

Economic development and resource degradation: Conflicts and policies

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Abstract

The paper develops a model that shares common features with computable general equilibrium (CGE) models. It is used to address two questions. First, what are the future prospects of a green gross domestic product (GDP); should we be concerned with resource degradation or not; and, to what extent, and under which conditions? Secondly, which policies are more effective than others? Model closures are simulated using different specifications of exogenous variables. Further, alternative policies are treated: human capital, price incentives, property rights and poverty reduction. In the African context, we show that while the prospects of environment-friendly economic development, i.e. a rising green GDP, are weak in the medium-run, under certain structural conditions there is a range of effective policies that resolves the conflict between economic growth and resource degradation, thus contributing to a rising green GDP.

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1. Introduction

Land degradation, deforestation and desertification can seriously reduce the productivity of land, and thereby jeopardise economic growth. The conflict between environmental sustainability and economic growth is nowhere more obvious than in developing countries. In these countries, the overwhelming majority of people are dependent for their economic growth on activities that are tied to land, such as Agriculture, Forestry and Livestock, or, briefly, the AFL sectors.

Four adverse interdependencies are commonly acknowledged. First, the inaccessibility of poor farmers to modern technical knowledge and information leads to misuse of natural resources [1,2]. Second, farm-gate prices in most developing countries are far below their world market levels. This discourages farmers' incentives for soil conservation and encourages soil depletion [3–5]. Third, lack of well-defined private property rights over natural resources lead to overexploitation and degradation of these resources [1,6].

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Fourth, pressured by their poverty, poor people adopt short-term survival strategies, and overuse land resources, thus giving environmental protection a low priority [7].

In spite of these negative developments, it has not been established for badly affected developing countries whether economic growth net of land degradation is positive or negative. In other words, if the notion of green gross domestic product (GDP) can be quantified, it is important to establish whether it is on the increase or decrease.

This paper focuses on modelling the trade-off between economic growth and resource degradation. We take the Sudan as a case study, a country very rich and diverse in land potential but equally so with ecological risks.¹ One concern will be to build a model capable of establishing, quantitatively, future prospects of green GDP in the Sudan, and identifying whether there are reasons for alarm or not, and to what extent. The answers will depend on the model specification and postulated conditions.

A second concern is to develop a modelling framework capable of evaluating alternative policies for reducing the above trade-off.

We will show that the prospects for resource friendly economic development in the Sudan—a rising green GDP—are weak in the medium-run, but that there are some corrective mechanisms that improve the situation in the longer run. There is also a range of policy choices that could effectively reduce the trade-off between growth and degradation.

There are a few policy models that explore the links between economic growth and environment conservation in the context of agriculture and (or) forestry. Those focusing on agriculture include incentives for upland farmers in Indonesia for investing in soil conservation as an alternative to existing methods of cultivation that lead to considerable soil erosion [10]. Others examined the deforesting behaviour of smallholder agriculturists in rural Nepal as off-farm labour market conditions change in the context of an open access regime [11]. There is also the computable general equilibrium (CGE) model for Costa Rica in which the effects of economy-wide government policies are traced on development of agriculture and forestry [6]. Some models have assumed a narrower scope in studying the environmental effects of stabilisation and structural adjustment programmes for Thailand [12] and Malawi [13].

The key conclusion drawn from a review of this literature is that the policy modelling of trade-offs between growth and conservation in the development context emphasises the need for joint appraisals of economic incentives, property rights, population and poverty pressures and modern farming knowledge. However, available models do not go beyond focussing on this one aspect to the exclusion of others. The models also emphasise the importance of land substitution between agriculture and forestry and the importance of relative prices in determining the outcome, supporting the use of general equilibrium models in modelling the problem.

This paper represents a step in the directions mentioned above. The economy-wide model we develop thus incorporates the joint appraisal of economic incentives, property rights, poverty pressure and the role of modern farming knowledge in the determination of sustainable growth. The model elaborates on links between agriculture, forestry, livestock, the AFL sectors, and the rest of the economy. The model gives also due emphasis to relative prices in influencing the allocation of resources, and shares common features with CGE models.

Section 2 introduces the model, while Section 3 describes the structure of the model. Section 4 includes remarks on estimation and calibration of the model, and Section 5 reflects on the results under alternative closures and decompositions. Section 6 uses the model to appraise alternative policies to reduce the trade-offs between growth and conservation. Section 7 concludes the study.

¹The Sudan is a typical country in which the four resource degrading factors apply [8,9,5]. For example, the low level of farmers' education and training leads to overexploitation of arable land. Next, price controls imposed by the government on irrigated agriculture have discouraged farmers from adoption of long-term sustainable cultivation practices. Besides, land tenure insecurity has pushed farmers in mechanised agriculture to "mine" arable land in pursuit of short-run gains. Finally, poverty in subsistence agriculture has compelled farmers to exploit arable land unsustainably. Furthermore, open access to woodland is a major cause behind the excessive clearance of forestland, and lack of well-defined property rights over grazing land has left no incentives for livestock owners to invest in improving the prevailing conditions in grazing land.

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