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A critical appraisal of the effectiveness of UK perennial energy crops policy since 1990

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ABSTRACT

Energy crops are cultivated primarily for bioenergy production, but can also have wider benefits to agriculture and the environment. Policies put in place in the UK and Europe have promoted bioenergy and the growth of energy crops. Despite the various policy support mechanisms the cultivation of perennial energy crops has proceeded at a low rate. This study rigorously analyses some of the key UK bioenergy policies since 1990 to assess why perennial energy crops have not fulfilled their potential. The UK energy crops market is scrutinised and shows the industry is still nascent compared to Government aspirations. Case studies of both successful and unsuccessful projects are evaluated to reveal how effective different policies have been in establishing UK perennial energy crops. This original review shows significantly that none of the projects, initiatives or schemes described can be viewed as an absolute success. The main obstacles that have hindered progress include: the lack of long term supportive energy crops policy, the failure of headline projects and organisations, the lack of competitiveness of long term perennial crop options compared to annual crops, bureaucracy of schemes, over-ambitious projects, and large-scale support schemes tending to favour imported biomass rather than support domestic supply.

25 years of failed energy crops policy suggests there needs to be a long term strategy. Future support for the sector must join up policy between different Government departments to recognise multi-functional benefits of perennial energy crops. Support mechanisms could aim to provide a competitive advantage for local supply and use, and improve management of cashflows during establishment. The risk burden should be shared between suppliers and end-users. Smaller-scale projects using established technologies are required with energy crops introduced in a phased manner. Supply-side measures need to be balanced with demand-side incentives to link supply with end-user markets.

Contents

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1. Introduction

Plants have been used for food, fuel, fodder, and fibre for thousands of years [1]. In recent decades there has however been an increasing need to make more efficient use of biomass resources due to fossil fuel depletion, global climate change, and energy security [2,3]. Bioenergy offers a potential solution to these societal challenges by offering a renewable alternative to fossil fuels, a reduction in greenhouse gas emissions, and the potential for locally produced energy that assists in developing rural communities [4]. Policies have therefore been implemented in the UK and Europe to promote bioenergy and the growth of energy crops [5–9]. Perennial energy crops are highlighted by several Government reports and strategies as offering significant potential for sustainable bioenergy development [3,4,10,11]. Despite the various policy instruments, grants, and incentives implemented, the cultivation of perennial energy crops has proceeded at a low rate [12–14]. This study reviews key policies since 1990 that could have led to the development of a viable perennial energy crops sector within the UK. An assessment of the energy crops supply market is conducted with a critique of case studies to evaluate the lessons learned and effectiveness of different policies and bioenergy projects.

1.1. Perennial energy crops

Perennial energy crops remain in cultivation for several seasons and are grown primarily for their energy content although they often have broader advantages. The ideal energy crop has efficient solar energy conversion resulting in high yields, needs low agrochemical inputs, has a low water requirement and has low moisture levels at harvest [15], which makes miscanthus and short rotation coppice (SRC) particularly promising [16]. Plants with perennial growth habits have the benefits of low establishment costs (when averaged across the rotation) and fewer annual operations are therefore required [17].

Using woody biomass for renewable energy can make a positive contribution to climate change targets and to the mitigation of greenhouse gas emissions [18]. Increasing locally sourced energy reduces dependency on fossil fuels and improves energy security [19]. SRC can also bring a wide range of environmental benefits to farms and rural situations which are summarised in Fig. 1.

1.2. Policy aspirations for perennial energy crops

Across Europe and in individual countries policy makers are aware of the need for perennial crops in order to reach future renewable energy and climate change targets. For instance, the European Environment Agency estimated that the environmentally compatible arable land area available for energy crops will reach 19 m ha by 2030 [10]. The 2012 UK bioenergy strategy estimates that miscanthus and short rotation coppice (SRC) could occupy between 0.62 m and 2.8 m ha by 2050 [3]. Nevertheless, current UK plantings of these perennial crops are estimated to be around 16,000 ha [25] which is a long way from policy ambitions and estimates. Indeed the remaining plantations could be 10–15% lower than this based on evaluations of crop removals due to issues encountered in the industry [24,25].

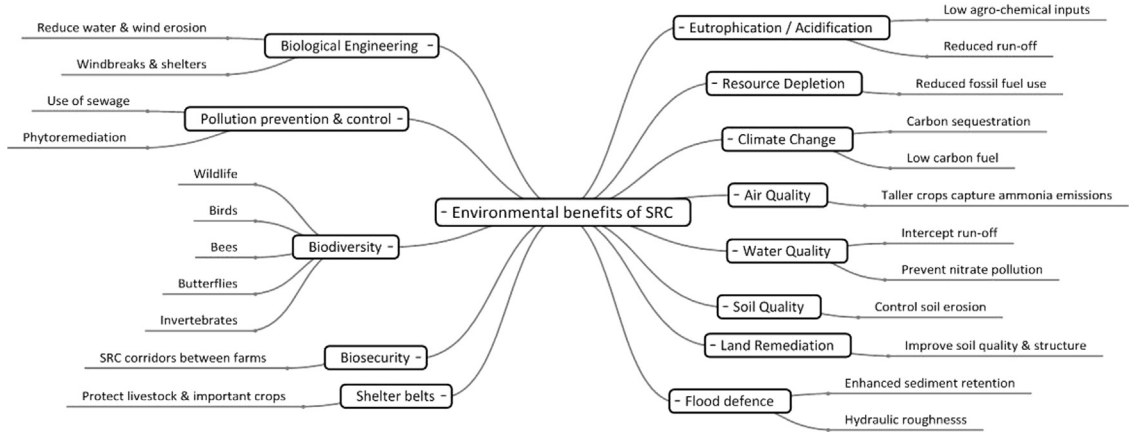

Fig. 1. Summary of the potential multi-functional environmental benefits of SRC [16–24].