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**Food Security and Sustainable  
Development**

**— An Issues Note —**

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## **I. Introduction**

The World Conference on Environment and Development in Rio de Janeiro in 1992 and Agenda 21, the Plan of Action that emerged from the conference placed much emphasis on Sustainable Development including food security. Food security is said to exist when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs. Hence, sustainability involves maintaining a non-decreasing level of per capita well-being over time. In the Agriculture, Forestry and Fishery sectors, sustainable development involves non-degradation of the environment and good management of land, water, plant and animal genetic resources to ensure continuous production of food and non-food primary products. In the African context, the inter-relationships among population growth rates, the state of the environment and agricultural productivity are at the root of food security and sustainability issues.

This issues note focuses on the inter-linkages among population, environment and agriculture as they affect food security and sustainable development in Africa. An understanding of these linkages is a necessary first step in policy-making to achieve sustainable food security. The Economic Commission for Africa has developed an advocacy tool, the Population, Environment, Development and Agriculture (PEDA) model to promote better understanding of the population-environment-agriculture linkages by African planners and policy makers.

## **II. Population, Environment, Poverty and Food Security**

Food insecurity is expected to accelerate in sub-Saharan Africa. Sub-Saharan Africa's share of the world's food insecure population is projected to almost quadruple from 11% in 1969/71 to 39% in 2010. According to the FAO, about 40 % of the total African population, largely children and women, face mounting problems of poverty and malnutrition, that is, inadequate nutrition due to a lack of access to adequate calories, proteins, vitamins and other essential macronutrients. The average daily per capita calorie intake of 2027 calories in many African countries is well below the recommended minimum of 2,400 calories for a healthy and active life. The number of food insecure people (including those who are malnourished) in Africa is expected to reach over 260 million by the year 2010 if present trends continue. The African situation contrasts sharply with the situation in other developing regions such as East Asia, South Asia and Latin America where food insecurity is expected to diminish in the same period.

Given the size of the agricultural sector in African countries in terms of its contribution to gross domestic product, employment, foreign exchange earnings, etc. the region's food security will depend, in the foreseeable future, on increases in incomes of the rural population, and increases in food produced locally or imported with earnings from agricultural and other exports. Increased food and agricultural production is thus key to enhancing food security in Africa.

Certain trends in the region, however, constrain agricultural growth. Among these are persistently rising population growth, increases in hectares of land that are degraded, and an annual level of agricultural production that is well below the rate of population growth. In addition, despite some signs of improvement, the low status of women who are mainly responsible for household food security has not received the necessary level of attention.

### **(a) *Rapidly growing Population***

Rapid population growth exacerbates the problem of ensuring food security in Africa. Decreasing levels of mortality combined with persistently high (but gradually or marginally declining) fertility rates, have resulted in large increases in population which is growing at an annual rate of 2.6% compared to a world average of 1.3%. Countries such as Angola, Botswana, Malawi, Namibia, Tanzania and Zimbabwe in southern Africa and Gambia, Mali and Niger in west Africa to name a few, had population growth rates exceeding 3% between 1990 and 1995.

Food demand is expected to increase tremendously in the coming decades. The IFPRI estimates that sub-Saharan Africa will account for 10.6% of the 690 million ton increase in the global demand for cereals, 5% of the 115 million ton increase in the global demand for meat products and 42.8% of the 234 million ton increase in the global demand for roots and tubers between 1995 and 2020 . These large increases in food demand will result not only from population growth but also from urbanization, income growth, and associated changes in life styles and food preferences.

### **(b) *Low Agricultural productivity***

The food security situation has worsened during the last three decades because food production has not kept pace with population growth. Agricultural productivity remains low, averaging 300-500 kg/ha. while per capita food production index has decreased in the past three decades. The index fell from 112 in 1970 to 101 in 1980, 98.4 in 1990 and 97.2 in 1998. In sharp contrast, between 1975 and 1999, growth in agricultural output (food and non-food) increased by 146% or 60% in per capita terms in Asia. According to the ILO, between 1975 and 1999, Africa recorded negative growth in agricultural output as food output per capita fell by 3.2%. Sub-Saharan Africa's performance in world trade in agricultural commodities was equally disappointing. While in Asia and Latin America, and the Caribbean agricultural exports grew by 6.7% and 5.1% respectively between 1975 and 1998, Sub-Saharan Africa's exports grew by only 2.3% and its share of exports in the world agricultural exports fell from 6.3% in 1975 to 3.0% in 1998.

### **(c) *Environmental Degradation***

Traditional agricultural practices notably shifting cultivation were appropriate in times past when the region's population was much smaller than at present. As the region's population grew at an accelerated rate, the stress on the natural resource base as a result of the mounting demand for food, fuel, pasture and housing has necessitated a massive exploitation of its natural resources, including land, water and forests. This has resulted in landlessness, fragmentation of land holdings, deforestation, water and air

pollution, loss of biodiversity, disruption in overall agro-ecological systems and land degradation.

An overview of recent global trends in land degradation in Africa suggests that approximately 25 % of the world's degraded land is located in African countries. Nearly 15% of the degradation is caused by deforestation and over-exploitation for fuel-wood while human-induced soil erosion from agricultural activities accounts for 25%.

Natural disasters are also factors that undermine efforts of African farmers and their families to attain food security. Within the last three decades, the Sahelian and southern African sub-regions have suffered from the scourge of several devastating droughts which have resulted in an accelerated pace of desertification, reduced land productivity, and harvest failures. At the other extreme, sporadic heavy flooding have resulted in leaching, erosion, degradation and failed harvests in some African countries.

#### *(d) Women's Roles*

Several studies have highlighted the need to recognize, appreciate and support the key roles played by African women in household food security, nutrition and health, population growth and environmental management. Hence, the challenge is to empower women for sustainable development by addressing several constraints, particularly their heavy work load, their economic exclusion, land tenure bias and other injustices, lack of institutional support, technological inadequacy, and power inequalities.

### **III. The Need for a New Approach**

Throughout the continent, most national governments, sub-regional and regional institutions, as well as international organizations, have attempted to implement food security and sustainable development strategies and programmes. In doing so, these strategies and programmes have focused rightly on increasing agricultural productivity and rural incomes, increasing awareness of the need for population planning, and reducing damage to the environment. These interventions have, however, been sector and problem specific, and not dealt with the problem areas holistically. Consequently, the intended objectives have not been realized.

There is now an emerging consensus that to address the problem of food insecurity, there must be a re-evaluation of past policy responses. In addition, the adoption and implementation of a strategy that focuses on overcoming the apparent negative synergies among agriculture, population and environment is crucial. Such a strategy must, in effect, pursue simultaneously three goals, namely; a substantial increase in the growth rate of food and agricultural production, a concerted effort to build human capital through education and empowerment of women, and promotion of sustainable use of natural resources. The achievement of these goals requires that policy- and decision-makers understand and re-direct their strategies and policies in population, environment and agriculture, both at the conceptual and operational levels.

Broadly, ECA assists member states to promote food security and sustainable development by a set of activities centred on three related sub-thematic tasks:

- ◆ Planning and implementing activities to raise policy makers' awareness of the urgency of food, population and environmental concerns (the nexus issues) in development planning;
- ◆ Encouraging member countries to develop and take full advantage of their abilities to foster and utilize science and technology in addressing the nexus issues; and
- ◆ Providing policy analysis support and dissemination services through workshops, training seminars, information exchange, and technical advisory services to enhance understanding and management of the complex interactions between agricultural productivity, population, environment, technology, and food security.

#### **IV. The population-environment-development-agriculture (PEDA) model**

With the assistance of the International Institute for Applied Systems Analysis (IIASA) in Vienna, the Commission has developed an interactive The computer simulation model to illustrate the interactions between population changes (P), the environment (E), socio-economic development (D) and agriculture (A). PEDA model is an advocacy tool to illustrate the likely impact of alternative policy options on the food security status of the population. As food security is a factor of developments in the areas of population, environment, agriculture and socio-economic development, the model demonstrates the relationships between these fields as well. Recently, an HIV/AIDS component has been introduced to account for its impact on both agricultural and human development variables. As such, the PEDA model is capable of providing indicative answers to a wide range of development related policy questions (Box 1).

##### **Box 1: sample policy questions**

*“What is the impact of increased education on the environment and land degradation?”*

*“How does a decrease in fertility rates influence the agricultural production in a country?”*

*“What is the impact of HIV/AIDS on agricultural outputs?”*

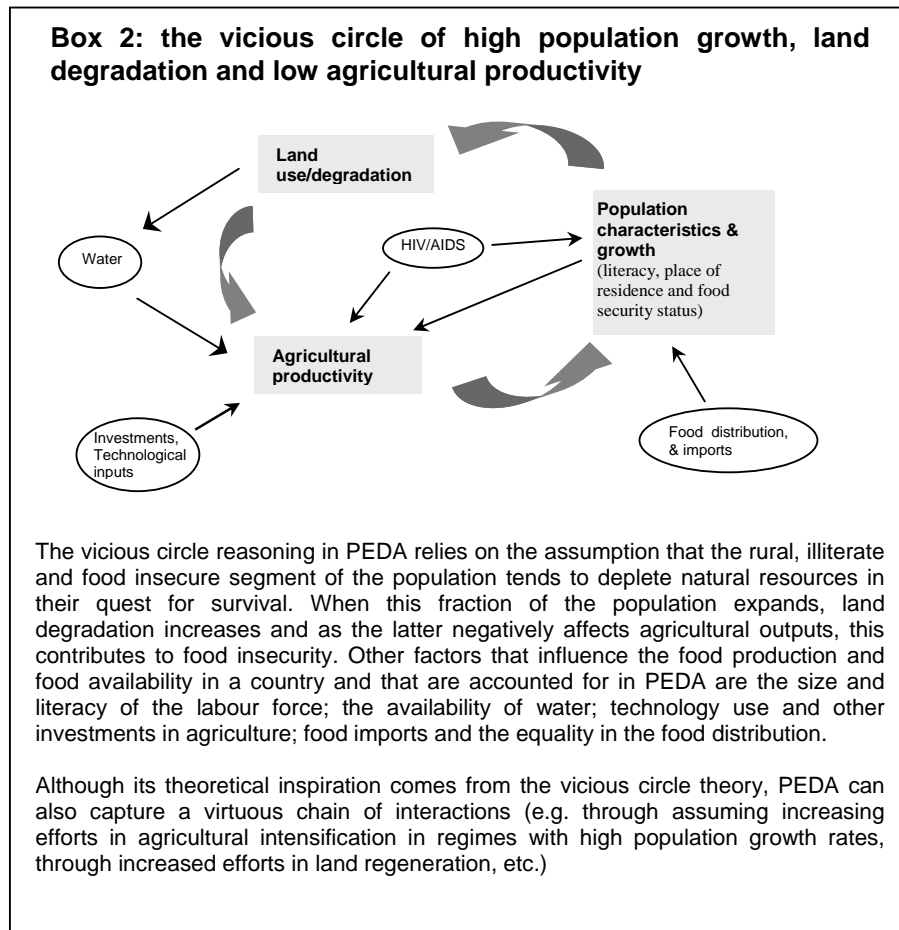
*“What will be the effect on the food security status of the population if the government took measures to increase fertiliser and machinery use in agriculture by 2% a year?”*

*“What will be the impact on the food security situation in a country if the educational enrolment rates would immediately be brought up to 75% for both sexes?”*

The simulation exercise in PEDA consists of three steps. First, (multi-state) population projections are carried out to determine the size and characteristics of the population. Simultaneously, the model estimates the food availability as the sum of food production and net trade. Agricultural production is considered as factor of the natural resources stock (land and water); the size and productivity of the labour force (endogenously determined by the model through the population projections) and

technological inputs and innovations in agriculture. In a third step, the estimated available food is distributed over the population following a non-linear food distribution curve to determine the fraction of the population that will be food insecure.

The theoretical inspiration for PEDa comes from the “vicious circle model” that was originally developed by Partha DasGupta (Cambridge University) and others. The vicious circle assumes a causal chain of interactions between poverty, high population growth, environmental degradation and decreasing per capita agricultural production that can trap certain rural societies into a vicious circle of increasingly destructive responses (see box 2). The vicious circle can be broken through several possible interventions in the field of food production, food distribution, education, environmental protection and population dynamics. The objective and advantage of a quantitative model like PEDa is to help users and policy makers to think in terms of the outcomes of alternative policy scenarios and, most importantly, to consider the nexus issues within a holistic framework.



Central or characteristic to the PEDa model is its population or human development based approach. It views human beings and their characteristics (education, health status, food security status and place of residence) both as the agents of social, economic, cultural and environmental change and as those who are the first at

risk suffering (or benefiting) from repercussions of these changes. The economic environment (e.g. the importance of markets in distributing goods) plays only an intermediate role and is not seen as an end in itself nor the primary objective of the modelling exercise. In this, the population-based approach differs from much of the development economics literature.

## **V. Conclusion**

Population, environment and agricultural development are vitally linked, and affect both the level of food security and poverty in Africa. Programmes to alleviate poverty and enhance food security must, therefore, take on a multi-disciplinary and integrated approach that harmonizes overall population growth with food production growth while ensuring good management of the environment.