



## Dryland farming and food security in Kenya: challenges and research priorities

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### ABSTRACT

Agriculture is the backbone of Kenya and employs the highest proportion of the population, accounts for approximately a quarter of the country's Gross Domestic Product (GDP) and close to two-thirds of total exports, hence its importance in poverty alleviation. Despite the importance of the sector, about four-fifths of the country's land area is arid and semi-arid (ASAL), making rain fed agriculture largely unviable. As such, livestock and dryland farming are elevated to the highest among livelihood options for resident communities who are largely nomadic pastoralists and agro-pastoralists. While weather patterns are largely responsible for low crop yields and therefore food insecurity, there are other factors that come into play to escalate want in these areas including socio-cultural dynamics and institutional bottlenecks. This paper looks at the challenges of dryland farming in semi-arid areas of Kenya and henceforth points at possible research gaps that need to be bridged to alleviate food insecurity and enhance national development and the achievement of the UN Millennium Development Goal 1 of eradicating extreme poverty and hunger.

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### Introduction

Agriculture is the mainstay of the country and especially when defined to mean and include farming, livestock rearing, fishing and related activities. It contributes about 24% of Gross Domestic Product (GDP), 75% of industrial raw materials and 60% of export earnings and about 18% of the total formal employment (Republic of Kenya, 2007; 2008). In addition, it employs about 3.8 million people in farm, livestock production and fishing while an estimated 4.5 million other people are employed in agriculture-related off-farm activities. The foregoing importance of the sector notwithstanding, about 70% of the agriculturally potential land is owned by about 5% of individuals and 90% of the farms exceeding 3 hectares have absentee landlords in Kenya (Platteau, 1992), which leaves about 40% of Kenyans food-poor. As such, many acres of agriculturally viable land remain unused across the country. This is partly responsible for poverty, food insecurity and poor rural livelihoods (Odhambo & Nyangito, 2003). Such has far reaching implications on national development considering that it is likely to breed poverty, negative civic engagement and therefore underdevelopment.

The agricultural sector is an important entry point for stimulating industrialization, food production and security and the achievement of the development targets envisioned in the Kenya Vision 2030 (Republic of Kenya, 2007; 2008). Its growth is expected to provide the necessary food and social security, raw materials for agro-industries and spur employment and in essence reduce social evils (Republic of Kenya, 2002a). Consequently, the sector has a significant and direct impact in reducing poverty indices estimated at more than 50% in the country, however with rural-urban, regional and gender variations (Amuyunzu-Nyamongo et al, 2007; Republic of Kenya, 1999; 2002b). As the backbone of the country's economy, the agricultural sector also supplies raw materials to agro-based industrial and hence playing a leading role in stimulating economic growth and indirect employment.

While many attempts have been made to ensure food security in the country, they have largely been unsuccessful owing to several governance, economic and policy bottlenecks. For example, the National Food Policy despite its noble intentions of ensuring a broad-based food sufficiency in main foodstuffs (see Republic of Kenya, 1981; 1994) has failed to ensure food security close to three decades since inception. Part of the problem has been that the policy has emphasized on increasing food production without giving adequate attention to quality and access. In addition, while it has proposed various programmes for increasing food production, equity regarding access to agricultural land is unfortunately not in the picture. The foregoing partly explains the lingering food insecurity in the country close to five decades into internal self-rule.

To alleviate such food insecurity, ensure sustained national development and prosperity, the government has come up with several measures and strategic policies including a revision of the National Food Policy, increasing land acreage under irrigation, enhancing extension services, concerted crop disease surveillance and prevention and the development of a National Land Use Policy (Republic of Kenya, 2007; 2008; 2009b). Evidence has shown that rural development, which is largely agricultural in developing countries including Kenya, has important implications on poverty reduction and overall development (see Kimenyi, 2002). As such, agricultural development is not only pro-poor, but also has trickle up effects on the national development and improvement in human welfare.

On a gender perspective, women provide approximately 75% of labour for small-scale agriculture, giving much credence to the concept of feminization of farm work. However, returns to women labour are not commensurate with their efforts (Kimenyi, 2002). This is compounded by the unequal access to resources by men and women such as land, credit, education, health, information and technology among others. As a result, they are more socially and economically deprived, which

increases their vulnerability to poverty as opposed to their male counterparts. More specifically in dryland farming, they are likely to be more marginalized given that most rural communities especially pastoralists and agro-pastoralist are still at the seedbed stage of socio-cultural evolution. This leaves out men in much of the farm work, with negative implications on food production and subsequently household as well as community food security. Overall, it impacts negatively as well on nation building and national development and may be responsible for negative civic engagement and social evils including property-based crime.

#### **Characteristics of dryland farming**

Drylands are generally defined in climatic terms as lands characterized by limited and low annual rainfall that are not only erratic, but also highly inconsistent and variable. Hence, the main characteristics of dryland is the negative balance between annual rainfall and evapotranspiration rates, making rainfall scarce, unreliable and concentrated during a short rainy season, while the remaining period tends to be relatively dry. During the rainy season, high temperatures cause much of the water to be lost in evaporation, while the usual intensity of storms ensures that much of the rainfall runs off in floods. Dryland systems include cultivated lands, scrublands, shrub lands, grasslands, savannas, semi-deserts and true deserts. Hence, drylands refer to cultivated and non-cultivated lands with occasional moisture deficiency, but where rain-fed farming as opposed to irrigation is practiced (Panda, 2008; 2010).

On its part, dryland farming is seen as cultivation of crops in areas where annual rainfall is more than 750mm but less than 1150mm and therefore where dry spells do occur, although crop failure are less frequent (see Panda, 2008; 2010). It is therefore the type of farming practiced in arid areas without irrigation by planting drought-tolerant crops and maintaining a fine surface tith or mulch that protects the natural moisture of the soil from evaporation. It can also be seen as a system of growing crops in arid or semi-arid regions without artificial irrigation, but by reducing evaporation using special methods of tillage.

Drylands of the world cover about 41% of the earth's land surface and over 2 billion people (35% of the human population) inhabit them. Their primary productivity is limited by low soil water resulting from low precipitation and high evapotranspiration. These areas range from hyper-arid and arid deserts to semi-arid rangelands and dry sub-humid areas. In arid regions, ecosystem use is traditionally limited to pastoralism, while semi-arid and dry sub-humid areas can support croplands and rangelands. The practice is seen as the cultivation of crops in areas where rainfall is generally low but crop failure is infrequent (Panda, 2008; Widtose, 2010). In these areas high evapotranspiration and less precipitation is the main reason for soil moisture deficit and hence negative effect on food production. As such, moisture and soil fertility conservation measures are key to dryland farming in semi-arid areas.

Other characteristics of dryland farming include massive soil erosion caused by both water and wind and growth of several crops in large farms. The latter is intended to spread risk of crop failure in the case of monocropping. As such, agriculture is extensive and largely relies on natural rainfall, which is erratic and therefore unreliable. There is also the growth of drought-tolerant crops that are almost similar to all farmers such as millet, sorghum, green grammes and cowpeas. In addition, farmers have large farms in which unfortunately crop yield per unit of land is far below optimum. The foregoing can partly be

explained by poor farming practices, inappropriate seed variety choices, poor soil conservation methods and over-reliance on rain-fed agriculture against erratic, inadequate and unpredictable rainfall.

Moreover, dryland areas generally face unpredictable flash floods, sometimes water logging and drought which may occur within the same year and these may lead to total or partial crop failure (Kamath, 1961). While produce in these areas is low, there is poorly developed farm produce bazaar in which market forces of demand and supply are almost always unfavourable to the farmer. For example, crops grown are almost always similar and are ready for harvesting and sale at the same time. As such, supply outstrips demand during bumper harvest and this diminishes returns to farmers. In addition, poor harvest storage implies that a lot of food is destroyed by post-harvest pests even as much of it is sold at substantially low prices.

#### **Kenya's setting for dryland farming**

Although much of Kenya is arid and semi-arid ecological zone (80%), agriculture still plays and will continue to play a key role in the development of the country.

It accounts for 80% of employment, about 24% of Gross Domestic Product (GDP), 75% of industrial raw materials and about 60% of export earnings (Republic of Kenya, 2007; 2008; 2009a). This underscores the important role the sector can play in alleviating poverty which afflicts more than 50% of Kenyans.

Dryland farming is practiced under conditions of high temperatures and shallow and largely infertile soils, which constitute about 30% of the earth surface and receive between 10 and 20 inches of annual rainfall (Widtose, 2010). Much of the farming in dryland ecological zones that are spread across the country is done by women with strong support from their children, who incidentally happen to be the majority in rural areas. Without optimum manpower as men role remain largely marginal optimal food production of land is never realized.

Arid and Semi-Arid lands (ASALs) of Kenya are home to both nomadic pastoralists and agro-pastoralists. With global warming, climate change and anthropogenic activities such as wetland destruction, forest annexation for cultivation and poor soil water preservation activities, this mass of land is expected to increase as nature and human-induced weather changes take place. While agriculture in general and farming in particular is challenged by many factors, it has the highest potentials for poverty reduction (Kimenyi, 2002).

As a result, the agricultural sector is regarded as pro-poor since it does not only ensure food security, but also an important engine for spurring non-farm activities in both rural and urban areas, making it a focal point for research and continued improvement. Indeed, given the employment opportunities it provides, it is only prudent that more resources be set aside for the sector.

Further, the adverse effects of climate change that are already felt in the country are likely to be more severe in future and compound the exploitation of environmental resources with devastating impact on agriculture and related sectors. All these changes are expected to impact negatively on the environment and therefore the need come up with strategic intervention measures.

On the basis of the foregoing, which is expected to limit available water for crop production, then dryland farming may to come in handy as one of the viable livelihood alternatives in these areas to help achieve the country's development targets.

### **Challenges of dryland farming**

The ecological zones of Kenya where dryland farming is practiced are largely semi-arid, which means livelihood options are minimal, principally due to unpredictable and hence unreliable weather patterns. In a situation where livelihood options are substantially reduced as in this case, it is expected that poverty is also high. Indeed most dryland areas of Kenya posit poverty rates that are significantly above the national average (Republic of Kenya, 2002a; 2007; 2008). As such, inputs that increase crop yield such as fertilizers, herbicides and mechanized farming are largely beyond the reach of the local populace and many times regarded as unnecessary luxuries that can be ill-afforded. This makes dryland farming one of the least rewarding livelihood options and hence discouraging farmers from investing in it.

Related to the foregoing are the relatively warm climatic conditions in the dryland areas that are conducive for the thriving and multiplication of crop pests and disease vectors. Without the ability to afford pesticides, herbicides and related inputs courtesy of poverty among many dryland inhabitants, the crosspollination of crop pests, diseases, unfavourable natural weather conditions and other anthropogenic factors greatly compromise crop production in these areas. Related to the foregoing is the late onset and early cessation of rainfall, which make farmers unable to develop rain water Early Warning Systems (EWSs) and take advantage of the largely inadequate moisture (Kamath, 1961; Panda, 2008; Witdose, 2010). As a result, less food as compared to consumption needs is produced leading to food insecurity at the household and community levels. The foregoing may partly explain the perennial food insecurity, hunger and over-reliance on government and NGO relief food in dryland areas of the country.

Many communities of Kenya and particularly those inhabiting dryland areas are conspicuously conservative and more so regarding division of labour at the household level (Mwenzwa, 2011). Indeed, every other activity including access to social services has a gender definition and this assignment is more the preserve of men. Hence, women many times take the bulk of farm work with strong support from their children, while the work of men may just be reduced to supervision and other related supposedly heavy duties (Boserup, 1970; Mwenzwa, 2011). This therefore leaves men manpower grossly underutilized as women and their children are overworked. As a result, the underutilization of such manpower means less food production, not only for the household but also the community at large, with various implications on overall development of the country.

In many dryland areas of the country, land ownership and tenure security is tilted in favour of men and hence to the great disadvantage of women. Indeed, women hardly own land if ownership were defined to include the ability to use and dispose of it at will. When land tenure security is shaky, it is not expected that women would invest substantially on land that they do not own. Worse still, where title deeds are not available such as much of the Coast of Kenya (Republic of Kenya, 2009b), heavy investment on land even for men is unexpected. This in a way negatively affects their motivation for food production, which results in decreased food production and subsequently food insecurity in dryland areas of Kenya.

Dryland areas of the world are generally characterised by low precipitation and high rates of evapotranspiration. Indeed, in some of the dryland such as deserts, evaporation exceeds

precipitation and as a result perennial moisture deficiency. The resultant aridity is not only responsible for soil salinity, but also infertility, which in essence compromises food crop husbandry and growth of vegetation. The onset of flash floods ensures the erosion of soil nutrients as the land is largely vegetation-bare, which as well compromises its ability to hold water for vegetation and crop growth.

Dryland areas are synonymous with poverty and hence minimal opportunities for livelihood diversification. This compromises people's access to social services including education, health, technology and information. In particular, farmers in dryland areas largely utilize traditional technologies that not only restrict quality and quantity of produce, but also forbid farmers from enjoying economies of scale from farming. This can also be explained by poverty and illiteracy, which stand in the way of farmers to access modern farming technology, know-how and appropriate information. These are important factors that affect the ability of the dryland farmer to produce food and subsequently contribute to food security in these areas.

Many of the inhabitants of drylands of Kenya are peasant farmers and agro-pastoralists who largely use not only traditional methods of farming, but also practice poor soil husbandry, leading to soil erosion, loss and degradation. When soil is degraded it loses its fertility and as a consequence, productivity and the foregoing is for the major part compounded by unreliable weather conditions. This implies low crop yields, food insecurity and subsequent hunger and associated social evils including nutrition-deficiency diseases. In addition, due to the limitation in livelihood options, many people resort to the exploitation of the natural environment through charcoal burning, slash and burn cultivation, sand harvesting, wetland and forest excision and related activities that are environmentally-detrimental. These activities are known to degrade the environment further, making soils less and less productive and subsequently putting human being at the risk of food insecurity, starvation, malnutrition and hunger.

The limited livelihood options in many drylands that are largely rural have seen the economically active segments of the population moving into towns in search of white collar and other employment opportunities. This rural-urban migration has worked to rob the rural dryland areas of manpower that would have been used for local development including dryland farming and pastoralism. For example, data from Mbeere district shows that it is largely men who migrate to urban areas in search of alternative livelihood to supplement dryland farming and agro-pastoralism, which leaves women playing the role of farmer, bread winner and household head among others (Republic of Kenya, 2009d). This implies reduced labour investment in farming and hence reduced food production, with the result of household and community food insecurity.

Scarcity of water courtesy of low precipitation, high evapotranspiration, poor governance, inappropriate soil water conservation methods and both forest and wetland destruction compounded by climate change compels dryland farmers to over-rely on rain-fed agriculture, which is for the most part unreliable. Consequently, irrigation farming even among farmer along major rivers such as the Tana and the Athi is not optimal. As a result, considerable volumes of water drain into the Indian Ocean even as the major rivers snake through largely food insecure dryland areas including the Nyika and the Yatta plateaus. A classic example in this regard is the largely semi-arid

and food insecure Ukambani counties of Machakos, Kitui and Makeni through which both Tana and Athi rivers traverse.

#### **Towards food security in drylands of Kenya: Research priorities**

For proper planning to take place, there should be appropriate and adequate data regarding the issue at hand. In the case of dryland farming in Kenya, there is no gender disaggregated data regarding participation of people since land preparation through sowing seeds to harvesting and thereafter appropriation of the proceeds from farm produce. As such, it would be important if we come up with a gender dimension of dryland farming. This would ensure that we get answers to such questions such as the nature and extent of gender division of labour regarding farming in drylands and the gender-based constraints, causes and opportunities for enhanced food production through dryland farming.

Other issues of concern may include how gender-based division of labour in dryland farming impact on food production and household food security in dryland areas of the country. Hence, we may need to determine who does what, who has access and owns which resources, who controls farm produce, who markets farm produce and who is in-charge of farm produce returns among other questions. This information is important for pointing at participation gaps and coming up with strategic options to enhance food production and maximize household and community food security.

Many people in drylands blame natural weather conditions on crop failure, food insecurity and associated problems. Other still especially extension staff may blame the local people especially the farming practices employed. Is it really nature or humans who are responsible for food security in the drylands of Kenya? Literature attests to both (Stiles, 1995; Singh, 2010) and it would be important to do a study to determine how much of the food insecurity in drylands is a result of human action and the percentage that can be blamed on natural weather. Without such a study, the blame game will continue as people suffer hunger, malnutrition and starvation. Such a study would be important in determining how much rainfall is experienced in such areas and the percentage of water that is harvested and utilised for dryland farming. In addition, it is important to determine the soil water conservation practices employed by dryland farmers, their efficacy and to what extent locally available organic fertilizer is used in dryland farming.

To enhance food production and ensure food security, there is need for concerted household efforts in this endeavour. It is therefore important to determine from a gender perspective what roles men and women play in household food production. Many studies have shown that the bulk of direct farm work is largely left to women, which means men take a peripheral role in food production (Boserup, 1970; Republic of Kenya, 2009c; Mwenzwa, 2011). While most literature is general, it is important to determine specifically the gender dimension of farming in drylands, where food insecurity is most frequent and severe.

From the foregoing, food production is more likely to be below optimum given that there is underutilization of labour especially men. Nevertheless, there is good reason to follow up the little food that has been produced and determine what happens to it once it has been produced. In this particular case, we may be interested in knowing who is in-charge of storage and how is the food stored? Is it safe from destruction by post-harvest pests while stored? Does the person in charge of storage

possess the prerequisite skills and resources to ensure safe storage? From a gender perspective, who determine how the stored food should be utilized and appropriated? In general, is food production and harvest appropriation participatory? In particular, what are the gender issues of research priority in food production and harvest appropriation at the household level in dryland areas?

It is widely acknowledged that food security is not just about production but also what happens to it once it has been produced. We should therefore be interested in determining what happens to food once it has been produced in terms of whether it is stored for household consumption or is sold out in return for money. If for example it is sold, who is in charge of produce marketing? Who is in charge of appropriating the proceeds from household farm produce sales? Is the process of farm produce marketing inclusive or exclusive? Such are the factors that determine household food security and must be investigated with the aim of ascertaining household involvement and participation not only in food production, but also its appropriation once it has been harvested.

The foregoing will point at best practices in mainstreaming such issues as gender and participation regarding dryland farming to enhance food production. While there is already a Guide for Mainstreaming Gender in the Agricultural Sector (Republic of Kenya, 2010c), the present guide is more generic to agriculture than being specific to farming. It needs to be mentioned that the high potential and dryland ecological zones are not homogeneous and therefore a study on drylands farming as opposed to agriculture in general would be more specific and informative. Such is important in drawing up dryland specific strategies that enhance food production and ensure household and community food security in these areas. With household and community food security, then national development would be guaranteed.

For effective food production by farmers in the drylands, it is important that they are trained on among other issues, appropriate inter-cropping to spread risk of crop failure, use of locally available manure that is environmentally-friendly, mulching to conserve the limited soil moisture and post-harvest grain handling. However, for this to be effective there is need to carry out a Training Needs Assessment among dryland farmers to determine the specific skills deficiencies to enable the development of appropriate training methodologies and attendant programmes. As such, training needs is yet another priority research area that needs to be considered as a panacea towards enhancing food production to alleviate food security not only in dryland areas, but also the rest of the country.

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