding the schemes. On the contrary however, the empowerment has show negative social aspects like immorality being high in the market centres neighbouring the schemes. There is too much immorality in the schemes

Mwea irrigation scheme has adequate facilities for milling, both public and private. This capacity has been developed over many years to a level of carrying out value addition to the rice in terms of grading and packaging. The scheme, known for production of the aromatic basmati has created a brand of this variety of rice thus making the marketing of Mwea rice easy and paying. Recyclig of rice bran and straws to animal feeds has been observed in the scheme and these by products end increasing income to the producers and ultimately the returns per unit of land, water, labour and other inputs used in production.

At least the NIB has controlled use of the scarce water resource so much that conflicts among the users are low especially with the repairs and maintenance of the canals, distribution boxes and distribution schedules/ planting calendar. Establishment of a revolving fund in West Kano scheme is an achievement that has support the rural poor to produce some income earning crop unlike before. This is in line with the objective of promoting food security in the areas where otherwise there isn't any other cash crop.

## **8.0 CONCLUSION AND RECOMMENDATIONS**

Critical short comings have been revolving around lack of credit facilities, weak farmer organizations, non existence of market linkages and inadequate extension personnel thereby denying farmers business opportunities. These aspects pose big challenge to the development of irrigation in Kenya. Efforts to solve these issues need to be taken up by the irrigation promoting agencies by way of fostering private sectors parties that can get into formal agreements with farmers while the government agencies oversee the adherence to the agreements. Reference to the liberalization and privatization of

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non essential services spirit disqualifies government from continued management of production systems in the schemes. It now an opportune time for the NIB to put in force the dream of handing over the schemes management to the beneficiaries. This has to start by building adequate capacity in regard to as much as the potential noted is in regard to production, it would be much better to also consider the potential existing in terms of value addition and making the farm products more competitive with an intention or earning better prices. This would go an extra mile to source for cultivation and harvesting equipment that is appropriate to smallholder production systems. Losses incurred at post harvest stage need to be reduced as a way of maximizing profitability. Some equipment may have to be owned in partnerships among the schemes because of the costs involved. This calls for skill to manage and maintain such equipment. Smallholder may have to work together while carrying out certain activities that need uniformity of the produce especially when the market demands some form of timing.

Appropriated technologies should be promoted, and to take the government, on its part, should move with speed to review legislations that are long outdated and working against modern approaches to development of farm businesses and the right to access production factors and resources. It would be important to consider assigning irrigation production mandate to a specific subsector that would at the same time oversee the development of value chains related to the crops being produced. Initiatives towards adaption to climate change will go hand in hand with production. This will require consolidated efforts to create awareness among the users of the natural resources. This requires some coordination and support from the legal spheres, meaning that the government needs to develop policy guidelines on adaption and reactions to the already felt effects.

As much as the ESP has good intentions, It has not been infused into the strategies that provide guidelines towards the achievement of vision 2030. The funds so allocated may not be viewed as part of the efforts to fulfill the Maputo Declaration until awareness is created and all the interested parties brought to the same understanding.

Sensitization and firm management systems need to be among the issues to be tackled to reduce gender bias reported among the water distributing norms and at the same time improve on water and soil fertility and salinity management in irrigation schemes. Research agencies like MIADI should change their approach so as to carry out more of adaptive research than the present conventional research that end up taking too long and not really articulated to the needs of the farmers. Inclusion of more research institutions like the universities and KARI need to secure some mandate in the irrigation production systems in addition to the already going on research and adoption of NERICA rice that may not need as much water. This should go along with training of extension personnel mainly on irrigation production technologies that would improve skills on water requirements for different types of crops, disease and pest control, soil fertility management and environmental conservation in general.

Land tenure issues promote level of investment by individual owners; some level of ownership assurance is needed to draw individual investments and efforts into development and conservation of the natural resources. Legislation should further

enforce against land fragmentation to uneconomical units irrespective of the population pressure.

Long term food security solution should be sought through addressing production of food crops in a holistic manner that addresses relevant value chain systems with the first link being the input suppliers and the last one, the consumers. This approach considers the cost build ups during the navigation process of the food stuffs from the producer to the consumer. The cost of production is monitored and activities that are considered the main cost drivers in production are either eliminated, substituted or alternatives of mechanization sought if they have to do with labour availability. This process can provide alternatives to the most preferred food stuffs once shortage is forecast. This will further reduce the recurring deliveries of relief food stuffs and supply of subsidized seed normally done on crisis like firefighting.

The culture of selling grain immediately after harvest dilutes the business in these commodities as real business does not come out of the grain production but at the milling stage. Development of reliable post harvest structures related to drying and storage similar to warehousing systems will be necessary for grain commodities to retain their importance as food crops in the country.

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