ECAPAPA

Eastern and Central Africa Programme for Agricultural Policy Analysis
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NEWS

Appointments:

Prof. Paul Mafuka has been appointed new Director General for the Istitut National pour l'Etude et la Recherche Agronomique (INERA) of the Democratic Republic of Congo.

Dr. Ephraim Mukisira has been appointed Director General for Kenya Agricultural Research Institute (KARI).

Mr. Willy De Greef has been appointed Director for the Program for Biosafety Systems (PBS) in the Environment and Production Technology Division (EPTD) at the International Food Policy Research Institute (IFPRI).

ECAPAPA congratulates Prof. Mafuka, Dr. Mukisira and Mr. De Greef on their new appointments and wish them well in their new positions.

30-31 May: ASARECA/COMESA Regional Approach to Biotechnology and Biosafety Policy in Eastern and Southern Africa (RABESA) Regional workshop, Nairobi, Kenya

9-17 June: Participatory Research and Gender Analysis (PRGA) and ECAPAPA will hold their third Gender training of trainers workshop in Nairobi, Kenya. Participants will come from the Democratic Republic of Congo (DRC), Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda.

AGRICULTURAL PRODUCTION AND SOIL NUTRIENT MINING IN AFRICA: IMPLICATIONS FOR RESOURCE CONSERVATION AND POLICY DEVELOPMENT

The economic development of Africa, more than any other region, depends on development of the agricultural and agro-industry sectors, which are fundamentally affected by productivity of land resources. Declining fertility of African soils, particularly in sub- Saharan Africa (SSA) because of

soil nutrient mining is a major cause of decreased crop yields and per capita food production, a key source of land degradation and environmental damage. African countries face not only the challenge of increasing agricultural production with scarce overall resources but must raise productivity in a way that conserves the natural resource base and prevent further degradation that has characterized African soils for generations. Julio Henao and carlos Baanante highlight these findings in a report on soil nutrient mining in Africa. The highlights were released in March this year and the main report will be launched during the forthcoming Africa Fertilizer Summit scheduled for 9-13 June 2006 in Abuja, Nigeria.

Agricultural production, soil nutrient mining, and land conservation

THE propensity for nutrient mining of Africa's agricultural land and the severity of its consequences are the highest in the world. Soil nutrient mining is usually associated with low agricultural production and land productivity under severe constraints of poverty in terms of physical capital (infrastructure) and human capital (health and education). Continued nutrient mining of soils means a future of even increased poverty, food insecurity, environmental damage, and social and political instability.

Agricultural production has particularly stagnated or declined in important food crops such as cereals, tubers, and legumes. Crop yields and productivity in most African countries are about the same as 20 years ago. In 1998, cereal yields in sub-Saharan Africa averaged one tonne per hectare (t/ha)—15 percent lower than the world average of 1.2 t/ha in 1965. Africa's low crop productivity, especially in densely populated areas, is seriously eroding its economic development and the competitiveness of its agriculture in the world market. During the 2002-2004 cropping season, about 85 percent of African farmland (185 million hectares) had nutrient mining rates of more than 30 kg/ha of nutrients yearly, and 40 percent had rates greater than 60 kg/ha yearly. About 95 million hectares of soil have reached such a state of degradation that only huge investments could make them productive again.

Escalating rates of soil nutrient mining make nutrient losses highly variable in agricultural areas in the sub-humid and humid savannas of west and east Africa, and in the forest areas of central Africa. Depletion rates range from moderate, about 30 to 40 kilograms (kg) of nitrogen, phosphorus, and potassium (NPK)/ha yearly in the humid forests and wetlands of southern central Africa and Sudan to more than 60 kg NPK/ha yearly in the sub-humid savannas of west Africa and the highlands and sub-humid areas of east Africa. These areas are typical for the tropics in that they have weathered soil with low productivity.

Estimates by country show that nutrient depletion is highest (more than 60 kg NPK/ha yearly) in agricultural lands of Guinea, Congo, Angola, Rwanda, Burundi, and Uganda. Fertilizer use is low in those countries, and the high nutrient losses are mainly the result of soil erosion and leaching. Other regions, such as most countries of the north Africa region and south Africa, although constrained by harsh climate, have lower nutrients depletion rates, varying from 0 to 30 kg NPK/ha per year. Nutrient mining across Africa ranges from 9 kg NPK/ha per year in Egypt to 88 kg in Somalia Nitrogen Losses range from 4.1 kg/ha yearly in South Africa to 52.3 kg in Somalia. Losses of phosphorus range from none or minor losses in the Mediterranean and arid North Africa to 9.2 kg/ha per year in Burundi and Somalia. Potassium losses range from 6.5 kg/ha per year in Algeria to 30.4 kg in Equatorial Guinea and Gabon in humid central Africa.

The main factors contributing to nutrient depletion are loss of nitrogen and phosphorus through soil erosion by wind and water, and leaching of nitrogen and potassium. Nutrient losses due only to erosion in African soils range from 10 to 45 kg of NPK/ha per year. If erosion continues unabated, yield reductions by 2020 could be from 17 percent to 30 percent, with an expected decrease of about 10 million tons of cereals, 15 million tonnes of roots and tubers, and 1 million tonnes of pulses. Based on nutrient mining estimated by country, total annual mining of nutrients (NPK) is about 800,000 tonnes for humid central Africa; 3.0 million tonnes for the humid and sub-humid west Africa; 600,000 tonnes for the Mediterranean and arid north Africa; 1.5 million tonnes for the sub-humid and mountainous east Africa; 1.7 million tonnes in the Sudano Sahel; and 1.4 million tonnes in sub humid and semi-arid southern Africa. Total nutrient mining in the sub-Saharan region may be about 8 million tonnes of NPK per year.

The evidence leaves no doubt that the very resources on which African farmers and their families depend for welfare and survival are being undermined by soil degradation caused by nutrient mining and associated factors such as deforestation, use of marginal lands, and poor agricultural practices. About 50,000ha of forest and 60,000ha of Africa's grassland are lost to agriculture yearly. Intensification of agriculture with low fertilizer use, and the clearing of forest lands are the main causes of nutrient mining and land degradation in the tropical forests and savannas that are characteristic of the humid and sub-humid regions that predominate in Cameroon, Ghana, Nigeria, Gabon, Congo, Sudan, and parts of Uganda. Most soils are fragile and low in plant nutrients. The nutrient recycling mechanisms that sustain soil fertility are insufficient to support increased production without fertilizers. Land is being degraded, and soil fertility is declining to levels unsuitable to sustain economic production.

Indicators of soil nutrient mining, population, and nutrition

Population growth and migration associated with drought, food shortages and land over use have accelerated degradation of agricultural land. The average estimates of population density range from less than 0.1 to 5.0 persons/ha. This means that high population density in many countries already exceeds the long-term population carrying capacity of the land.

Variation in population density is highest in the very fragile soils in the semiarid areas of west and east Africa. Population density varies from as low as 5 persons/ha in semiarid areas of east Africa to as high as 150 persons/ha in some semiarid areas of west Africa. Population densities are also high in humid and sub-humid areas in the west coastal areas and in some fertile areas in Ethiopia, Kenya, Uganda, Mozambique, Tanzania, Burundi, Rwanda, Namibia and Angola.

Correspondingly, these areas have high rates of nutrient mining. The production of cereals expressed in kilograms per hectare is particularly low in countries with high rates of nutrient depletion such as the Sudano-Sahelian and the humid and sub-humid areas in west, central and east Africa. Countries such as Congo, Gabon, Liberia, Sierra Leone, Eritrea, Rwanda, and Botswana continue importing large quantities of cereal food.

Sub-Saharan African countries (excluding South Africa) imported 19 million tons of cereals at a cost of $ 3.8 billion in 2003. Assuming that the current situation in agricultural land management

will not change dramatically sub-Saharan countries (excluding South Africa) will import about 34 million metric tonnes of cereal at a cost of $ 8.4 billion by 2020.

Part of the imports is used as animal feed, but most is to satisfy demands of an increasing population. The imports of cereals, along with imports of other food, have a great impact on economies of African countries, and makes food security strategies difficult to accomplish. The influence of nutrient mining on the land's capacity to sustain population and production has long-term impacts besides loss of soil productivity and the consequent exodus of farmers. About 33 percent of the sub-Saharan population is undernourished compared with about 6 percent in north Africa and 15 percent in Asia. Most of the undernourished are in east Africa, where nutrient mining rates are high. Malnutrition rates in these regions are from 10 percent to 50 percent. The nutritional level as measured in calories per person/day is lower than the basic level of 2,500 kilocalories. Crop cereals provide more than 60 percent of these calories in the semiarid and sub-humid areas, while animal products provide 5 percent to 30 percent. Roots, tubers, and plantation crops provide most of the calories in humid regions. Low yields in nutrient-mined areas seem to contribute to poverty and malnutrition.

Soil nutrient mining and policy development

Information about the extent and intensity of soil nutrient mining, and better understanding of its main causes, are essential to design and implement policy measures and investments to reverse the mining and subsequent decline in soil fertility. Restoration of soil fertility is necessary to increase crop yields and food production in order to combat the worsening food security situation in Africa. Thus, these policy measures and investment strategies must be viewed as key contributors to the joint goals of increased agricultural production, food security, economic development, land conservation, and environmental protection.

Better understanding of the economics of nutrient mining, and of the agro-climatic and socioeconomic factors that explain why farmers deplete the soil, provide rationale for design of effective policy and investment strategies to reverse current trends. The main goal of such strategies is to prevent soil nutrient mining by making the use of external plant nutrient sources, particularly mineral and organic fertilizers, more economically attractive. This implies implementation of policies and investments that increase the cost of depleting plant nutrients from the soil while decreasing the cost and increasing the profitability of mineral and organic fertilizer use. These essential plant nutrients, and other improved technologies, must be made available to farmers efficiently and timely.

Key factors determining the extent of nutrient mining in many areas of sub-Saharan Africa are prevailing land tenure arrangements and the lack of plant nutrients such as mineral or organic fertilizers. Divergences between the cost of nutrient mining to individual farmers and to society as a whole result mainly from land tenure arrangements that make the farmers indifferent to the loss of future economic returns to land. When farmer possession of agricultural land is well established through property rights or land tenure arrangements, and there is a functioning market for agricultural land, farmers internalize costs associated with loss of the land's productive capacity. That significantly increases the cost to farmers of the mined soil nutrients. The opposite occurs when land tenure rights are not well established and there is no functioning market for agricultural land. Then, costs associated with the land's lower productive capacity become an externality and

thus, a social rather than a private cost. From the farmer's point of view, soil mining is perceived as the least expensive source of plant nutrients. This is particularly true for farmers who practice shifting cultivation. They often perceive that they are not significantly affected by the declining land productivity associated with nutrient mining.

Design and implementation of policy and investment strategies

Policies and investment strategies to reverse soil nutrient mining should be designed and implemented nationally, and sometimes locally, but always in context, and as a key part, of a comprehensive policy approach to economic development. To facilitate the selection of a set of policy measures and investments as key components of an effective strategy to reverse soil nutrient mining, it is useful to describe and pre-assess them in terms of expected outcomes; impacts on the countries' capital endowments (their natural capital, physical man-made capital, and human capital); and change in the incentives or disincentives to mine soil nutrients.

Summaries of key policies:

1. *Broad scope development policies:* These include investments in roads and associated infrastructure, investments in schools and education, and measures to control corruption and promote good governance. Expected outcomes of these broad scope development policies are increased availability and lower costs of fertilizers and other agricultural inputs and significantly improved access of farmers to information and markets for their products.

2. *Land tenure policy:* Measures or legislation to improve farmers' long-term rights to own the land they use can significantly affect the importance of the benefit streams that farmers receive as a result of the long-term use of the land. This seriously affects farmers' decision making in management and use of agricultural land, and in nutrient mining.

3. *Policies to improve agro-inputs supply efficiency:* The timely and efficient supply of agro-inputs such as seeds and fertilizers can be improved through provision of credit and technical assistance (TA) to farmers as well as the producers, importers, wholesalers, and dealers involved in the procurement and distribution of seeds, fertilizers, and other inputs. In this context, TA involves providing technical and managerial assistance, as well as training and the dissemination of relevant information to business entrepreneurs and farmers.

4. *Policies to expand the demand for agricultural products and stabilize prices:* The goal and expected outcome of this policy is to expand the demand for agricultural products that farmers can efficiently produce in a competitive environment and in a way that is consistent with price stability. Growth in demand for agricultural products that is consistent with stability in the prices that farmers receive for their products promotes the profitability of fertilizers and modern inputs and increases the productivity of agriculture and the incomes of farmer households. Expansion in the demand for agricultural products can be attained as a result of policies and investments that increase the domestic demand for agricultural products and policies that increase the demand for exports of these products.

5. *Social support programs for poverty alleviation and public health:* These programs are needed to combat poverty and malnutrition among both rural and urban populations, and to alleviate the HIV/AIDS epidemic. Policies that are primarily directed to promote economic development should be implemented, along with social support programs. These programs should be designed to reduce malnutrition and hunger, provide health care to combat the HIV/AIDS epidemic, and offer basic education and information to fight these two problems.

Conclusions and recommendations on policy development

To reverse and prevent soil nutrient mining, policies and investment strategies must be designed and implemented at the national level, focusing on well-defined target areas. These measures must successfully promote the judicious use of mineral fertilizers in conjunction with sound soil conservation practices. Given the complex nature of the multiple constraints affecting the use of fertilizers, a well-integrated strategy involving the simultaneous implementation of all or some of the policy measures described above should be adopted to achieve the goals of increased fertilizer use and soil fertility conservation.

It is important to note that national policy and investment strategies must include details about geographic coverage, the chronology of policy interventions and investments, and the specific modus operandi to be used in the implementation of policy measures, such as the provision of technical assistance and credit. Thus, the proper design of national policy and investment strategies to reverse soil nutrient mining in African countries can, in some instances, be involved and demanding.

This is an abridged version of the forthcoming Technical Bulletin of the International Center for Soil Fertility and Agricultural Development (IFDC) titled: ***Agricultural Production and Soil Nutrient Mining in Africa: Implications for Resource Conservation and Policy Development.*** *It is available on www.ifdc.org*

COMMUNICATION

Vacancies

The FAONILE Project in Entebbe, Uganda is seeking two regional consultants to participate in a survey on **Agricultural Water Productivity and Agricultural Water Use** in irrigated and rain-fed agriculture in the countries of the Nile basin, under the **Information Products for Nile Basin Water Resources Management** project. The survey is expected to enhance the information base of agriculture in the Nile basin through the development of a geo-referenced database relying on information available at national, regional and international level. The results of the survey will be used to establish the current status of water productivity in agriculture in the Nile basin and the scope of improvement by farming system within each Nile riparian country. For details, visit: www.faonile.org

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