

Full Length Research Paper

Positioning smallholder farming in the agricultural productivity and food security in resource limited Sierra Leone

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Agriculture is dominated by smallholder farmers who occupy the majority of land, and produce most of the crop and livestock products in Sierra Leone. Nonetheless, the key long-standing challenge of the smallholder farmers is low productivity that stems from the lack of access to markets, credit and technology, and in recent years these are compounded by the volatile food and energy prices and very recently by the global financial crisis. Holistically, smallholder farmers in Sierra Leone can be categorized on the basis of: (i) The agro-ecological zones in which they operate; (ii) the type and composition of their farm portfolio and landholding; or (iii) on the basis of annual revenue they generate from farming activities. Developing successful smallholder farming in country-specific context for agricultural productivity and food security to understanding that household food insecurity largely depends on three interdependent components: Food availability as a function of production; food access/entitlements as a function of purchasing power or job availability; and food absorption/utilization as a function of environmental hygiene, family healthcare and drinking water security. Overcoming these challenges to ending food insecurity and poverty, the ultimate goal is to establish relevant indicators for agricultural productivity and food security planning at the local level, mainly emphasizing the basis for comprehensive food availability, access and absorption. Retrospectively, translating specific indicators to interpret who and how many smallholder household famers are better-off or very poor in the implementation process provide a platform for fruitful agenda with smallholder farmer inclusiveness. This conceptual framework provides the enabling environment to showcase the future of smallholder agricultural productivity and food security in Sierra Leone.

Key words: Smallholder farming, agricultural productivity, food security, relevant indicators, Sierra Leone.

INTRODUCTION

Some recent agricultural growth accelerations notwithstanding, the sector's growth remained insufficient

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to adequately address poverty, attain food security, and lead to sustained gross domestic product (GDP) growth on the African continent (Dessy et al., 2006 and World Bank, 2008). Although agriculture is dominated by smallholder farmers who occupy the majority of land and produce most of the crop and livestock products, the key long-standing challenge of the smallholder farmers is low productivity that stems from the lack of access to markets, credit and technology, and in recent years, these are compounded by the volatile food and energy prices and very recently by the global financial crisis (AfDB, 2009).

African smallholder farmers in Sierra Leone can be categorized on the basis of: (i) The agro-ecological zones in which they operate; (ii) the type and composition of their farm portfolio and landholding; or (iii) on the basis of annual revenue they generate from farming activities. In areas with high population densities, smallholder farmers usually cultivate less than one hectare of land, which may increase up to 10 ha or more in sparsely populated semi-arid areas, sometimes in combination with livestock of up to 10 animals (Dixon et al., 2003; Dixon, 2013).

Developing successful smallholder farming in the agricultural productivity and food security agenda to understanding household food insecurity largely depends on three interdependent components: Food availability as a function of production; food access/entitlements as a function of purchasing power or job availability; and food absorption/utilization as a function of environmental hygiene, family healthcare and drinking water security (Koroma, 2011). Meeting the challenges for smallholder farmers to ending food insecurity and poverty, the ultimate goal is to establish relevant indicators for agricultural productivity and food security planning at local level, and to put in place recommended strategies for the implementation of the smallholder food security agenda in the context of local content policy for implementation action.

The paper mainly emphasizes the basis for comprehensive food security planning at local level, thus translating specific indicators that interpret who and how many smallholder household farmers are better-off or very poor in the implementation process.

Policy gaps in smallholder agricultural system

Low levels of food production and productivity

Low human development coupled with low technology use, has stifled the country's agricultural development process. In fact, labour productivity has always been one of the worrying aspects associated with very low levels of food production and productivity, and per capita output is inadvertently on the decline since 1982. This decline is due to: (1) Reduction in the period fallow for arable land

due to incessant population pressure; (2) poor agronomic practices; (3) inadequate inputs such as improved seed varieties, fertilizers and other agro-chemicals; and (4) the lack of committed and dedicated expertise to research and development in the field of food security. The continuous reduction in food output per person had also been a result of lower food intake and the deterioration in nutritional standards.

Inadequate social, physical and institutional infrastructures

Inadequate social, physical and institutional infrastructures severely limit access to timely availability of food that provide the way forward to enhancing food production and productivity throughout the country. The problem is particularly precarious in rural areas; in addition, the scarcities of basic health and educational facilities, as well as feeder roads for ease of transportation of farm products to markets pose other serious constraints to rural agricultural development. Superimposed on the economic debilitating syndromes, these problems culminate into rapid migration from rural to urban areas. The immediate consequences are illegal congested settlements of unskilled migrants in mushrooming slums of urban areas without jobs, and the opportunities for outreach to other alternative livelihood creation is another far-reaching consequence. At the same time, the farming areas which they desert, remains largely beset with labour shortages, reduced production and increasing food insecurity.

Skilled manpower shortage

One of the most pervasive and recurrent challenges affecting food security and poverty alleviation in Sierra Leone relates to the acute shortage of skilled manpower for research and extension services. The situation has become even more critical during the past decade as the limited skilled personnel leave for jobs outside the country to escape the consequences of the war. In view of the current inadequacy of the educational system to cope with the nation's manpower requirements, a strong justification exists for substantial investment in the agricultural education sector as complimentary component of the action-programmes for food security and poverty eradication.

High population growth

In spite of Sierra Leone's current predicament, it is almost certain that rapid increase in population is a cause for concern. The high population growth rate (estimated at

2.6%/annum) will have serious implications for the country, particularly in respect of food supplies, employment, provision of social services and the productivity-inhibiting burden it will impose on subsistence agriculture.

Low status of women

The low status of women is steeped in deep cultural tradition. In the remote traditional Sierra Leonean society, the wife and children are at the mercy of the male household head for practically all decisions pertaining to welfare of the family; women have very little control or influence over decision-making, even on a matter as delicate as the number of children in the family. Certain socio-cultural practices also culminate into pervasive gender disparity, and Bah (1988) emphasizes that gender inequity, especially in rural areas is evidenced by: (1) High fertility rate; (2) high infant and child mortality rates; (3) high adult female illiteracy rate (82% as compared with 55% for male); (4) the exclusion of women from receiving certain services and entitlements such as land, extension services, credit, and farm inputs; and (5) the disproportionate amount of the work load in agriculture (estimated at 60-80%) allocated to women. Therefore, ensuring food security would remain a far-reaching consequence if high priority were not accorded to gender inclusion relating to the status and quality of life of women in Sierra Leone.

High dependence on external sectors

The economy of Sierra Leone is significantly dependent on the external sectors. Between 1994 and 1995, exports of goods and services constituted over 22% of GDP while the corresponding percentage for imports was as high as 27% (World of Work, 2000). Given these substantial proportions, the balance of payments out-turn have binding consequences on the development of the agrarian economy. It should however, be noted that there is considerable scope to reduce the level of imports in the short to medium term. This can be done through import substitution in food. Import substitution in rice, cooking oil and vegetables can be achieved to a considerable degree by efficient management of the production potential in agriculture.

Small domestic market

As a member of the Economic Community of West African States (ECOWAS) and the moribund Mano River Union (a customs union comprising Sierra Leone, Liberia and Guinea), the regional groupings are potentially of great advantage to the country in overcoming the

inhibitions to sustained economic growth imposed by the smallness of the domestic market.

High dependence on mining

While the average cultivable area per year is small and the farming system is traditional with low yielding crop varieties, the active population diverts attention to mining activities. These and other factors have not enabled the farmers (largely small-scale) to produce enough food to meet household consumption capacity, thus, leaving over 80% of the population in desperation and disproportionate food insecurity.

Before independence, the country was a net exporter of rice in the sub-region to Guinea, Liberia and The Gambia. But during the mid-1960s, the booming mining industries, especially diamond, gold and iron ore attracted much of the active rural population from the farmlands to the mining areas, devastatingly causing a sharp decline in the production of rice, the staple food for the people of Sierra Leone. The economic situation deteriorated further in the first half of the 1980s primarily because of falling production from the mining sector. In addition to the fall in mineral production, the deteriorating economic performance in the agricultural sector stemmed from poor fiscal management. Efforts to develop strategies under the SAP were further undermined by the decade old debilitating rebel war, which plunged the country into economic catastrophe.

Today, the Sierra Leone government spends some 60% of her foreign exchange earnings for the importation of food, mostly rice. This involves a huge amount, which no sensible government can afford to spend indefinitely on such commodity that can be adequately and abundantly grown in a country with plentiful and suitable land and water resources for agricultural development.

Civil conflict in the 1990s

The civil conflict imposed a freeze on the agricultural development in the 1990s. The cost of the war in terms of lives, property and lost opportunities, is yet to be finally quantified. But even without any quantification, it is visible that the economy and society were severely crippled by the rebel war, and continue to be so even in the post-conflict period. Agricultural production was often disrupted in rebel-held areas. Massive destruction of the key production area has been reported and verified (NCDDR, 2002). Untold number of schools, health centres, Njala University College (the country's single most important institution for agricultural research and environmental education), teachers' colleges, dwelling houses, and community facilities, among others, were razed to the ground.

On the human casualties, at one time or another, millions became internally displaced within the country, as well as refugees in the neighbouring countries and thousands may have perished while fleeing for their lives. Displaced and refugee camps within Sierra Leone and in neighbouring countries, respectively, have been in dilapidated conditions. Family break-ups, missing persons, amputees, beggars and prostitutes are all growing phenomena that were associated with the war. The environment also, took a heavy toll as the warmongers plundered the land to scrape their living from the illegal diamond mining.

INDICATORS OF SMALLHOLDER FOOD SECURITY PLANNING

In the last two decades, it has been widely accepted that poverty is the principal root cause of food insecurity at the local/household level (Brown, 1995). Agarwal (1994) also points out that where the poor have no assets such as land, livestock, fishponds, or skills for working in the secondary or tertiary sector, it becomes extremely uncertain for them to escape poverty and desperation.

A number of works done by Oxfam (1997), FAO (1999a) and FAO/WHO (1992) defined food security in different ways according to the focus of the respective agencies, the level of analysis, the geographical focus, and the conceptual starting point or programming of priority. In a special programme for food security, the World Bank (1995) summarizes the varying definitions as:

Access by all people at all times to enough food for an active, healthy life, and this definition provides development planners and decision makers with a useful organizing framework to understanding and responding to both causes and consequences of poverty.

Agriculture has always been central to increasing human wellbeing and national economic growth. Its importance is in part due to its multi-functionality as livelihood provider and source of income and jobs for rural households. Its contribution to rural communities' cohesion for agricultural productivity and food security, through the maintenance of ecosystem services (for example, water supply and purification, pollination, pest and disease regulation) and transformation of local economies largely depend on a number of indicators for food availability, food access and food absorption (Koroma, 2011).

In order to create a viable path to understanding how smallholder household farmers meet their food and other basic needs, and what options they have for their coping mechanisms when exposed to risks and crises, a visible interlocking point is to discern firsthand information gathering using some or all of the indicators for the three

key components of food security at the local level. These indicators illustrate the overall concept that can be translated into action programmes for smallholder agricultural productivity and food security

Food availability indicators

In the framework of other researchers, food availability is a function of both home production and imports. According to Adeleke et al. (2010), indicators that may bring about the clear understanding of food availability for priority action to agricultural productivity and food security at the household level include the following:

1. Deficit/surplus in food production over food consumption
2. Instability in food production
3. Environmental sustainability (which is interdependent on other factors such as percentage area under forest, level of freshwater exploitation, percentage of area under leguminous crops, percentage of degraded area, etc.)
4. Population affected by floods, bush fires, heavy rains, etc., and
5. Percentage of drought affected area, etc.

The information gathered from these indicators help to bring about adequate interpretations on food production and distribution that would enable the establishment of viable action programmes for the short, medium and long terms in smallholder farming for agricultural productivity and food security in Sierra Leone.

Food access indicators

Inadequate livelihood opportunities may lead to household food insecurity. And where poverty is pervasive, suitable measures must be put in place based on identified priorities of the vulnerable groups to provide the needed entitlements to food (Koroma, 2011). Therefore, development policies at the local level for access/entitlements to asset-based resources should be conducive to fostering job-led economic growth through micro-enterprises supported by micro-credit for income generating activities, thus, supplementing shortage of food and other basic human needs incurred from local production and distribution (Oxfam, 1997; Chung et al., 1994; Maxwell and Smith, 1992). In order to comprehend the key elements in the planning process to enhance smallholder agricultural productivity and food security, especially in rural communities, indicators for food access must be centered on the following issues:

1. Daily household calorie intake
2. Percentage of population consuming less than 1890

Kcal

3. Percentage of population below poverty line
4. Percentage of population dependent on labour income
5. Rural infrastructure status (roads, water supplies, irrigation and healthcare facilities, etc.)
6. Percentage of female literacy
7. Percentage of strong culture (SC); and
8. Percentage of social ties (ST) among the population, etc.

These characteristics also serve as meaningful parameters for formidable conclusion of the population below poverty line and the availability of active farming labour for action planning.

Food absorption/utilization

Lack of access to clean drinking water, as well as poor environmental hygiene and health infrastructure lead to poor assimilation of the food consumed (Koroma, 2011). Therefore, food security in smallholder African farming cannot be achieved without environmental hygiene, primary healthcare and clean drinking water security. In order to perceive clear insights on these functions of food absorption, the following indicators would be essential in the planning process to visualize the perceptions of target groups in the action programmes:

1. Life expectancy at age one
2. Percentage of population with chronic energy deficiency
3. Infant and maternal mortality rates
4. Percentage of severely wasted (malnourished/anemic) children under five
5. Percentage of severely stunted (body index) children under five; and
6. Rural health infrastructure index

In attempt to justify adequate interpretations of factors that may impede or favor food absorption it is absolutely necessary to understand these characteristics

Significance of food security indicators

In field analyses, the indicators identified for the three interwoven components of food security are widely used today by researchers with the involvement of planners and target group beneficiaries in specialized food security programmes in many developing countries, and Sierra Leone is not an exception. Some of the findings have made it possible to draw a general conclusion on food security programmes dealing with action-oriented community-led approach by defining food economy zone as geographical area within which the majority of

households obtain their food and cash income through the same combination of means, although by doing so, they are often at risk with some external factors (Save the Children, 2000 and FAO, 1999). The food economy zone therefore, does not necessarily follow administrative boundaries.

In brief, researchers, planners, decision makers and local development officers elsewhere have reaffirmed that these indicators explore all sources of food that people rely on, their relative importance, and the extent to which they can be expanded in times of crisis (Levinger et al., 1996).

By identifying these indicators for information gathering, the local situations can be analyzed to understand these underlying factors for agricultural productivity and food security (Young, 1992). However, the identification of indicators, in itself is not sufficient to ensure that they will be used effectively to suggest changes for improvement of sustainable livelihoods at the local level. Ultimately, the usefulness of indicators and the rigor with which they can be interpreted will be determined by the quality of the data collected and analyzed for overall planning and decision-making.

COMPLEMENTARY VISIONS FOR SMALLHOLDER PRODUCTIVITY AND FOOD SECURITY

People's access to food among the most vulnerable populations in developing countries is largely affected by a number of factors, and the immediate problem is a lack of entitlement to food and access to an adequate food supply (Annan, 2000). World Bank Report (1990) estimates 2.8 billion of the world's people live in a chronic state of poverty and daily insecurity, and this is the number that has not changed much since 1990. The problem reported by World Bank also visibly shows part of the common features of the Sierra Leone population, where over 80% of the 5.2 million people do not have access to sufficient, safe and nutritious food even during the pre-war period that was pervasively characterized by widespread public disenchantment with the failing state subverted by corruption and the lack of social and economic opportunities. Other reports of FAO (1999a) and United Nations Department of Economic and Social Affairs (2001b) show that the vulnerable populations suffer daily hunger, malnutrition and food insecurity even though most national food supplies had been notoriously reported from the local statistics as adequate. In addition to the lack of entitlements to food and access to adequate food supply, land degradation in some areas has severely impaired land productivity (WHO, 2001). This signifies the importance of a political commitment to respond to food insecurity and the need for early warning monitoring systems on malnutrition and food availability (Sen, 2002).

As part of the constraints analysis to formulate strategies in overcoming the problems and obstacles affecting food security in Sierra Leone, the intractable challenges that are complementary to the report of CHS (2003) must be integrated into the policy framework of the Ministry of Agriculture and Food Security in the Government of Sierra Leone. Of particular concern for food security programmes at local level in Sierra Leone constitute the following issue domains; food insecurity and hunger, water insecurity, population explosion and environmental degradation.

Food insecurity and hunger

Food insecurity and hunger undermine a person's dignity and well-being. The ability to produce and procure enough food for the people of Sierra Leone to avoid hunger and malnutrition is critical to human security and local regional development in the post-conflict period. Nonetheless, question of food insecurity and its results is not only how to maintain an adequate national supply of food, but also how to place an existing adequate supply of food at the disposal of those who need it most. Given the desperate nutritional status of many people, what is urgently required is direct and immediate intervention as well as longer term development policies.

In addition, war and conflict inadvertently lead to reduced food production as well as income losses and limited or no access to food for many people, with the most serious impact on the poorest households. Another new dimension of deepening poverty and food insecurity in situations of conflict is the use of hunger as weapon and food insecurity as a constant threat (Stewart and Fitzgerald, 2001). Food supplies are seized and cut off; food aid is hijacked; crop, water supplies, livestock and land are destroyed and often households and families are stripped of assets. In some eastern and southern regions of Sierra Leone where food might otherwise have been available, conflict made people food-insecure and affected their access to adequate food as well as their ability to attain healthy and productive lives. A case example is exemplified by the perpetuated violence in November 2000 before the end of the decade old conflict in Sierra Leone that left an increasing 341,205 registered internally displaced persons (IDPs) and approximately 330,000 Sierra Leonean refugees in Guinea in acute food insecurity due to enormous disruption of the normal channels of emergency food delivery to the afflicted areas (UNDP, 2002; USAID, 2001).

Sustaining individual and household food security to ensure people's survival demands a dual focus on practical strategies in the immediate term; for direct transfer of food in transparent and participatory manner to desperate people to improve their food security, and longer term, capacity-building initiatives that can

gradually improve sustained production and access to food. The emphasis should be on creating and maintaining viable avenues of access to food, enhancing entitlement to food and transferring food to people living in critical or exacerbating food deficit. In addition to food production, improved nutrition increases the capacity to earn and produce, and the income earned provides the means to buy more food. Therefore, having access to adequate food affects people's ability to participate in all spheres of economic, political and social life, and to move out of chronic poverty.

Although there is relatively democratic peaceful governance in the country since May 2002, there remains an increasingly fragmented unity of purpose due to the lack of structural reform, as well as the ongoing disproportionate poverty and food insecurity among 80% of the population living in predominantly rural environment. It is therefore, more important than ever to ensure that food access, availability and nutritional knowledge in consonant with the development assistance from both local and international partners should regenerate a paradigm shift in the administration of specialized local food security projects in ways that do not fuel further conflict, but instead encourage peaceful negotiation and advocacy for community organizing to implement community-based strategies for a lasting end to; fighting killing people, destroying trust among the people affected, increasing poverty and crime and slowing down the economy.

Water insecurity

Without water, survival of human beings or otherwise, is impossible. Meeting the needs for clean and safe water for all in Sierra Leone imposes difficult choices on the government. But failure to respond to this most essential ingredient for life sustenance carries human cost as well as significant economic and political risks. In fact, food security and empty taps are among the most immediate and sensitive public service issues for which societies hold the government accountable. World Commission on Dams (2002) describes the recently emerging crises of reduced access to potable water in all fragile environments of sub-Saharan Africa and South Asia in post-conflicts era as considerable strains on the relationships:

- i. Within and between regions in each country
- ii. Between rural and urban population
- iii. Between upper and lower river interests affecting people's survival and livelihoods
- iv. Among agricultural, industrial and domestic users
- v. Between human need and the requirements of a healthy environment

Yet water scarcity cannot be permitted to lock people,

regions and the nation in a fierce, competitive struggle. The challenge is not to mobilize to compete for water but to cooperate in reconciling competing needs. Water resource management is therefore an important element of food security in efforts to build a socially and environmentally just society. Recognizing the global threat posed by water scarcity, Sierra Leone is therefore, in full support of the United Nations 2003 declaration of the International Year of Freshwater in Kyoto (Japan), and its Millennium Development Goals, calling for reduction by half the proportion of people without sustainable access to safe drinking water by 2005. Every comprehensive action-programme to sustain water security in the post-conflict reconstruction critically addresses this vital scarce resource, but emphasis must focus on community-based strategies in simplified rain harvesting technologies and upstream-downstream demand responsiveness for river basin management.

Population

Although international debates/conferences about ageing populations primarily focus on developed countries, the number of older people in developing countries is expected to rise from 8% in 2000 to nearly 20% in 2050 (CHS, 2003). Sierra Leone is not an exception to this rule.

On the other hand, changing population structures will have major implications for food security. They will affect people's ability to move out of poverty and cope with crises, especially for households with high number of young dependents, as in the case of rural Sierra Leone. In addition, the recent HIV/AIDS crisis in post-conflict period is having a devastating impact on the most productive segment of the population, leading to profound changes in household composition. Years of investments in education and skill training are being lost, and the number of orphans and households headed by women is increasing. Much of the burden falls on women, further crowding any sense of security and dignity.

In retrospection, designing food security strategies, these long-term shifts in population structures need to be taken into account. As population age, more emphasis will be needed to put in place protection and empowerment strategies benefiting older people. This would have major implications for health and education strategies, and for the resources needed to create minimum social safety net. Keeping the most productive segment of the population healthy must be an integral component of the food security challenges at local level.

Environment

Environmental resources are a critical part of the livelihoods of many people. When these resources are

threatened because of environmental changes, people's food security is also threatened. In this regard, the key elements of strategies for sustainable development are complimentary to the successful issue domains that emerged from Johannesburg summit (WSSD, 2002). And at the centre of sustainable development is the delicate balance between human access to natural resources and the cultures of consumption in the environment.

For many of the poor in rural areas, household food security is intimately connected to the natural environment. Families rely on forests for fuel and on subsistence agriculture for food. When these resources are degraded, the effect is direct and immediate: Poor families are forced to migrate to ever more marginal lands; household income falls as non-timber forest products become depleted; pollution from burning fossil fuels causes health problems and premature death on massive scale.

Among the intractable and costly environmental problems in Sierra Leone are land degradation and siltation of water bodies from the intractable mining activities, deforestation of natural ecosystems (illegal logging) and the traditional slash-and-burn agricultural cultivation. These environmental impacts pose pervasive threats, especially for poor people and their food security, thus, increasing the state of vulnerability.

Government and other stakeholders that are increasingly aware of the existing relationship of access to natural resource and ecological stability must be committed to the capacity assessment and objective-oriented training in effort to strengthen the civil society and mobilize their concerted strategies to promote sustainable development and increase awareness of its importance in environmental management decision-making. Government emphasis must therefore, focus on improved environmental management, with enormous commitment to concrete actions at the local level to ensure the participation of affected communities. Experience learning from Burkina Faso and Mozambique with recent exceptional cases studied show that the governments have sought to give the poor people and local communities greater access to and control over natural resources (Marcus and Wilkinson, 2002). The linkages in partnerships and participation require more commitment to effective regulation, management and sustainable use of natural resources. Critical to this is the need to explicitly link plans for improved environmental management and sustainable development to disaster prevention and preparedness.

Mechanisms for smallholder sustainable productivity and food security

Smallholder farmer credit scheme

Smallholder farmers can be provided fertilizers and seeds

in a form of cost recovery loans recovered at the end of the crop production season. What is important is timely delivery of the farms inputs. This would help highly successful farmers to phase out the credit facility because they will be willing to pay in advance for the following farming season.

Linking farmers to input sources

Having realized that little effort is made to coordinate the extension package delivery for improved seed, fertilizer and the crop protection technologies, there is need to establish direct linkage with the agencies or organizations responsible for input supply in each province/district. This plays a significant role in the development of input markets by training the farmers to make optimum use of improved seeds and fertilizer, thus, stimulating their demand for these products. As a result of the inter-linkages, bottlenecks would be easily identified in the distribution of inputs, thus, helping to improve the technology delivery system.

Linking farmers to markets

The agencies/organizations involved in input delivery to farmers take the responsibility of gathering periodical market information from its operational areas for farmers. The exercise greatly assists farmers in channeling their produce to suitable markets providing better prices. Specifically, if farmers attain bumper harvest the benefit from the marketing linkage would promote product-export group for the purchase and export of the produce to the West African sub-region markets.

CONCLUSION

Food security agenda in Sierra Leone has become an important requisite in poverty reduction strategies. Although the emerging trends are faced with many challenges, it has been perceived that the concept can be translated into action through an integrated and sustained initiatives in local-level development by facilitating, motivating and promoting participatory learning action working with the indicators for smallholder farming to improve agricultural productivity and food security. Achieving to establish such a system would help regenerate mutual self-assisted collective action capable of linking the conservation-cultivation-consumption chain. It will also help to ensure genetic diversity, food and water security. Moving from concept to action in alleviating the problems at the local level, the different activities undertaken must be supported by micro-credit enterprises that involve low transaction costs in order to guarantee and ensure the long-term viability and sustainability.

The primary objective of the government's current agricultural strategy is to promote sustained growth of agricultural output, food security and the reduction of poverty. The strategy comprises development programmes, especially, for rice, other food crops, export crops, livestock and fisheries. The objective is to expand and diversify national food production, generate employment and export revenues. In support of these programmes, action would be needed in five main areas: Maintaining good policies and incentives for farmers and private entrepreneurs in general; developing infrastructure; strengthening institutions; carrying out a programme of agricultural training and education; and ensuring transparent donor co-ordination.

RECOMMENDATIONS

Sierra Leone being predominantly rural with over 65% of the population engaged in farming, the overall objective is to assist small-scale farmers achieve improved and sustainable growth in agricultural production and productivity, thereby reducing food insecurity, poverty and improving incomes of small-scale farmers by the demonstration and adoption of modern crop production technologies. Practical approaches would require the establishment of a balance between the following policy strategies and the results of diagnostic work therein that would accommodate effective constraints analysis and resolution:

1. Supporting policy reforms to create enabling environment for the growth of agricultural sector;
2. Supporting institutional and human resource development;
3. Demonstrating environmentally friendly improved technologies; and
4. Supporting private sector initiatives in the production and promotion of improved technologies Table 1.

Factor to consider for complimentary functional productivity

Capacity building

Farmers and other local personnel (village leaders, staff from district and provincial governments) involved are trained in workshop organized for community action planning and provided with seeds, tools and the equipment that they need to enhance production.

Participatory constraints analysis and resolution

Distinguishing features in all the training workshops of

Table 1. Complimentary components objective-oriented activities.

Complimentary component	Objective-oriented activity
Improvement in on-farm water control	Small-scale water harvesting; irrigation and drainage systems using rainfall, water runoff, small streams, shallow groundwater and simple lifting devices such as the treadle pump; land development and tillage systems that offer greater resilience to climatic variation.
Crop intensification	Sustainable intensification of crop production systems with the introduction of widely accessible technologies, including the effective use of high yielding varieties, improved cultural practices, integrated pest management and appropriate post-harvest handling, storage and processing technologies, combined with functional marketing and credit schemes. Improved extension service mechanisms and rural income opportunities by increasing community's capacity to produce value-added goods – such as parboiled rice or smoked fish, thus making the rural farmers bankable.
Diversification of production systems	Diversification of production systems includes integrated aquaculture, small-scale village animal restocking (poultry, sheep, goats, pigs, etc.) and tree/fruit crops. Special attentions should be paid to post-production activities (post-harvest and value-added food processing techniques).
Constraints analysis and resolution	Identify the problems and obstacles that prevent farmers from adopting improved technologies and management practices, as well as favourable factors that bring them together to accept and adopt the dynamic functioning of the productivity groups. Search for practical means to overcome the problems and obstacles, and take action to remove as many of them as possible during phase I operation. Formulate action proposals for the removal of more complex constraints, that is, those requiring major policy decisions or investment, so as to stimulate the widespread adoption of technical innovations during the expansion phase.

Phase I should emphasize on participatory constraints analysis and resolution. The aim is to ensure that the appropriate interventions address opportunities and problems identified (with special attention to the empowerment of women) in ways that are adapted to local conditions.

Interrelated and complimentary techniques

In effort to improve farm output, income stability and system sustainability, the pilot projects must focus on four interrelated and complimentary areas of activity; improvement in on-farm water control, crop intensification, diversification of production systems, and constraints analysis and resolution.

Integrated knowledge system management

The balance between these four depends on the productivity group formation, commitment of target participants and the results of diagnostic analysis of the indigenous knowledge as a way forward to articulating the integrated knowledge system management (IKSM) in

information technology for agrarian prosperity in rural Sierra Leone.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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