

PROMOTING EVERGREEN AGRICULTURE AMONG SECONDARY SCHOOLS IN ARID AND SEMI-ARID LANDS OF KENYA

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Abstract

Pastoralism has been a major source of livelihood for most of the families in Arid and Semi Arid Lands (ASALs). Studies have shown that the range land available to support enough livestock that can provide sufficiently for ASAL livelihoods is on a decline trend (Mortimore, 2013). This land is characterized by severe degradation threatening human, crop and livestock survival. Besides, during prolonged drought, pastoralists have been reported to incur huge losses at times amounting to hundred percent. Evergreen agriculture which combines conservation agriculture and agroforestry would play a critical role in reclaiming back these lands as well as making them agriculturally productive. Agroforestry diversifies and sustains production for increased social, economic and environmental benefits on plots of land of any size. Agricultural extension officers and a few Non-Governmental Organisations (NGOs) have done commendable work in promoting evergreen agriculture among ASAL communities. However, the education sector through the curriculum implementers in secondary schools has a role to play in promoting evergreen agriculture. The Kenya secondary school agriculture curriculum has content on conservation agriculture and agroforestry which if properly implemented would equip learners with conservation and agroforestry knowledge, skills and attitudes necessary to make ASAL schools ever green.

Introduction

Agriculture has wide-ranging global impacts which extend to economic growth, poverty reduction, food security, livelihoods, rural development and the environment (Meijerink & Roza 2010). In Kenya it is the backbone of the economy. Kenyan agricultural sector contributes directly about 24 percent of Gross Domestic Products [GDP] and about 19 percent of the formal wage employment (Lewa & Ndungu, 2012). An estimated 60 per cent of all households in the country are engaged in farming activities and 84 percent of rural households keep livestock. The sector also indirectly contributes a further 27 percent to the country's GDP through linkages with agro-based industries. According to Ministry of Planning and National Development (2007), agriculture is key to national food security and is expected to play a critical economic role as Kenya envisages its transformation into a rapidly industrializing, middle-income nation by the year 2030. Most of the farming is done in the high and medium potential areas which only accounts for less than 17 percent of Kenya's land mass while the rest of the land is classified as Arid and Semi Arid Lands [ASALs] and considered less productive (Ministry of State for Development of Northern Kenya and other Arid Lands, 2011).

In Kenya livestock in the ASALs contribute 50% to agriculture GDP and have an estimated value of 60 billion shillings whose annual trade is estimated to be worth 6.0 billion shillings in a year (UN, 2011). Although most communities in arid lands are predominantly pastoralists the Vision 2030 development strategy for Northern Kenya and other dry areas acknowledges the need for diversification through crop production (Ministry of State for Development of Northern Kenya and other Arid Lands, 2011). Kenyan ASALs have 9.2 million hectares of land which has the potential for crop production if put under dry land agriculture (DLA). Thus enhancing knowledge and skills on DLA is of great importance in realization of vision 2030 of becoming a middle level economy earner. This knowledge and skills need to be inculcated among the youth as early as possible the reason it's necessary to practice some of the DLA practices like agroforestry in secondary schools.

ASALs are focused because they are characterized by low rainfall, water scarcity, land degradation and high temperatures making them less agriculturally productive (Bogdanski, 2012). In addition they are experiencing high population growth rates outstripping food production leading to food insecurity. This also increases the demand for wood fuel, fodder, timber, other non-timber products and environmental services making them vulnerable to land degradation (Mowo, Dobie, Hadgu & Kalinganire, 2010). Their productivity can be enhanced by promoting agroforestry practices aimed at making the areas evergreen. The Kenya secondary school agriculture curriculum has agroforestry as one of the topics to be covered in the four years course (Kenya Institute of Education [KIE], 2002). Agroforestry involves the growing of trees and practicing agriculture at the same time in the same piece of land. Evergreen agriculture is being advocated because of the role trees can play in rejuvenating degraded ASALs. The benefits associated with evergreen agriculture include maintaining vegetative soil cover, nutrient supply through biological nitrogen fixation and nutrient cycling, enhancing soil structure and water infiltration and provision of food, fuel and fiber. Other benefits include supply of medicinal herbs for both humans and livestock, supply of fodder and shade, carbon sequestration and conservation of above and below ground biodiversity. Communities in the ASALs also rely on tree products as one of their major source of income (Akinnifesi, Ajayi, Sileshi, Kadzere & Akinnifesi, 2012). A study by Assefa and Abebe (2011), established that trees and shrubs were used by many pastoralists to fill the gap of seasonal food shortage with 40 percent being consumed during famine. However, besides the secondary school agriculture curriculum having content on conservation agriculture and agroforestry, its impact in reclaiming ASAL areas in Kenya is far from being felt.

Literature Review

Dry lands occupy 41 percent of the earth's land surface globally and are home to 35 percent of the worlds' population (Mortimore, 2009). They are more extensive in Africa where they account for more than two-thirds of African land mass and support a population of over 400 million people. In sub-Sahara Africa, they cover about 40 percent of the region and are home to more than 206 million while in Eastern Africa, they cover close to 81 percent of the total land mass (Chauvin, Mulangu & Porto, 2012). In addition, poverty levels have been established to be extremely high and the average Human Development Index of countries in sub-Sahara Africa with large dry land areas was is low as 0.35 (Batana, 2010). In Kenya the situation is not any different with 23 out of the 47 counties in the country being ASALs. Some of these ASAL counties have time and again dependent on the government for relief food for their inability to produce sufficient for their population. However, these ASALs can be rehabilitated into agriculturally productive areas through evergreen agriculture as done in Tanzania and parts of west Pokot in Kenya.

A paper by **Mowo, et al. (2010)** indicated that 1920's Shinyanga woodland in Tanzania was cleared as a way of controlling tsetse flies which were causing huge losses in livestock and transmitted sleeping sickness in man. This made the land habitable and productive but only for a short while. Increasing population of both human and livestock put enormous pressure on land resources. Like in many other unproductive areas, agricultural production was then characterized by very little conservation, limited use of fertilizers and poor livestock management. By the 1980s Shinyanga had become 'the desert of Tanzania' and the rural population was confronted with declining crop and livestock yields, long distances in search of wood fuel and water and increasing levels of poverty and food insecurity. Degradation of Shinyanga desert drew concern from the Tanzanian government for rehabilitation. However, their effort did not bear any fruit from 1984 to 2004 until **ICRAF** took over. Through participatory agroforestry ICRAF employed a wide range of agroforestry technologies ranging from planting of woodlots, fodder banks and use of nitrogen fixing trees.

This resulted into one of the most successful land rehabilitation in Tanzania and the eastern Africa region boasting of rehabilitating more than 500,000 hectares. The result of this rehabilitation were the benefits reported by farmers including increased fodder availability reflected by the improvement in milk production from 7 to 11 litres per cow per day, reduced time to collecting firewood and fetching water, increased availability of building materials, improved biodiversity and increased incomes from sales of different tree products. Extensive ground cover in the enclosed area helps in improving soil fertility and reducing soil erosion by wind and water.

The Vi-agroforestry an International Non Governmental Organisation (NGO) has rehabilitated the degraded arid west Pokot through agroforestry science with the aim of increasing food and energy security as well as wealth creation. At the initial stages the NGO met resistance from the community and hence resolved to establish their demonstration plots in institutions like schools and hospitals. The idea impressed the community and the members then started approaching the NGO for help on how to establish the same in their farms. Massive adoption of the agroforestry science introduced has led to individualization of land tenure, reduced nomadism improved animal health and increased school enrolment.



Figure 1: Land transformation in west Pokot through agroforestry science

In Kenya, nearly 10 million people live in the ASALs which constitute about 84 percent of the country's land and experience permanent threat of drought and famine (UN, 2011). They are also characterized by massive land degradation due to human and livestock population pressure. Promoting an evergreen environment in the ASALs will be of great help not only in reclaiming the land but also improving the

lands productivity. Learning institutions especially secondary schools can be used for piloting the agroforestry projects before the idea can be extended to the larger ASAL community. Engaging agriculture students and those in agriculture and environment related clubs actively in these projects would equip them with appropriate skills for problem solving in ASAL areas. Secondary schools are better learning institution targets because it is at this learning level where many learners are engaged in the agriculture related subject. A study by Nguma (2011) revealed that such students become good ambassadors of the same projects back in their community by carrying out some of the activities they do at school in their homes. Evergreen schools are likely to produce school leavers who are environment sensitive hence help in reclaiming the ASALs through agroforestry practices. One of the agriculture topics covered in secondary school syllabus is agroforestry. Adopting evergreen agriculture in schools would be an essential way of reinforcing practical teaching and learning of the topic. This would go a long way in enabling agriculture students and the school fraternity to realize the benefits of agroforestry.

Schools being learning centers are an essential component in agricultural information dissemination because they offer a conducive environment for learning by doing which boosts interest and enhances retention. Issa (2013) acknowledges that information is the vital resource which provides impetus for a nation's social, cultural, political and economic development. Participatory curriculum implementation promotes innovation and creativity which leads to acquisition of skills for life (Konyango & Asienyo, 2015). Participatory curriculum implementation uses active methods of teaching which fosters critical and creative thinking as well as collaborative problem solving which are very crucial in agricultural education (Olatoye & Adekayo, 2010). Such methods are very appropriate when teaching agricultural practices that promote agroforestry and conservation agriculture if our ASAL secondary schools are to embrace evergreen agriculture. These methods include; problem based, context based, student centered, demonstration, project, tutorial, seminars, fieldwork, inquiry method, discussion and computer based instruction (Ali & Muhammad, 2012; Okogu, 2011; Olatoye & Adekayo, 2010; Wootoyitidde, 2010). The study done by Olatoye and Adekayo (2010), indicated that project based method was gaining popularity for it challenges students to learn how to learn and work cooperatively in groups to seek solutions to the real world. There is need for teachers and students to embrace the project based method in making our schools evergreen agriculture learning centers. Active involvement of learners in agricultural activities through project exposes them to long lasting experiences and assists them think critically enhancing learning and retention. Carrying out agroforestry and conservation agriculture practices aimed at evergreen agriculture in secondary schools would give learners skills they would apply to promote evergreen schools in ASALs.

Findings by Napoli and Raymond (2004) established that students have a tendency of focusing their study on the things that are assessed and graded. Assessing and rewarding individual students in such projects would reinforce the learning of agroforestry practices which would promote evergreen agriculture in schools and by extension in the community. Within a secondary school set up the target are the youth who make up the futures' human resource not only in agriculture but also in all the other economic activities. Therefore promoting evergreen agriculture in secondary schools will help bring up youths who are conscious of their environment. To promote this, agriculture teachers need to form a team with the relevant club patrons in the school as well as extension officers in the surrounding. This will lead to a strong linkage between the school and the surrounding community boosting the schools' role as a learning institution and an information dissemination agent. For sustainability and relevance of this project both in schools and the surrounding community teachers involved and the extension agents need regular training and motivation (Doan, Roggenbaum & Lazear, 2012).

Theoretical Analysis and Application

Kolb's (1984) experiential learning guides this study. He defined experiential learning as the process in which knowledge is created through the transformation of experience. It focuses on "doing" in addition to the "hearing" and "seeing" that occur in traditional learning (Rizk, 2011). Additionally, experiential learning is participative, interactive and applied allowing contact with the environment. It involves active participation of the learner and learning takes place on the affective, behavioral as well as on the cognitive dimensions. Thus if the content on agroforestry in secondary school curriculum could be learned experientially, schools especially those in ASALs could be evergreen. This could improve the environment and the schools could experience all the benefits associated with agroforestry.

This study is also guided by the functional curriculum theory by Obonya (2004). The theory posits that the purpose of education is to acquire skills of adapting to that environment and acting to influence it thereby contributing to its development. According to Obonya, the learner's environment should determine the way education is carried out, including what is taught and how it is taught and learned. The bottom line of secondary school agriculture was to equip learners with agricultural skills they could use for self reliance. A study by Lawal and Wahab (2011), found out that education remained the most effective instrument through which the society can be transformed. Education equips human resources with the needed knowledge, skills and competencies which would make them functional and contribute to the all round development of the nation. This theory informs the study in that; agroforestry is a critical measure in transforming ASAL areas. Proper implementation of agroforestry skills and techniques will lead to evergreen ASAL areas as enhancing their productivity and overall development.

The endogenous growth theory which sees education as a process that changes the production technology itself (Kwabena, Paddison & Mitiku, 2006) guides this study as well. In this model, education is seen as a subject to increasing returns so it could overcome the growth reducing effect of diminishing returns to physical capital. In their study they found out that an economy that made an economic choice of devoting more of its resources to accumulating knowledge had a permanently higher growth rate. Additionally, Monteils (2012), indicated that production of knowledge by education induced a self sustained economic growth. This theory will inform the study in that through proper secondary school agriculture curriculum implementation learners will be able to acquire skills on conservation agriculture and agroforestry which can be used in promoting evergreen ASAL secondary schools. Secondary school agriculture teachers' emphasis on agroforestry will go a long way in transforming the dry and dusty ASAL schools into cool evergreen schools.

Conclusion

Promoting evergreen agriculture in ASAL secondary schools calls for practical implementation of secondary school agriculture curriculum with emphasis on the conservation agriculture and agroforestry. Setting up agroforestry tree nurseries within the school compound and transplanting them will equip learners with appropriate knowledge, skills and techniques they can apply to promote agroforestry even out of school. Growing different agroforestry trees will make learners realize the benefits of agroforestry among them; land transformation, source of fruits, wood fuel, timber, fodder, aesthetic value as well as creating a cool microclimate within the school environment. Through agroforestry, ICRAF has reclaimed Shinyanga desert into a productive agricultural land while Vi-agroforestry has improved the arid West Pokot and immense benefits have been realized including enhanced food security. Similarly giving agroforestry the attention it deserves right from our secondary schools could help make a

difference in ASALs in the near future. This is because we will be producing environment sensitive youths who are likely to promote agroforestry practices even after school.

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