Sustainable Agriculture in Subsistence Economies: Some of the Overlooked Research Issues Based on Tanzania Experience

by
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Introduction

This paper is about sustainable agriculture at subsistence level in the context that agricultural practices should meet the needs of the present population without compromizing the ability of the future generations to meet their own needs. I concentrate on small holder farming because it is the system which dominated agricultural practices in most developing countries.

I should also mention here the obvious statement that the agricultural sector covers both crops and livestock production. In this paper, however, I will limit myself to crop production at a subsistence level.

Over many years, there have been research agenda in Tanzania in the agricultural sector which have been influenced by the prevailing national policies at any given time. Unfortunately, however, national policies in Tanzania have bee essentially based on sectoral concerns at each specific time. It is therefore crucial to periodically review the direction of research activities in the different sectors.

Implementation of the principles of sustainable agriculture begs the use of an interdisciplinary approach, whereby even environmental economists should also come in to examine and quantify the nature of these interdisciplinary linkages.

However, the integration of research across the disciplines of agronomy, natural science and social science disciplines is problematic. This is because the integration of these aspects calls upon effective use of

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interdisciplinary approaches, which is difficulty to achieve. There are many reasons for this; but I will not go into them for it is outside the scope of this paper.

I should, however, mention that differences in methodological approaches between disciplines contribute to the difficulty of effecting inter-disciplinary integration of principles and findings from different disciplines. Also, I should mention that mult-disciplinary (where people with different disciplines work together without, necessarily integrating the results) approaches are relatively easier to achieve than inter-disciplinary approaches because in the former case, it is a matter of having a group of various sub-projects which are not necessarily integrated.

Essentially, multidisciplinary approaches consider a number of issues from different disciplines without integrating them to derive a holistic analysis. On this regard therefore multidisciplinary approaches have limitations in that they do not effectively handle cross disciplinary issues. This is a serious limitation in that it leaves many of the crucial environmental issues integrated and hence not effectively handled. The converse is true for the interdisciplinary approach, which, as I have mentioned above, it is difficult to achieve.

In the section that follow we briefly review some of the basic characteristics of the agricultural sector in Tanzania to provide some background to the discussions that follow. In section 3, I discuss the concept of sustainability. I link this discussion on the concept of sustainability to agriculture in section four. I then go into the central issues of this paper, i.e. the research agenda for sustainable development. This is covered in section five.

2.0: The Agricultural Sector In Tanzania

2.1: General

The Tanzania agricultural sector is essentially a small holder production with an average holding of less than two hectares (see Table One below) even with large households. The average area planted per household is put at 0.89 ha (Havnevk and Skarstein, 1995).

Table 1: *Average total area and average planted area by household in Tanzania Mainland*

H/hold size (No. of people)	*Average total area (ha) per H/hold*	*Average planted area (ha) per H/hold*
1	0.57	0.36
2-5	1.20	0.80
6-10	1.57	1.05
11-15	2.49	1.51
16	2.45	1.91
Average	**1.39**	**0.89**

Source: BOS (1990): Agricultural sample survey of Tanzania mainland 1987/88 final report No. 28.

The sector employs about 80% of the country's workforce. When this situation is considered along with the rate of population growth of approximately between 2.4% and 2.8% per year the importance of ensuring sustainable agriculture should further be appreciated. Such a high rate of population growth is bound, in the long run, to be an impediment to sustainable agriculture. This is because agriculture is bound to be pushed to the marginal lands and catchment areas, hence making it unsustainable. we already see this happen in Tanzania in the Usambaras, the southern highlands, north western areas etc. India, Nepal and Central America also provide good examples of such a phenomenon.

2.2: Main food and case crops

The main food crops in Tanzania are maize, rice, wheat, sorghum, millet, cassava, potatoes, bananas, and yams. Maize is by far the most important food crop. In the 1987/88 agricultural survey it was estimated to cover 38% of the small holder planted area (BOS, 1990).

Although most of the so called food crops are produced for subsistence, it is estimated that between 25% and 75% (depending on the type of crop) is marketed. Export crops include coffee, cotton, cashewnuts, tobacco, sisal, pyrethrum, various oil seeds, spices, and recently, flowers. The agricultural sector accounts for about 50% of the GDP and about 75% of the foreign exchange earnings (MOA, 1991).

2.3: Performance of the agricultural sector

The growth of the agricultural sector was rapid (about 4.5% p.a) between 1965 and 1970 but it steadily declined to 0.6% p.a between 1980 and 1985. Although it is of great interest and importance to discuss the factors which have contributed to the decline, in the agricultural sector it is not the intention here to go into such details. However, Havnevik and Skarstein (1995) discuss this aspect and they mention that a variety of socio-economic conditions and relations have influenced agricultural performance. They discuss these factors as tradition and societal organization, land tenure, Villagization, technology, land distribution, land use, marketing, producer price policies and economic liberalization. It should be mentioned here that some of the factors attributed to agriculture performance are debatable.

It should also be noted here that the decline being referred to above is in terms of output and not the area cultivated. The latter will have to increase since as productivity declines due to land degradation and other factors the total area cultivated will have to increase to offset the low productivity in order to meet the food demands of the growing population.

The expansion of land which is being put under agriculture has environmental implications. More and more woodlands will have to give way to farmlands. Statistics on the different land use in Tanzania are unreliable. Estimates suggest that about 3.1 million hactres are planted every year by small holder farmers while the estimated total area under large scale farms is 2 million hactres (Havnevik and Skarstein, 1995).

3.0: The Concept of Sustainability

The concept of sustainable development is variously defined. But despite this variety of definitions of the concept, the message conveyed is essentially the same. In the paragraphs that follow below, I give a brief review of the concept to put the sections that follow into context.

3.1: The Brundland's report version

'Our Common Future', a report by the World Commission on Environment and Development (WCED, 1987), puts sustainable development simply as that development which meets the needs of the present without compromising the ability of future generations to meet their own needs.

3.2: The FAO version

In 1988 the FAO Council adopted the definition of the concept of sustainable development as the management and conservation of the natural resource base (i.e. land, water, plant, and the animal genetic resources). The utilization of these resources has to be in a manner which is environmentally non-degrading. Also technology should be appropriate, economically viable and socially acceptable. Furthermore institutional change should ensure the attainment and continued satisfaction of human needs for the present and future generations.

It will be noted that the second version as presented above is more elaborate and explicit than the first one, although the message is essentially similar to that given by the 'common future'.

3.3: The world summit's version

The World summit held in Rio de Janeiro in 1991 linked sustainable development to the broader environment issue. It enunciated that without environmental management, the development itself will be undermined; and that without accelerated development the environment will continue to degrade.

It should be noted from the above that the enunciation of the world summit essentially echoes the other two versions above. However, it should also be more clear from the versions above that the concept of sustainable development covers both the aspects of sustenance of the resource base in the course of the development and the sustenance of the development itself.

3.4: The World Bank

The World Bank has adopted the use of the term 'Environmentally Sustainable Development' (World Bank, 1995). The use of the word 'environment' above further articulates the linkages of the concept of sustainable development and environment as was the case at the world summit. It further emphasizes that truly sustainable development will not undermine the ability of the environmental resources and that of the biosphere to support and sustain descent livelihood.

Some African scholars have attempted to put an African flavour to the concept of environmentally sustainable development. Recently Professor Okigbo has had this to say:

> 'In an African context it is important to define sustainable development with a historical perspective. It is not enough to compare the present with the future, since the residual effects of past practices must also be considered. African cultural heritage and traditions must also be considered. African cultural heritage and traditions remind us that land and its associated natural resources must be regarded as a scared trust which has been bequeathed to us by our ancestors. This resource base must be handed over to future generations intact or in an enhanced condition' (Scandinavian Seminar College, 1995).

As noted already, all the different versions above portray the same message that sustainable development is that which meets the needs of the present without compromising the ability of the future generations to meet their own needs.

Having reviewed the concept of sustainability above, let us now link it up with agriculture.

4.0: Sustainability in the Context of Agriculture

It follows from the above review, therefore, that sustainable agriculture includes, among other characteristics, the following ones:

- Sustainable agriculture is that which is environmentally 'friendly'. In other words, sustainable agriculture will not undermine the resource base so as not to sustain itself and the various life forms.

- The other quality of sustainable agriculture is that it will meet the nutritional requirements of the present and the future generations. It will similarly provide employment and income, thus suporting a descent living.

- Sustainable agriculture will also support, enhance and maintain the productive and the regenerative capacity of the natural resource base as a whole. It will not, for example, disrupt the basic ecological cycles, including the contamination of the environment.

- Sustainable agriculture will not disrupt the social-cultural attributes of the society. It will also reduce the Vulnerability of agriculture to and social economic factors.

Furthermore sustainable agriculture must adequately address the issue of equity in resource distribution (Skarstein, pers. Comm). He argues that lack of equity in land distribution, for example, will drive the land-less to marginal lands in the same way that excessive population will do.

Emerging from the above is that the concept of sustainability as related to agriculture is that it covers a big range of not well understood issues. This in a way signals to the importance of research which will articulate the various issues. Further justifications for the need of concerted efforts in research on sustainable agriculture are based on the strategic importance of the sector it has on subsistence economies.

It is estimated, for example, that by the year 2010 Tanzania will need to feed about 18.7 million mouths in addition to the current approximately 24.3 million people. This has immense implications to the natural resources base (mainly land and water) which has reached critical levels, primarily because of unsustainable agricultural practices. These practices have led to soil degradation and erosion. The result has been a fall in productivity. Many subsistence farmers have compensated this reduced productivity by increasing the land cultivated (Kikula, 1986)

There are, of course, other contributing factors towards the depletion of the natural resource base. The high demand for bio-mass energy, particularly for the urban population, is one such factor which is heavily impacting upon the peri-urban environments. Consequent to the depletion of the resource base for example, food production in Tanzania is at a critical balance between production and needs (MOA, 1991). At a house hold level there are serious problems of food insecurity (MOA, 1993). This, in many ways, is influenced mainly by the unsustainable agricultural practices which in view of the population pressure can no longer be sustainable.

Also there is, for example, serious malnutrition in various parts of Tanzania. It is estimated that 25% of the population in Tanzania is affected by Protein Energy Malnutrition (PEM) due to food insecurity. The average energy and protein intake is about 22% of the requirements (MOA, 1991.)

The implications of such a prevalence of malnutrition are many. For example, nutritional anaemia is prevalent among 32% of the population. This is particularly the case among the lactating women. There are also

other nutritionally related disorders caused by the prevailing malnutrition in the country (MOA, 1991).

It is therefore important to intensify research in sustainable agriculture to ensure that appropriate strategies are developed. Having justified the importance of research in sustainable agriculture, let us move to the crucial step of identifying the research challenges.

5.0 The Research Challenges

5.1: An overview

There are various ways of identifying the possible aspects for research in the area of sustainable agriculture. Section three above provides a broad framework for developing a research agenda on sustainable agriculture. In this section we will expand on the framework thus provided in section three above.

While trying to propose a research agenda for sustainable agriculture, recognition of some significant environmentally related national development has also to be made. In Tanzania, such initiatives include the National Conservation Strategy for sustainable Development (NCSSD), the Tanzania National Environment Action plan (NEAP), the National Land policy, the National Environmental policy etc.

It should be mentioned here that the partnerships created by the national initiatives through the processes of NCSSD, NEAP and the sectoral policies provide an innovative solution to the problem of grappling with the concept of sustainable development. This is so because traditional instruments of economic analysis and planning tend to focus on fiscal balance and economic growth. The NCSSD and NEAP approaches on the other hand, attempt to focus on long term issues and their cross sectoral nature. The importance of balancing investments in natural, human-made, human and social capital are implied in these national initiatives.

5.2: The research agenda

I deliberately skip discussing the traditional research topics like marketing, pricing, transport etc. not because they are not important. I am taking this approach because these aspects are well established. But probably more significant is the fact that they are outside my competence.

I mentioned in sections Two and Three above a number of issues in relation to sustainable agriculture. These issues can be summed up into two broad headings, namely:

(a) land related issues (i.e. environmental: covering the issues of land degradation, land policies etc.)

(b) Food security and technology.

The rest of the issues could be put together under a mixed bag which for convenience we may call it the miscellaneous category.

Let us, therefore, discuss below these and the related aspects in the context of sustainable agriculture.

5.2.1: Land Related Issues

The land related issues discussed here include land degradation, land policies, land administration, and land use planning. Land policies in the context used here also cover land distribution. We will discuss each of these aspects in turn as follows:

5.2.1.1: Land degradation

The term land degradation is used here in its broadest sense. In view of the significance and the confusion around this phenomenon, let us briefly review it below.

Land degradation can mean different things to different people. For example, at a range lands manager, tree and shrub re-growth would also be considered as land degradation (Vandersee, 1978), while a soil conservationist would consider it as land rehabilitation.

A barren eroded landscape should be regarded as a result of the degradation process involving a continuum of change (mills and Bozland, 1980 and Christie, 1981). The loss of productivity and vigour, loss in cover, shift, in botanical composition, are but some of the indicators of land degradation along this if they have not reached a critical stage.

It should be mentioned here that the development of indicators of land degradation is yet another important research agenda which has not received its due attention. But quite often symptoms or indicators of land

degradation are interconnected and an area undergoing the process may manifest all of them.

There are many processes within the general phenomenon of land degradation. In terms of soil, Riquier (1982) defined soil degradation as a process which reduces the capacity of the land to produce crops. This could be in terms of observable attributes of the soil i.e. soil erosion or simply the fall in nutrient levels. Similar definitions were earlier given by FAO (1977), FAO (1978) and FAO (1979).

Environmental scientists in subsistence economics have not been able to correlated and demonstrate with accuracy the relation between land degradation in the form of soil degradation with decline in crop productivity partly because of the inaccuracy in assessing the final crop productivity. This problem is caused by the usage of crops from the fields before they are ready for harvest which is normally not included in the final assessment of the total productivity of the farm. Also there is the contribution of wastage during harvest.

The relationship should provide an interesting and useful area of research not only as related to food security, but also to help justify to farmers some of the advocated measures of soil conservation. It is clear now that it is only those conservation measures with demonstrable benefits that can be adopted easily by farmers.

There are certainly no straight forward answers to the problem of resource degradation and this is what makes it an important research area. However, possible solutions lie within Land Use strategies. Land management strategies include land policies and conservation. There are many important research issues related to land use strategies. For example the social aspects of unsustainable agriculture are often not addressed and yet they are crucial. Also innovative aspects of agricultural practices which have a bearing on sustainable agriculture are only starting to be addressed. Furthermore, indigenous knowledge in resource management with a bearing to sustainable agriculture is yet to be effectively addressed.

5.2.1.2: Land policies and related issues.

It is often stated that land policies need to be comprehensive. Nevertheless, the way the different land related policies e.g. land use policy, agricultural policy, livestock policy etc. support or contradict each other are important

issues for research in order to provide solid grounds for addressing the contradictions. Likewise, some sectoral activities have contradicting strategies, e.g. activities related to livestock development *vis a vis* forestry development. These conflicting sectoral activities have a potential of confusing farmers who are the target of these different operations.

In the various land related policies for Tanzania, aspects of sustainability are only inferred to through aspects like land tenure, soil and water conservation, land use planning etc. Similarly the different policies (in many countries) are developed on sectoral basis with minimal or at most accidental integration of the various sectoral concerns.

Indirectly, the new Tanzanian land policy attempts to, among other things, address the issue of providing incentives to land users for sustainable land use. This attempt assumes many things. These assumptions provide fertile grounds for research. Let us therefore highlight some of them.

It is argued that land tenure issues are fundamental to the sustainable utilization and management of land resources and hence sustainable agriculture. Insecurity of tenure particularly for those holding land under customary law is often seen as a disincentive to proper land husbandry. Much of the land in rural Tanzania is occupied under customary rights which are deemed inferior to the granted rights.

Security of tenure to and or the resources on the land is claimed to influence the level of investment, both in terms of capital and personal labour investment into agriculture and the use of desirable resource management practices. The linkage between security of tenure and conservation, therefore, also lends itself well as one of the important research agenda.

According to Stahl (1993), in Kenya, areas with active and effective soil conservation, approximately coincide with areas where land has been adjudicated, registered and land titled. It will be interesting to establish whether this can be the case for the various situations in Tanzania as well.

Research on the linkages of security of tenure and conservation practices by the land husbandman, including pastoralists, will help to at least understand the complexities in resource management. The results will

most certainly be valuable, particularly during the conception of conservation projects, which take many things for granted.

It will be useful also to extend the inquiry of land tenure and conservation to aspects of traditional wisdom of pastoral and other resource management systems. According to knight's model, people have a culture and there exists an elaborate local knowledge of environment which has evolved in the environment (Knight, 1974).

The above inquiry, therefore, will have to be closely linked up with perception studies. Generally routine action comes out of rules and institutions have to make sense to participants (Giddens, 1984). What the indigenous people believe about right or wrong action and how they perceive "environmental problems" is critical if one wants to understand what is going on in a particular human-environment situation.

Since cultural perceptions of natural phenomena and their changes are unique to societies, there is bound to be some conflict between the "inside" and "outside" views (MAB, 1975; Whyte, 1977, Kikula 1986). This inevitable conflict partly accounts for the frequent existence of differences in perceptions of environmental issues between the "outside" land manager and the "inside" Local people.

In this way what may be an environmental crisis to one group may be something quite different for the other. It is therefore important to identify and to account for the differences in environmental perception between an outsider and the indigenous people.

However, differences in environmental perceptions may also occur among the people living in an area undergoing change. It is therefore equally important to understand the difference in perception existing among the local people. This forms yet another important area of research.

In addition to perception studies, the issue of poverty also come in. But the nexus of poverty and environment is not explicitly understood and it should provide yet another area for research. It is, however, fairly well accepted that poverty is both a cause and effect of the environmental degradation and hence leading to unsustainable agriculture.

Limited opportunities for socio-economic development put pressure on the agricultural sector and the poverty of producers forces them to look for ways to obtain quick returns from resource exploitation. Poverty discourages investment in measures which protect the long run productivity of the land resources. But, on the other hand, all these may be just assumptions in which case they need thorough investigation.

5.2.1.3: Land administration

It is worthy noting here that a confused land administration will not provide good grounds for sustainable agriculture. This is the situation which has prevailed for a long time in Tanzania. In this situation, there are many institutions under different authorities dealing with land matters. This has created a lot of confusion in many aspects including the responsibilities of ensuring proper land management for the sustainability of the environment and the operations.

There is therefore the need for streamlining the roles of the central and the local government in land matters. The best way of achieving this is also a subject for serious research in order to find out the best ways of resolving conflicting interests.

5.2.1.4: Land use planning

The term "planning" can be defined in a variety of ways. But essentially, planning is the exercise of making foresight in support of management (Dent, 1991). It is often argued that the severe land degradation problems in various parts of Tanzania and other parts of Africa, are to a large extend caused by lack of land use plans.

Consequently, land use plans, particularly at the village level, have been advocated as potential entry points to the conservation of village land resources. To this effect, there has been essentially two main approaches to land use planning.

The traditional approach which has been top down has produced results which have not been implementable. Experiments on participatory land use planning approaches are underway and they are producing promising results. One such example is the Mzula experiment in central Tanzania (Lerise, Mwaiselage and Kikula 1993)

The method used to produce the land use map (see Fig. 2) in Mzula, documents the farm plots as they exist. This is unique and is being experimented for the first time. Only minor boundary changes of the boundaries are effected but with the consent of the owners of the *shambas*. This way there is minimum alterations of the existing land use pattern.

This is one of the biggest advantages of the approach being tried out. It is easily acceptable and implemented by the people. However, a number of issues need to be resolved in connection with the participatory land use planning approaches. Two such issues are the question of costs and the way forward beyond production of the maps. This is because participatory land use planning is slow and hence quite expensive.

The question of how one goes about integrating the different sectoral issues in participatory land use planning, to ensure sustainable agriculture and utilization of resources, needs careful considerations. Maybe the integration of the land husbandry and farming system approaches may be of value.

Both of the issues raised above as related to costs and the way forward are crucial and need to be researched upon. For example, it is important to establish the cheapest method of undertaking participatory land use planning without distorting the principles of the concept.

Maybe it is important to mention here the concept of integrated land use planning. The importance of integrated land use plans for agriculture, livestock and forestry is better appreciated if it is realised that constraints to sustainable agriculture are linked to the whole question of resource management. The prevalence of these constraints point toward the demand for integrated approaches. It is carious to question here on whether or not the partnerships (if any) created by NCSSD, NEAPS provide an innovative solution. Again it will be useful to make such a follow-up when the NEAPS start being implemented. This will provide valuable insights.

The exact nature and the importance of land use planning for sustainable agriculture is certainly a subject for research. But, it is well established that the land use plans should be implementable in order to reduce the many prevailing conflicts which are contributing to unsustainable development. Also environmental assessment, mitigation and monitoring should be considered as integral parts of these considerations. Conflicts with

regard to existing land use and tenure patterns should also form part of the important considerations.

5.2.2: Food Security, and Technology

A mis-match between food demand and supply is a common feature in the developing economies. There have been many prescriptions aimed at solving this mis-match. These include the advocacy for intensification of agricultural production together with measures to conserve and restore soil fertility.

The central issue here is the conservation and restoration of fertility. It is interesting to note also that traditional land management practices could have a lot of contribution in this regard, particularly at the level of flashing out the main principles. In terms of research it is therefore important to identify the main principles which could be developed in accordance with the contemporary demands.

Shifting cultivation, for example, provides some important principles, which had conservation value but were not deliberately practiced for purposed of sustainable utilization of resources.

Shifting cultivation is remarkable in its universality, given that it has been practiced in widely separated regions of Africa, Oceania and South-East Asia (Nye and Greenland, 1965).

Despite its universality, shifting cultivation has been condemned for a long time as a destructive farming method (Nye and Geenland, 1965 and Allan, 1965). Nye and Greenland (op.cit) however, argued that:

> "..... when not pushed to excess, shifting cultivation has for centuries given man his livelihood in the humid tropics; and it is significant that even now after a quarter of century of experiment in African tropics, we have failed to introduce to the forest regions any methods of staple food production superior to the system of natural fallowing used in shifting cultivation. On the contrary, failure to appreciate its nice adjustment to the tropical environment has lead to many disadvantages."

Allan (1965), Nye and Greenland (1965), FAO (1974) and Kikula (1986) strongly suggest that shifting cultivation had an environmental conservation value, in that it allowed enough time for the soils and vegetation to

regenerate after cultivation. But this is only possible under conditions of low population density (Allan 1965 and Kikula, 1986).

With population increases, the fallow periods get shortened, leading to the transformation of woodlands to grasslands (Nye and Greenlands 1965). This aspect is exemplified by Allan, (1965) who found, that in Zambia the cropping period ranged between five and eight years. Beyond these periods there is a significant drop in productivity and where shifting cultivation is no longer possible, the general response of the people to the declining yields is to increase the area under cultivation, order to compensate for the reduced productivity per unit area of land under cultivation (Allan, 1965 and Kikula 1986).

Reliance on the use of inorganic fertilizers is not sustainable due to the high prices. It is tempting to suggest credit facilities here. But under subsistence farming the prices involved may not be affordable by the majority of the farmers. Probably, where appropriate, greater emphasis should be placed on the role of farm yard manure, compost, and green manure. Also there should be emphasis on tillage practices and mulching to improve the soil structure. These measures will reduce the dependence on inorganic fertilizers. There are also discussions on the use of rock phosphate to enhance productivity. But this is still at an experimental stage. However a demonstration of the impact of all these practices being advocated need to be done to the farmer who may be so brain washed with the use of inorganic fertilizers that he or she may not appreciate fully the value of the afore mentioned strategies. Substantial amount of research has been going on in the area of organic farming and promotion of agro-forestry as a productive form of multiple resource use and sustainable agriculture. Unfortunately the concept of agro-forestry has in many cases been unknowingly used wrongly. We see in many incidents, wrong species being planted at wrong places. This could partly account for the poor performance in such cases. The emphasis should be on biological nitrogen fixation through inter-cropping and crop rotation with leguminous plants. Overall it could be said that emphasis should be on integrating agro-foresty into the farming systems.

5.2.3: Miscelleneouss issues

This section will be brief because I will only mention the various issues even though they are not directly related to sustainable agriculture.

When discussing issues related to sustainable agriculture, it is important to bear in mind the role of science and technology which is relevant to the sustenance of any development. In addition, the technology has to be appropriate and information dissemination has to be in place.

Alien technologies are normally introduced without regard to the culture of an area. As a result, quite often there are elements of culture resistance or even shock. This situation undermines the sustainability of that particular "Development". Efforts, therefore, must be increased to develop new technologies which take on board the cultural and social settings of an area.

Technology goes hand in hand with education. It is important to note that the education systems are only starting to integrate environmental education into the curriculum structure. In view of the numerous examples of linkages development is a move in the right direction.

It should be noted that there is a gender gap in education. The education system seems to be more favourable to boys than it is to girls. Yet education to girls is directly related to sustainable agriculture and economic productivity in both rural and urban societies. Let me finish by mentioning that due to the defficences of research facilities and equipment, research capacities is research institutions in highly underutilized. The system of the agricultural research fund that is being introduced by the Ministry of Agriculture is a possible solution to these deficiencies.

There is also the crucial issues of the role of institutional organization in sustainable development. It can be stated right away that sustainable development requires clearly laid out institutional organization. Institutional responsibilities on advisory, supervisory and regulatory roles has to be clearly laid out. This, however, is the ideal situation. In practice things are rather complicated.

Institutions linked up to the whole question of sustainable agriculture are not only those falling directly under the ministry of agriculture. Other players include those institutions in the ministries dealing with natural resources, water land, education, women affairs, science and technology etc. Unfortunately, however, these institutions have not been organized to promote sustainable development. This is because they are not designed to cut across the sectors which have traditionally influenced

the nature and structure of government ministries. Thus, the institutional set up to foster sustainable agriculture is yet another research agenda.

6.0: Conlusion

Sustainable development as related to agriculture has immense implications to the natural resource base (Vegetation, land water etc.). Unsustainable use of these resources, especially through agriculture, has led to serious problems of land degradation.

Research into land related issues like policies and how they relate to land degradation are important but not adequately researched upon.

Also, there is not yet adequate research to develop indicators of land degradation. When developed, the indicators could be useful in providing early warning mechanisms such that land is not degraded to levels beyond recovery. It is also important to investigate how the confused land administration relates to unsustainable agriculture through land degradation. Many issues related to land use planning have been taken for granted and yet a closer look clearly indicates the need for research in many of them. For example, the principle of traditional land management practices need to be closely examined to establish those aspects which have a conservation value.

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Pastoralism and the Pan-Oromo Nationalist Movement

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In May 1991, the Mengistu government of Ethiopia collapsed at the hands of the Ethiopian People's Revolutionary Democratic Front (EPRDF)[1]. Mengistu's fall provided the Oromo nationalist movement an unprecedented opportunity to further its agenda. Immediately responding to Mengistu's demise, the United States hastily brokered a transitional government whose core partnership included the EPRDF and the Oromo Liberation Front (OLF), the strongest and most visible Oromo political/military organization. The momentum of the Oromo nationalist movement has exponentially increased in response to this unprecedented opportunity. The future of the uneasy EPRDF/OLF coalition and the larger Ethiopian conflict is far from clear. Nevertheless, the Oromo people, in the context of their emerging modern nationalist struggle face many obstacles, some of which are indigenous to the Oromo nation. One such obstacle is *pastoralism*.

A significant portion of the Oromo population engage in pastoral production which imposes certain constraints and challenges to the emerging Pan-Oromo nationalist movement. Though the Oromo make up the largest ethnic group in Ethiopia- estimates range from forty percent to well over fifty percent of Ethiopia's total population-they are nothing but a homogeneous ethnic group[2]. Oromo diversity largely reflects their historical expansion in the Horn of Africa.[3] Following Oromo expansion, "considerable diversity emerged among the Oromo tribes as they adapted to varied material environments and interacted with different cultures in the areas where they settled[4]." Located primarily in Southern Ethiopia, the Borana Oromo (a.k.a. Borana) are widely regarded as the original, core Oromo community and are thought to have best preserved tradition Oromo pastoralism. Though this

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