APRIL 2020

Policy Brief

Institute for Natural Resources in Africa

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Towards Banning Rice Importation By 2023:

Policy Suggestions To Reduce Potential Environmental Impacts

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Keywords: Tanzania, charcoal, cooking fuel, natural gas, deforestation

Executive Summary:

Agricultural production is associated with the emission of greenhouse gases (GHGs) that cause global warming and induce climatic changes. It is estimated that about 15% of global GHG emissions emanate from agricultural activities. Of the 15% of global GHGs associated with agriculture, 45% is attributable to livestock and rice production systems. Rice cultivation is known to produce some of the most harmful of these GHGs, including methane and nitrous oxide. The government of Ghana's flagship "planting for food and jobs" policy aims to increase domestic rice production and eventually ban rice importation by 2023. But the policy does not directly address potential environmental threats and does not provide guidance on the measurement and management of potential increases in the emissions of potent GHGs. Although food security attainment and possible foreign exchange savings from eliminating rice imports are critical for Ghana's economic development, robust policies are needed to ensure that domestic rice sufficiency is not achieved at the expense of the environment. Policy support is required to provide guidance on agricultural management practices that can increase rice production and reduce GHG emissions. This brief presents the current state of management practices in different rice production systems and suggests possible policy revisions that can enable Ghana to achieve domestic rice sufficiency and mitigate GHG emissions.

SCOPE OF PROBLEM

Rice is the second most important staple food crop in Ghana. But domestic production accounts for less than 50% of rice consumed in the country (Figure 1), with a high annual import bill of about USD 376 million (MoFA, 2018). To boost local production of rice, reduce imports, improve livelihoods (SDG 1) and achieve food security (SDG 2), the government of Ghana has launched a five-year strategic policy called Planting for Food and Jobs (PFJ). The PFJ policy provides farmers with subsidized inputs, extension services, access to markets and an electronic platform for monitoring activities in the sector. A marginal increase in domestic production from 44% of domestic demand in 2016 to 47% in 2017 is attributable to the policy, coupled with favourable rainfall and enhanced extension services (MoFA, 2018). Ghana plans to increase domestic rice production through the PFJ and halt importation by 2023.

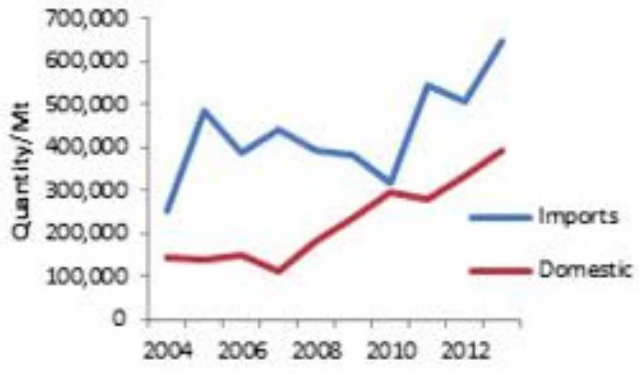

Figure 1: Imports versus domestic rice production

Meanwhile, rice fields are a major source of dangerous GHGs such as methane (CH4) and nitrous oxide (N2O) which cause global warming. Methane from global rice production, for example, is estimated to account for one-half of all crop related GHG emissions (Kritee et al. 2018). Compared to carbon dioxide (CO2), methane has 23 times more potential to cause global warming in a time horizon of 100 years (IPCC, 2001). Therefore, increases in rice cultivation and production can potentially exacerbate global warming through increased methane and nitrous oxide emissions.

Agricultural management practices such as water/flood management, fertilizer application and residue management are mainly responsible for the emission of these highly potent gases. For example, the use of nitrogen-based fertilizers has been found to be responsible for the growth in nitrous oxide concentrations since the pre-industrial era (Park et al., 2012; Reay et al., 2012). Ghana's second national communication to the UNFCCC estimates that agricultural GHG emissions in the country represent 36% of total emissions, the greater portion of which comes from nitrogen from soils and increasing use of artificial fertilizers (followed by methane), and expansion of pasture and grazing lands.

For Ghana to achieve domestic rice self-sufficiency and still meet global emission commitments, there is the need to investigate and recommend a combination of optimal management practices that reduce emissions of potent GHGs while increasing productivity. In this regard, experiments to measure GHG fluxes vis-à-vis various management practices should be established in different rice production systems to proffer locally relevant solutions. But a recent study conducted by UNU-INRA in collaboration with the Ghana Climate Innovation Centre (GCIC) revealed some challenges with conducting these experiments.

Lack of measurement of potent GHG fluxes (CH4, N2O): Current assessment of GHG fluxes from agriculture, including rice cultivation, are mostly made through indirect methods, such as applying global emission factors or guidelines that are not validated for the country's conditions. The study by UNU-INRA/GCIC found only two cases of direct measurement of carbon dioxide from irrigated rice fields at Kpong in the Eastern Region of Ghana (Koomson, 2013; MacCarthy et al., 2018). Two other studies directly measured GHG emissions from maize and vegetable fields (Mankaabusi et al., 2018; Atakora et al., 2019). In these latter cases, either sampled GHGs were sent abroad for analysis or equipment was flown from abroad for in-situ emission measurements. This suggests a general lack of equipment and capacity to measure and analyse GHG emissions in the country. Additionally, there seems to be weak coordination between mandated and relevant institutions in measuring and analysing GHG emissions from agricultural and other land uses.

Varied management practices: The study revealed varying practices in the three major rice production systems in Ghana (irrigated, rainfed upland and lowland system). The mode and quantity of fertiliser application on rice fields varied from one system to the other, and sometimes within the same system. Various flood management strategies are also applied, especially on irrigated and rainfed lowland rice systems. Rice residue/biomass burning was, however, a common practice within all the production systems (see Figure 2). Due to the general lack of measurement of individual potent gases, the contribution of these existing and varied management practices to the emission of potent GHGs remain an unknown. Furthermore, extension officers and farmers were found to have minimal knowledge regarding the linkages between rice management practices, emission of potent GHGs and contribution to climate change.

Figure 2: Burning of rice residue.

POLICY ENVIRONMENT

Ghana has several national and sectoral policies that aim to reduce GHG emissions and increase the adaptive capacity of vulnerable populations to climate change. Examples are the National Climate Change Policy (NCCP), National Environment Policy (NEP), Nationally Determined Contributions (NDCs), Medium Term Agricultural Sector Investment Plan (METASIP), Ghana Shared Growth and Development Agenda GSGDA) and National Climate-Smart Agriculture and Food Security Plan/ policy. The METASIP, for example, explicitly mentions the need to encourage farmers to undertake mitigation measures to reduce GHG emissions in the agricultural sector through a suite of technologies and management practices such as no-till, cropland management, planting of perennials, etc. Despite these references, most policies seem to overlook the important aspect of field based GHG measurements, through which experiments can be set up to determine optimal management practices to reduce GHG emissions in rice production systems. Policy reviews are, thus, required to enable the availability of required equipment, infrastructure and capacity (expertise) to measure and analyse potent GHG emissions in agriculture and related sectors. In addition, policy reviews are required to provide more concrete guidance on mitigation actions in the agricultural sector, especially pertaining to specific crops which are associated with known potent GHGs. In the case of rice, science-based guidance on water/flood management, fertiliser application and residue management in different production systems are critical to achieving mitigation targets considering the planned expansion in cultivation and production. Despite the emphasis on capacity building in several policies, stronger support to improve the knowledge of extension officers and farmers on the relationship between management practices, GHG emissions and climate change is required in future policy formulation. Policy reviews are also required to specify incentives for farmers who adopt recommended climate-smart management practices that contribute to achieving mitigation targets. On the other hand, consumer education to patronise agricultural production that is carried out with climate-sensitive practices is needed.

POLICY RECOMMENDATIONS

Based on the findings of the study conducted by UNU-INRA/GCIC, the following are recommended for consideration in future reviews of agricultural sector and climate change policies.

GHG measurement: Measuring and analysing GHGs is fundamental to managing emissions and attaining mitigation targets in the agricultural sector. Consequently, it is important for future climate change and agricultural sector policies to address the general lack of field-based measurement and analysis of GHG emissions. In addition to enabling the determination of optimal crop management practices, consistent and long-term field-based GHG measurements and analysis are required to determine country-specific emission factors (EFs) for use in inventorying the country's GHG emissions to the UNFCCC. In this regard, policy support is required to urgently establish a dedicated functioning laboratory in Ghana to develop and promote nationally agreed methods for measuring and analysing GHG emissions. Technical expertise and capacity within mandated governmental agencies/ministries (led by the Environmental Protection Agency) needs to be developed to provide leadership. Policy support is further required to define how mandated government agencies and research/academic institutions where some level of technical expertise exists can collaborate to improve measurement and analysis of GHG emissions. Recommendations on best management practices to reduce emission of potent GHGs in rice production systems will not be realised until attention to measurement and analysis of GHGs is given priority in policy making.

Water and soil management: Fertiliser application and soil and water management influence the emission of potent GHGs in rice fields. The influence of such factors will differ from one production system to another. Although field-based measurements are required to recommend best management practices and technologies that can reduce GHG emissions and increase productivity, some preliminary recommendations can be suggested to reduce emissions from rice fields. For example, the timing, placement and application of the right amount of nitrogen-based fertilizers can lead to significant reduction in N2O emissions from rice fields. The use of fertilizer application methods that gradually release nutrients into the soil (i.e. controlled release) and placement at the required depth can manage and reduce the release of potent GHGs in rice production systems.

With respect to water management, prolonged inundation (continuous flooding) of the rice fields, particularly in irrigated and lowland rainfed systems, creates anaerobic conditions (i.e. absence of free oxygen) that promote the emission of methane and nitrous oxide. Intermittent drying and flooding is an alternative that has been found to reduce these emissions, although this could lead to increases in other less potent GHGs or yield losses if not well managed. Considering the Government of Ghana's plans to expand irrigation facilities to reduce climate change impact on rainfed production, recommended water management practices in irrigated rice production systems should be urgently identified and promoted through rigorous policy formulation. Future reviews of agricultural sector policies should rely on results of field based GHG experiments to provide explicit guidance on management practices in rice production systems in Ghana that will support the attainment of domestic rice sufficiency with reduced emission of potent GHGs.

Residue management: The study revealed burning of residue (rice straw and husk) as a dominant management strategy in the three rice production systems. Rice straw is burnt directly on the field or accumulated at a central location and burnt. It was also noted that rice millers burn the husk after milling. But residue burning is a major source of carbon dioxide emissions. However, most rice farmers do not have ready use for the residue. In this regard, the development of a biochar industry, that uses rice residue as feedstock can be an effective solution to this problem. Biochar has been found to be an important soil amendment, with recent research findings noting significant reduction in carbon dioxide emissions as a result of biochar incorporation in soils (Koomson et al., 2013).
Policy support is required to engage the private sector to develop business models that can manage and potentially reduce GHG emission from burning rice residue, into economic gains and environmental benefits. Micro-level industries established at or near rice production sites can receive rice straw and husk as feedstock from farmers and in return supply biochar to farmers for soil amelioration. Excess biochar production beyond the needs of rice farmers could be sold on the open market to other crop farmers. In Ghana, biochar production technology is available and has been tested at the Soil and Irrigation Research Centre, University of Ghana, Kpong.

Figure 3. Top: biochar production.
Bottom: example biochar product

Incentives: Future policy reviews should consider including incentives for rice and other types of farmer to adopt climate-smart practices that increase production and concurrently reduce emission of potent GHGs. A review of two relevant agricultural sector policies – National Climate Smart Agriculture and Food Security Action Plan and METASIP – revealed no provision of incentives for farmers adopting GHG-sensitive practices. The Ghana Strategic Investment Framework (GSIF) for Sustainable Land Management (SLM), which is designed to create incentives for adoption and upscaling of SLM practices, does not provide any incentives for farmers who adopt environmentally safe practices in cultivation. Policy revisions should advocate incentives such as the payment of premium prices for rice cultivated using recommended soil, water and residue management practices. At the same time, customers should be educated and encouraged to patronize such produce. Schemes similar to REDD+ (Reducing Emissions from Deforestation and Forest Degradation) could be designed for rice and other crop farmers to gain credit for adopting recommended management policies. Ghana's mitigation targets in the AFOLU (Agriculture, Forestry and Other Land Uses) sector can only be achieved if enough incentives exist for farmers to adopt GHG-sensitive management practices.

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