Forest Policy and Economics 7 (2005) 97–107
Forest Policy and Economics
www.elsevier.com/locate/forpol

Instrument choice for sustainable development: an application to the forestry sector

John Bowers*

The Business School, The University of Leeds, Leeds LS2 9JT, England, UK

Received 26 April 2002; received in revised form 3 February 2003; accepted 18 February 2003

Abstract

The paper addresses the problem of the choice of policy instruments for sustainability in a privately operated forestry industry. Sustainable forestry affects many aspects of operations. Sustainability conditions are exogenous to project appraisal and should appear as constraints on project design. As applications of broader policies, sustainability requirements do not possess a monetary value independently of the policy they are derived from. Efficient instrument choice entails a trade-off between control and compliance costs. Marketable instruments are unlikely to be efficient in forestry. Where policy failure results in irreversible effects, the Polluter Pays Principle should not be applied. Efficient instrument choice in the presence of irreversibility requires that the agent be rewarded for contributions to achieving the policy objective.

Keywords: Sustainable forestry; Marketable instruments; Principal-agent

1. Introduction

The paper discusses the problem of choosing policy instruments to achieve sustainable development objectives for the forestry sector in a country with a privately operated forestry industry. The industry may either own or lease the land on which the forests are located or it may operate concessions in state forests. While the ownership of the land will affect the details of instrument choice in a number of ways it is not central to the issues discussed in this paper. In either case, instrument choice can be viewed as a principal–agent problem. The principal, the state, wishes to induce the agent, the forestry industry, to manage and exploit the forests in conformity with its requirements for sustainable development. The agent's interests diverge from those of the principal and in the absence of the use of instruments by the principal, would not choose sustainable forestry.

The paper is structured as follows. Section 2 examines definitions of sustainable development in the economics literature. Section 3 examines what the various schools of thought say on how a sustainable development programme should be determined and the role allotted to cost-benefit analysis and monetary valuation of the environment. Section 4 considers sustainable forestry. Section 5 considers the princi-

* Tel.: +44-1132-758957; fax: +44-1132-334465.
E-mail address: J.K.Bowers@lubs.leeds.ac.uk (J. Bowers).

1389-9341/$ - see front matter © 2003 Elsevier B.V. All rights reserved.
doi:10.1016/S1389-9341(03)00015-7

ples of instrument choice. Section 6 discusses whether marketable instruments are likely to be efficient for the forestry sector. Sections 7 and 8 examine instrument choice in the presence of irreversibilities. Section 9 applies the previous findings to Forest Certification as an instrument. Section 10 contains some conclusions.

2. Sustainable development

Starting from the report of the Brundtland Commission (World Commission on Economic Development, 1987) the debate on the concept of sustainable development has been extensive and wide-ranging, embracing both social and natural sciences. The debate within economics has centred round the concept of natural capital. Conventional neo-classical economists deal with the environment by adding another factor, natural capital, to the aggregate production function.

$Q=f(L, K, K_n)$ where Q is aggregate output, K_n aggregate natural capital, K aggregate conventional (reproducible) capital and L, labour.

The form of the aggregate production function is assumed to be Cobb–Douglas or, more generally, CES (constant elasticity of substitution), implying no limits to the substitutability of factors. In this case, the availability of natural capital imposes no constraint on economic development provided that the Hartwick rule (Hartwick, 1977) is followed. The Hartwick rule requires that all surpluses from resource production are re-invested. It is normally formulated for exhaustible resources but can apply equally to renewable resources if they are exploited unsustainably, i.e. at rates above the maximum sustainable yield (MSY) of the species concerned.

Sustainable development predicated on the neoclassical aggregate production function and the Hartwick rule is generally termed *weak sustainability*; that along a sustainable development path natural capital may be consumed provided it is replaced by reproducible capital.

If it is believed that there are limits to the substitutability of natural and reproducible capital or that natural capital yields services that are not measured in output, then sustainability requires constraints on the values of K_n. The usual restriction is that $d(K_n)/dt \geq 0$ for all t. This gives us what is termed *strong sustainability*. With strong sustainability the aggregate production function is not CES and the Hartwick rule cannot be followed.

These two concepts of sustainability have been subjected to criticism by Beckerman (1994). He argued that the weak sustainability rule was redundant, amounting to no more than conventional optimising behaviour through time. Strong sustainability, on the other hand, was morally repugnant since it required unlimited sacrifice of current and future consumption in order to conserve biota and maintain stocks of exhaustible and renewable resources.

In the ensuing debate a number of authors defended the notion of strong sustainability (Daley, 1995; Jacobs, 1995) arguing that the underlying assumption was that natural capital was a complement not a substitute for reproducible capital. In his reply, Beckerman (1995) argued that since it was fixed in quantity it could not be a gross complement within the aggregate production function. Beckerman's criticism of weak substitutability produced few defenders. El Sarafy (1996) suggested that it was at least operational and Common (1996) explored the implications of the two notions for natural resource accounting.

Both concepts of sustainability and the definitions of sustainable development they lead to, rest on the notion of natural capital and specifically on aggregate natural capital. While the authors discussed so far utilised the concept, none defined it. On an analogy with reproducible capital, natural capital comprises the assets of the natural world that provide services to humanity. Pearce et al. (1990) speak of the planet's life support systems: the atmosphere; the soil; the oceans; and the ecosystems that they support. The services yielded by these systems are extremely diverse; ranging from the absorption of waste products, gasses for respiration, water supplies, growth media for plants, minerals and raw materials, fisheries and forests, foodstuffs, pharmaceuticals and sources of innovation for a wide range of industries. Analogously with reproducible capital, the value of this natural capital should be the present value of these environmental services summed, presumably to infinity, at some unspecified discount rate.

While the concept of aggregate natural capital has some heuristic value it can be questioned whether it could ever have operational significance. Judgements