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# Developing publicly acceptable tree health policy: public perceptions of tree-breeding solutions to ash dieback among interested publics in the UK

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ABSTRACT

The UK needs to develop effective policy responses to the spread of tree pathogens and pests. This has been given the political urgency following the media and other commentary associated with the arrival of a disease that causes 'dieback' of European Ash (*Fraxinus excelsior*) - a tree species with deep cultural associations. In 2014 the UK government published a plant biosecurity strategy and linked to this invested in research to inform policy. This paper reports the findings of a survey of informed UK publics on the acceptability of various potential strategies to deal with ash dieback, including "no action". During the summer of 2015, we conducted a face-to-face survey of 1152 respondents attending three major countryside events that attract distinct publics interested in the countryside: landowners & land managers; naturalists and gardeners.

We found that UK publics who are likely to engage discursively and politically (through letter writing, petitions etc.) with the issue of ash dieback a) care about the issue, b) want an active response, c) do not really distinguish between ash trees in forestry or ecological settings, and d) prefer traditional breeding solutions. Further that e) younger people and gardeners are open to GM breeding techniques, but f) the more policy-empowered naturalists are more likely to be anti-GM. We suggest that these findings provide three 'steers' for science and policy: 1) policy needs to include an active intervention component involving the breeding of disease-tolerant trees, 2) that the development of disease tolerance using GM-technologies could be part of a tree-breeding policy, and 3) there is a need for an active dialogue with publics to manage expectations on the extent to which science and policy can control tree disease or, put another way, to build acceptability for the prospect that tree diseases may have to run their course.



## 1. Introduction

The spread and establishment of tree pathogens and pests beyond their natural ranges has potentially serious consequences for tree health and therefore also for ecology, economy and society (Brasier, 2008). Such incursions are increasing at a time when plants are stressed by factors such as climate change, habitat fragmentation and development (Webber, 2010). This dynamic is leading to growing concerns relating to tree health (Sutherland, 2008; Budde et al., 2016).

Effective and acceptable policy responses to the threats posed by tree diseases are difficult to formulate. This is on account of the reality that: a) dispersal pathways for pest and pathogens are numerous, poorly known and many are beyond human management control (e.g. air borne diseases), b) trees are located (grow) in many different ownership, cultural and policy contexts, c) the issue attracts the interest of multiple policy lobbies due to the multiple identities that trees possess (e.g. as timber resources, components of ecosystems, and symbols of nation, heritage and/or landscape), and d) the limited contribution of silviculture to developed economies means that this area of policy is often under resourced.

UK policy makers faced the arrival and subsequent spread in the UK of *Hymenoscyphus pseudoalbidus* (a fungal disease also known as Ash dieback (ADB) and *Chalara*) that causes high levels of mortality in Ash (*Fraxinus excelsior*). In the UK European Ash is a well-known and loved tree species on account of its cultural, spiritual and literary associations, and its use as a timber and fuelwood source (Rackham, 2014). Confirmation that this disease was the cause of dieback of several hundred ash trees provoked a spike of media reporting between September and December 2012. Media headlines framed the consequences as potentially worse than those of Dutch elm disease, a virulent strain of which killed an estimated 25 million *Ulmus procera* trees across the UK during the 1970s (Forestry Commission, 2016a). Such reporting and associated commentary generated intense pressure on the government to explain the perceived policy failure and 'do something'.

Tree diseases are nothing new in the UK (Brasier, 2008), however from media and communication perspective (Hansen, 2010), ash dieback and by extension tree health was constructed as a problem of public concern in late 2012. It is likely that the potential impacts of the disease were amplified by a) a recent and successful campaign against the government proposal to 'sell-off' publicly owned woodlands in England, and b) the attention and priority given to media reports by government agencies and environmental bodies which legitimised and

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reinforced the notion of an impending crisis (Potter and Urquhart, 2016;). In short, this case shows that tree health policy is complex and uncertain and can suddenly become political.

In response to rising concern over tree diseases, the UK government established a Tree Health and Biosecurity Expert Task Force. Biosecurity refers to approaches to minimise harm from biological invasions including the spread of pests and diseases (Waage and Mumford, 2008). In 2014 the UK government published its Plant Biosecurity Strategy for Great Britain (Department for Environment, Food and Rural Affairs, DEFRA, 2014). This adopted a risk based approach and included an aim to increase social, environmental and economic resilience to pests (p6) and a specific action to 'build resilience and learning to live with pests' (p10). Linked to this strategy, in 2014 the UK Biotechnology and Biological Sciences Research Council (BBSRC), Natural Environment Research Council (NERC), Department for Environment, Food and Rural Affairs (DEFRA), the Forestry Commission, and the Scottish Government invested £7 million in seven research projects across the Living With Environmental Change (LWEC) Tree Health and Plant Biosecurity Initiative (THAPBI) to generate nature and social science knowledge to '*inform the development of innovative ways of addressing current and emerging threats to trees and woodland ecosystems from pathogens and pests*" (BBSRC, 2013).

This paper reports the findings from a component of a BBSRC-funded research project that aims to develop new approaches for identifying genes conferring tolerance to ADB and as part of this understand the public acceptability of genetic solutions to tree health issues. Specifically, we report the findings of a survey of public attitudes to different approaches towards developing disease tolerant ash trees, ranging from traditional tree breeding to genetic modification (GM).

In representative democracies achieving congruence between public preferences and policy is of particular importance (Wlezien, 2016). Where policy involves new scientific intervention it is important to investigate public attitudes and preferences in order to identify and understand potential concerns and to build an effective public policy dialogue. The introduction of the agricultural GM technology in the 1990s generated a stark public and political controversy that has generated a persistent negative framing of GM technologies and presents a cautionary tale on how not to introduce a new biotechnology. In their astute analysis of the GM experience, Kearnes et al. (2006) pointed to the need for researchers to bring an understanding of 'societal imaginations' relating to their technologies into dialogue with their visions of how their science might solve social and/or policy problems. The present study picks up on this call for 'upstream steers' to scientists on the public acceptability of applied science solutions.

This study, as well as contributing to policy development on tree health and the extent to which agricultural GM concerns spill over into silviculture, contributes to a growing academic literature on the design and efficacy of science-policy interfaces (SPI). Briefly, ideas that scientific legitimacy is predicated on neutrality and objectivity gave rise to the belief that science should be separated from politics and 'speak truth to power' (e.g. Sutherland et al., 2012). In practice SPIs rarely operate in this linear model and many argue that they should not: that effective SPIs involve dialogue between networks involving scientists and other actors involved in the policy process (see e.g. Koetz et al., 2011; Young et al., 2014). Information on the values and attitudes of citizens typically access the SPI though interest group advocacy, opinion makers and/or commissioned studies. An innovation of this study is to bring public attitudes more closely into the scientific research component of a SPI.

To our knowledge, this is the first attempt to explore the attitudes of the British public towards the development of disease tolerant transgenic trees, and to explore the factors affecting their attitudes. As such, it represents one contribution to future policy guidelines regarding the development and introduction of disease tolerant GM trees.

## 2. The spread and impact of ADB

During the last 20 years populations of European ash (*Fraxinus excelsior*) have suffered damage from the invasive pathogenic fungus *Hymenoscyphus fraxineus*. Although the introduction history is not very clear, the pathogen was most likely introduced from Asia to Eastern Europe through movement of *Fraxinus mandshurica* stock that led to a host shift to *F. excelsior* (Drenkhan et al., 2014; Budde et al., 2016). First reports of the disease came from Poland in 1992, where it has since caused a large-scale decline of ash trees (Hantula et al., 2008), and in the following 2 decades the disease spread across Europe. By the mid 1990s it was also found in Lithuania, Latvia and Estonia (European and Mediterranean Plant Protection Organization, EPPO, 2010). In Denmark, where the disease was first observed in 2002, it had spread to the whole country by 2005 (EPPO, 2010). By 2008 the disease was also discovered elsewhere in Scandinavia, the Czech Republic, Slovenia, Germany, Austria and Switzerland (EPPO, 2010). By 2012 it had spread to Belgium, France, Hungary, Italy, Luxembourg, the Netherlands, Romania, Russia, Britain and Ireland (EPPO, 2010). Ash dieback was first identified in Great Britain in 2012 (Forestry Commission, 2016b).

The disease affects trees in all settings: forest, urban and nursery and causes leaf loss, crown dieback and bark lesions in affected trees (Forestry Commission, 2016b). Infection rates are substantial, particularly amongst young trees: Husson et al. (2012) reported infection in 92% of 2400 trees surveyed across 60 forest plots in France, and in two test plantings of 6000 trees in Denmark, <5% of trees remained healthy 10 years after planting (McKinney et al., 2014; Budde et al., 2016).

The experience of managing ash dieback in Europe has been negative so far, with most affected countries failing to control its spread, largely due to the absence of effective strategies for managing the disease (EPPO, 2010; Hantula et al., 2008). Even if effective strategies are identified, the process of restoring the ash tree population across Europe with resistant trees is likely to take decades (EPPO, 2010; Hantula et al., 2008).

The first reported incidence of ADB in Britain involved a consignment of infected trees transported from a nursery in the Netherlands to one in Buckinghamshire in February 2012 (Forestry Commission, 2016b). However, confirmation in October 2012 of cases of ADB in established woodland sites in the eastern counties of Norfolk and Suffolk suggest it may have arrived naturally earlier and remained undetected. Since 2012, the disease has spread across Britain: as of 2016 there were 734 confirmed infection sites covering 25.9% of the country, but particularly affecting trees in Eastern and South-Eastern England and Eastern Scotland (Forestry Commission, 2016b). The full environmental, social and economic impacts of ADB in Britain are not yet clear, but based on experience from continental Europe, there is no doubt that the disease has potential to cause significant damage to Britain's ash population (Forestry Commission, 2016b).

An on-line survey conducted in 2014 found high levels of concern relating to tree health in the UK: 73.9% of respondents identified themselves as "concerned" or "very concerned" about the threat of pests and diseases to UK trees and woodlands (Fuller et al., 2016). However, awareness of newly introduced pests and diseases was low. Just, 30.1% of respondents checked that they had heard of ash dieback, and 80.6% checked that either they had heard of the disease but had no knowledge about it or that they had never heard about the disease.

## 3. Tree-breeding solutions and the GM issue

One option for building resilience to ADB in the British landscape is to (re)plant trees with traits that confer low susceptibility to the disease. In conjunction with nationally recognised experts (including experts in phylogenomics of ash tree, plant scientists, and foresters) we identified the following seven approaches for implementing such a policy (which are not mutually exclusive) based on the source and means of production of tree stock: