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To cite this article: Kingsley Mikwamba, Joost Dessein & Daimon Kambewa (2019): Fighting banana bunchy top disease in Southern Malawi. The interface of knowledge systems and dynamics in a development arena, The Journal of Agricultural Education and Extension, DOI: 10.1080/1389224X.2019.1665077

To link to this article: https://doi.org/10.1080/1389224X.2019.1665077
Fighting banana bunchy top disease in Southern Malawi. The interface of knowledge systems and dynamics in a development arena

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ABSTRACT

Purpose: Banana Bunchy Top Disease (BBTD) was first reported in Malawi in 1997. The major strategy used to deal with BBTD required banana growers to uproot and burn all their bananas and replace them with disease-free imported planting materials. This had limited success only. This paper uses an actor-oriented approach to explain this experience by assessing the different knowledge types and dynamics.

Design/methodology/approach: Using a qualitative study design we sampled respondents through snowball and purposive sampling. Focus group discussions and key informant interviews were used to interview 120 farmers in 5 villages, 5 extension experts, 6 crop scientists, 2 banana research scientists and 3 NGOs leaders. Transcripts were analysed using Grounded Theory Methodology.

Findings: The results showed that development agents and farmers conceived of, and dealt with, BBTD on the basis of different types of knowledge and dynamics. The battle that arose around this knowledge interface explains why the top-down approach to dealing with BBTD led to resistance from banana growers. These top-down approaches contrast with the widely-used rhetoric of using bottom-up approaches to foster co-innovation.

Practical implications: Development actors need to embrace co-innovation principles and move away from merely sticking to the label of bottom up approaches.

Theoretical implications: Using participation as a means to achieve predetermined strategies lead to failure and conflict in development programmes while as consulting with, and listening to farmers has potential to increase their cooperation in development programmes.

Originality/value: The study informs that while there is so much talk about a shift in extension approaches, not much has changed to embrace co-innovation amongst actors.
Introduction

Banana is a major food staple and income-generating crop for over 100 million people in sub-Saharan Africa (Kumar and Hanna 2008). Banana Bunchy Top Disease (BBTD) is recognized as the most devastating virus disease of banana (Dale 1987). BBTD is caused by the Banana bunchy top virus (BBTV), a complex circular single stranded DNA virus with multiple genomic components, belonging to the genus Babuvirus in the Nanoviridae family (Niyongere et al. 2012). The symptoms of BBTD include development of morse code streaking of variable length in the leaf veins, midribs and petioles; progressive dwarfing of leaves and development of marginal leaf chlorosis, upright and crowded leaves at the apex of the plant, hence the name bunchy top disease. The plants affected by the disease at an early stage are unable to produce bunches whereas those infected at a later stage of growth produce bunches often of poor quality (Niyongere et al. 2012). Chlorophyll content and growth differences between virus-infected and control plants are not observed until 40–50 days after the plants are inoculated with viruliferous aphids (Hooks et al. 2008). Hooks et al. (2008) adds that the incubation period of banana bunchy top disease or appearance of symptoms ranges from 25 to 85 days after aphid inoculation.

BBTD was first reported from the Fiji Islands in 1889, but its causal agent was not identified until nearly 100 years later (Harding, Burns, and Dale 1991). To date, BBTD has been recorded in about 33 countries in Africa, Asia, Australia and the South Pacific Islands (Amin et al. 2008; Kumar and Hanna 2008). BBTD affects both industrial and subsistence farmers. Although accurate estimates of yield losses are lacking for the Great Lakes countries of Africa, about 90% yield loss was reported in severely BBTD-infected plants of susceptible cultivars (Niyongere et al. 2013).

The first cases of BBTD in Malawi were reported in 1997 and several efforts have been used to eradicate the disease (Kenyon, Brown, and Khonje 1997). These control measures came gradually. Initially the research experts recommended restricting the movement of planting materials, strict quarantine measures, slashing the infected plants in BBTD infected areas. Later the message was changed to uprooting and burning all banana plants, irrespective of whether they were attacked by BBTD or not. This uprooting was supposed to be followed by a closed season of two years while disease free planting materials were being multiplied locally. Additionally intensive farmer education programmes on controlling the disease with the use of insecticides were conducted (Qazi 2016). Despite all the efforts, the disease hasn’t been eradicated and livelihoods have been negatively affected. Many districts in Malawi have been affected by BBTD, including those of Mulanje, Nkhotakota, Nkhotakotakato and Salima. It is a challenge to estimate figures for the production area of bananas in Malawi, because the production systems of bananas in most cases do not have well demarcated banana plantations. There are a lot of backyard mats and in most cases mats spread sporadically in the field or across field boundaries without any control. However, Thyolo district in Southern Malawi was unanimously identified by key informants from both research and extension as the worst hit district although there were no verifiable figures about hectarage to be used for the comparison. BBTD caused huge economic losses and damaged many smallholder farmers’ livelihoods. Due to the acute shortage of bananas in Malawi, the country resorted to importing bananas from Tanzania to satisfy the local demand. This necessitated that BBTD be dealt with as a matter of urgency.
Several actors were involved in dealing with BBTD and introduced several mechanisms to cope with the disease, although with little success. This failure to completely eradicate BBTD raises the question whether the approaches used provided an opportunity for all actors to co-innovate. In order for an innovation system to be successful in meetings its goals, the objectives, strategies and actions of the different actors engaged need to be aligned (Segers et al. 2008). Long (1999) has pointed out that perceptions of technical experts, extension workers and farmers about the aims of agricultural development seldom completely coincide. The differences that exist amongst them are not merely due to personal idiosyncrasies but reflect different patterns of socialization and professionalization, and can often result in miscommunication or a clash of rationalities (see, e.g. Chambers, 1983; Box, 1984 in Long 1999). In this study we examine how and why the technical-scientific knowledge of ‘experts’ and the popular knowledge of farmers failed to coincide in the control of BBTD in Thyolo District of Malawi. We use an interface analysis (Long 1999) to unravel the roles of, and interactions, between farmers and researchers and extension experts as their deliverers.

Theoretical framework

The notion of social interface offers a way of exploring and understanding the issues of diversity and conflict inherent in external interventions (Long 2001). Long (2001) further argues that interfaces typically occur at different points. Interfaces may occur where different, and often conflicting, life worlds or social fields intersect and more concretely, in social situations or arenas in which interactions become oriented around problems of bridging, accommodating, segregating/countesting social, evaluative and cognitive standpoints. In a healthy and effective ‘innovation system’ there are strong flows of information and fruitful coalitions between key actors over time (Matsaert et al. 2005) and yet this is not always the case.

The study examines the different knowledge fronts of different actors. Long (1999) defines knowledge as a cognitive and social construction that results from, and is constantly shaped by, the experiences, encounters and discontinuities that emerge at the points of intersection between different actors’ life worlds. Knowledge refers to the broad variety of human activities, concepts and ways of being social, or the ‘knowledge of doing’ (Krauss 2005). In a development arena, differences in knowledge influence the outcome of confrontations between different actors. However, knowledge is not evenly distributed within populations and some actors have more knowledge than others. This may be influenced by gender, class, age, occupation and social status and both the level of knowledge and these attributes can inform the objectives and strategies of local actors (Sardan Olivier 2005).

Knowledge is a social construct that is informed by the shifting of overlapping paradigms that are constantly evolving. In their comprehensive overview of shifting paradigms in rural development, Ellis and Biggs (2001) distinguished four main paradigms that evolve in a non-linear, complex way, which are overlapping and interrelated. As a reaction to the dual-economy approach of the 1950s, the ‘agricultural growth based on small-farm efficiency’ paradigm led to the promotion of small-farm-first approaches (see also Smalley 2013, 3). In the 1980s and 1990s, there was an evolution from a top-down, blueprint
approach to a bottom-up, grassroots, or ‘process’ approach. This paradigm was based on participatory processes designed to empower rural dwellers to decide on their own priorities for change. From the 2000s onwards, the livelihoods paradigm took an open-ended view of the combination of assets and activities that constitute viable livelihood strategies for rural households (Parizeau 2015).

Blaikie (2000) has evaluated how these development paradigms were actualized. In the classical approach to technical change, common in developing countries prior to 1970, research agendas were determined by scientists ex situ and local or indigenous knowledge was entirely absent. The neo-liberal counter revolution, exemplified in the approach of the World Bank (1990–1995) prioritized the market, assumed that local farmers are economically rational in their behaviour and that suitable technologies for development were available or could easily be devised. The contemporary neo-populist paradigm shows a continuum of degrees in which local people participate in problem identification, research design and implementation. At one extreme, technologies are developed ex situ and are adapted through local ‘participation’ (Marglin and Marglin 1990; Pimbert and Pretty 1994). Another position holds that local people have their own effective knowledge and resource use practices and that development practitioners need to understand and evaluate the potential vitality and relevance of these knowledge and management systems through extensive dialogue in order to facilitate development (Blaikie et al. 1997). While this participatory rhetoric is popular in theory the results of the interface between different knowledge systems shows that the potential of local knowledge is often not given equal weight when it comes to making technological decisions (Corburn 2003). Although contemporary scholars stress the value of ‘Traditional Ecological Knowledge’ (Berkes 2018) and point at the importance of hybrid knowledge and ‘vernacular expertise’ to challenge the exclusivity of scientific knowledge in development processes (Lowe et al. 2019), many initiatives that promote technologies designed to foster rural development don’t take these into account. Already in the 1990s, Blaikie et al. (1997) denounced this lack of dialogue, consultation and on the ground research with local people, and thus implicitly the negation of local knowledge and the de facto classic, linear process of technology transfer approach.

This study explores the extent to which different knowledge types and dynamics in the development arena impacted on eradication efforts of BBTD in Malawi. The study presents an opportunity to understand the practices of actors involved in implementing BBTD control interventions. While there is plenty of literature on biophysical strategies for dealing with BBTD (Kumar et al. 2011; Omondi et al. 2017), there is a lack of detailed sociological studies that identify and trace the types and dynamics of knowledge used by actors involved in managing BBTD. Two research questions are addressed by this study. Firstly, which actors were involved in BBTD control? In answering this question the study has identified the key actors in the innovation system involved in the control of BBTD, mapped the links and information flows between them, and looked at how these supported or inhibited BBTD initiatives. Secondly, what were the actors’ views on and underlying knowledge about BBTD control? Here we have isolated the different views and knowledge types and dynamics of the different actors. This enabled us to understand the kind of relationships that existed between experts and locals.
Research methodology

Adopting an actor-oriented approach, we deployed a qualitative research design (Lyons and Coyle 2016) to elicit the conflicting paradigms and knowledges present in the control of BBTD. Data collection was spread over two periods. In September 2016, an exploratory study (Stebbins 2001) was carried out to select the worst-hit district. The exploratory study was done in three major banana growing districts: Mulanje, Thyolo and Nkhatabay. The second field work was conducted in November 2016 when we carried out a series of semi-structured interviews. The target of our investigations was Thyolo District where we interviewed banana growers, actors from extension and research organizations. Chizinga and Muwata Villages in Mawonga Section were purposively selected because Mawonga Section was the worst hit and it was also the only section where uprooting of diseased plants and planting of imported disease free planting materials had been implemented. So a whole range of activities and events of the BBTD control programme were experienced in the research area. The interviews were recorded and we have used quotes from these interviews to illustrate the arguments (Seidman 2013).

We used ethnographic techniques (Denscombe 2010; Scott and Garner 2013) to collect data using focus group discussions (FGD) with farmer groups and key informant interviews with local leaders, extension workers, senior government officials involved in research and extension, NGO officials, and representatives of BBTD management committees (see Table 1 below). Most of the interviews were done in groups of committees

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Type of actor</th>
<th>Number of interviews/respondents</th>
<th>Tool(s) used to collect data</th>
</tr>
</thead>
<tbody>
<tr>
<td>District Agricultural Development Office (DADO), Thyolo</td>
<td>Extension specialists</td>
<td>5</td>
<td>Key informant Interviews</td>
</tr>
<tr>
<td>Blantyre Agricultural Development Division (BLADD)</td>
<td>Crop Scientists</td>
<td>6</td>
<td>Key informant Interviews</td>
</tr>
<tr>
<td>Bvumbwe Agricultural Research Station</td>
<td>Research Scientists</td>
<td>2</td>
<td>Key informant Interviews</td>
</tr>
<tr>
<td>Mawonga Village</td>
<td>Banana growing farmers</td>
<td>17</td>
<td>FGD and Key informant Interviews</td>
</tr>
<tr>
<td></td>
<td>Uprooting Committee Members</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Welekesi Village</td>
<td>Banana-growing farmers</td>
<td>15</td>
<td>FGD and Key informant Interviews</td>
</tr>
<tr>
<td></td>
<td>Uprooting Committee Members</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Kalimtulo Village</td>
<td>Banana-growing farmers</td>
<td>14</td>
<td>FGD and Key informant Interviews</td>
</tr>
<tr>
<td></td>
<td>Uprooting Committee Members</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Chizinja Village</td>
<td>Banana-growing farmers</td>
<td>16</td>
<td>FGD and Key informant Interviews</td>
</tr>
<tr>
<td></td>
<td>Uprooting Committee Members</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Muwata Village</td>
<td>Banana-growing farmers</td>
<td>18</td>
<td>FGD and Key informant Interviews</td>
</tr>
<tr>
<td></td>
<td>Uprooting Committee Members</td>
<td>8</td>
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</tr>
<tr>
<td>CARD</td>
<td>NGO</td>
<td>2</td>
<td>Key informant Interviews</td>
</tr>
<tr>
<td>Plan Malawi</td>
<td>NGO</td>
<td>1</td>
<td>Key informant Interviews</td>
</tr>
</tbody>
</table>
but individuals were also interviewed. The extension worker and the local leaders were interviewed individually. The summary of interviewees is presented in Table 1 below:

The questions asked were unstructured as only a checklist was prepared to understand who were the actors, what roles they performed and how the farmers (re)acted in a particular situation and why. The interviews were recorded after obtaining consent from respondents. Chichewa, the local language of the area was used to conduct interviews in the villages. Interviews with other actors were done both in Chichewa and English.

Data analysis was done by use of Grounded Theory Methodology (GTM). GTM was considered an appropriate approach and analysis method because it facilitates development of a theory by means of continuous data collection and analysis, and allows theoretical concepts to emerge from the data without being influenced by predefined frames of previously existing theories (Braun and Clarke 2013; Kornilaki and Font 2019). GTM involves the progressive identification and integration of categories of meaning from data and it is both the process of category identification and integration (as method) and its product (as theory) (https://www.mheducation.co.uk/openup/chapters/9780335244492.pdf, 2019).

The process of data analysis involved familiarization with data through reviews, reading, listening etc. The data was transcribed into narratives. Coding followed transcription and later data was used to identify themes. Themes were then converted into categories. Relationships amongst categories were explored and later development of theory and incorporation of pre-existing knowledge was done. Figure 1 below shows how the analysis was carried out using Grounded Theory Methodology. Starting from the qualitative data, and inspired by Strauss and Corbin (1998; as applied in Rogge,

![Figure 1](https://www.mheducation.co.uk/openup/chapters/9780335244492.pdf)

**Figure 1.** The coding sequence in Grounded Theory: starting from a number of categories (defined in open coding), axial coding leads to clusters of meaning, that are combined into a meaningful general narrative (selective coding) (source: authors).
Dessein, and Gulinck 2011), we developed concepts, that were combined into interrelated categories in a sequence of open, axial and selective coding, and in the end led to the general narrative and theoretical concepts of the research.

The presentation of findings has been supported by quotes from interviews. In reporting the findings, depending on the data source, some actors have been reported from an external point of view while in other cases it is the actors’ own perspective.

Results and discussion

The main actors involved in the control of BBTD and the knowledge dynamics

The study distinguishes between different types of knowledge held by different groups of actors who were obliged to interact with each other in combating the threat posed by BBTD in Malawi.

The main actors involved in the management of BBTD were research and extension experts, local leaders, farmers, Banana Bunchy Top Uprooting Committees, Community Police and locally-active NGOs. The relationships amongst them varied, ranging from long-established, trustful relations, to tensions and mistrust.

Research experts from the Bvumbwe Agricultural Research Station were in the forefront in passing on recommendations on ways to control BBTD through the existing extension system to farmers. The Department of Agricultural Research in Malawi (DARS) has several research stations and each station has a specific mandate. The Bvumbwe Agricultural Research Station, which is, coincidentally, in Thyolo is responsible for horticultural crops including bananas. So its scientific officers were well placed to be involved in the control of BBTD. One of the strategies research experts used was to take samples and test them in the laboratory to make ultimate recommendations on BBTD. They also connected with development partners (such as the World Bank) to provide support in developing a response. Since this was the first time efforts to control BBTD were intensified, the networks with outside world were very useful to learn how other countries/regions of the world had dealt with it. Research experts consulted existing banana research networks such as the French Agricultural Research Centre for International Development (CIRAD) to learn how BBTD had been controlled elsewhere. Research took the lead in importing the new disease free planting materials. The imported varieties were Williams and Grand naine (AAA genotypes) while the varieties that were being replaced were Williams and Mulanje (AAA genotypes as well). The disease free planting materials were supplied as a start-up, so they had to be multiplied locally.

Extension experts from Thyolo District Agriculture Development Office (DADO) and at the area level were involved at the ground level, interacting with farmers in controlling the BBTD. The DADO has various subject matter specialists (SMS) including horticulture, crop protection and extension. All these SMSs work through frontline extension (AEDOs) workers who work in designated geographic areas. For the purpose of this study all the SMSs and AEDOs are regarded as extension experts. They used different means to communicate various messages to farmers in ways that were designed to be easily understandable to them. At the higher level, the Thyolo DADO is supported by the Blantyre Agricultural Development Division (BLADD) with technical expertise in different
aspects of crop management and extension who also played a role in the management of BBTD. The BLADD backstops several districts, including Thyolo.

Farmers were the major actors in the control of BBTD, as they were in charge of managing the banana plants. They were asked to uproot and burn all their banana plants, with the promise that if they did so, they would be provided with imported disease-free banana suckers. This uprooting and replacing of diseased bananas came as a last resort, after other measures failed to eradicate BBTD. However, the abrupt and forced adoption of a seemingly new banana variety after uprooting was not a smooth process for several reasons. Bananas in Thyolo are ‘territorialised complex goods’ (Landel, Gagnol, and Oiry-Varacca 2014 in Dessein 2016): goods with an ensemble of often non-codified ‘territorial attributes’, such as knowledge, emotions, beliefs, images and experiences that are anchored in a specific area. Bananas are culturally embedded and loaded with symbolic value as contributors to the pride and identity of local farmers and their belonging to an area. Bananas are seen as belonging to the cosmological realms, and the planting of bananas is regarded as a ritual to cure evil spirits, while uprooting them is thought to lead to madness or death in the family. These beliefs contributed to households’ resistance to uprooting banana mats, for fear of the consequences. By contrast, the characteristics of the new varieties were unknown to the farmers and to grow them successfully the banana farmers had to implement recommendations from the extension experts. The recommendation to uproot and burn bananas gave rise to conflicts, as this ran against the cultural meanings of bananas. At the same time, the districts’ reputation as a banana growing area was being challenged by uprooting bananas. Thyolo used to receive many visitors who came to buy bananas to resell in urban centres. This meant that there were also economic reasons for farmers not wanting to uproot and burn their bananas.

Local leaders were central to the control of BBTD. According to Margolies, Aberman, and Gelli (2017) local leaders in Malawi play a primary role in establishing and maintaining norms as well as in decision-making around community resource management. Local leaders are the primary reference in shaping their subjects’ beliefs and actions, promoting good conduct and establishing or enforcing shared customs. They are also responsible for establishing and enforcing sanctions.

Like most of the banana growers, local leaders initially resisted cooperation with the authorities. However, the extension experts (in consultation with research experts) facilitated a visit by village leaders to Bvumbwe Agricultural Research Station to see the disease free planting materials that were being readied for distribution to villages that had uprooted and burnt their old banana plants. The assumption was that once the local leaders were convinced, they could easily get their subjects follow their commands. As the common saying goes that ‘seeing is believing’, the visit to the research station somehow convinced the local leaders of the availability of planting materials to be distributed after uprooting the infected bananas. Because of the conviction the local leaders had, they ultimately became mediating figures between the farmers and extension workers. Their support was crucial as local leaders in Malawi often act as an entry point for research and extension experts to the village. They are the first to be informed and convinced of the need to mobilize their subjects to engage in development projects. Local leaders were also responsible for sanctioning those farmers who resisted uprooting diseased bananas and they accompanied the Uprooting Committees, to increase the pressure on the farmers to uproot.
Uprooting Committees: After their visit to Bvumbwe Agricultural Research Station, the local leaders mobilized the villagers with the aim of building a common front for managing the disease. Informal Uprooting Committees were set up in each village with the mandate of overseeing the uprooting and burning of bananas, irrespective of whether or not they were infected. Often it turned out that the committee members themselves were the ones who did the uprooting and burning. The villagers were promised that once all the diseased bananas were uprooted each household would receive five disease-free imported planting materials which were multiplied locally. Although it appeared that everybody was convinced of the gravity of the BBTD problem, there were many farmers who either did not want or could not manage to uproot their bananas, and this gave rise to tensions between farmers and the Uprooting Committees.

Community Police stood on the side-lines overseeing uncooperative farmers. It was agreed in the village and communicated to all villagers that those farmers who resisted having their bananas uprooted would be sanctioned by the Community Police. There were two layers of the police involved. The first layer were the community police fora, composed of members of the village chosen to enforce law and order at the village level. The second layer was the Malawi Police Service, which provided a back up to the local Community Police. Members of the Community Police are trained by Malawi Police Service and play a useful role in the community in enforcing the law without involving the police. The community police fora were initially set up in response to the low police to citizen ratio in Malawi and to address the problems of policing remote rural areas. In the case of BBTD, they were useful in handling cases of resistance to uprooting banana mats. Farmers who resisted to uproot their mats were being sanctioned by the Community Police who in turn referred cases to the Malawi Police Service for arbitration. These layers of the police proved powerful enough to influence farmers to reconsider their tough or uncooperative stance towards uprooting.

Non-Governmental Organizations. Surprisingly, the NGOs working in Thyolo District, involved in various programmes to improve peoples’ livelihoods decided to not directly take part in the control of BBTD. Churches Action in Relief and Development (CARD) is one of the leading NGOs in the area that responded to BBTD in an indirect way. Instead of looking for direct solutions to BBTD, it promoted livelihoods programmes that focused on irrigation and growing of pigeon peas. CARD felt that these initiatives would offer banana-growing farmers alternative opportunities for raising money. Based on our discussions we learnt that the NGOs in Thyolo focused on programmes that aimed at bringing instant results as their annual funding cycles depended on achieving yearly results and this precludes them from engaging in activities that only yield results in the longer term, such as the BBTD control programme. NGOs did participate in distribution of suckers, whose results could be seen within a short period of time but they did not participate in the BBTD control programme, as eradication takes a long time and results would only be visible in the long run.

Dynamics at the interface of the fight against BBTD

The development arena of the fight against BBTD harboured the different actors with their different knowledge types and dynamics as outlined above. This section demonstrates how the uprooting and replacing of bananas happened at the interface of different actors’
knowledges and how this affected the process of co-innovation. The term co-innovation has been used in this study to mean a new innovation paradigm where new ideas and approaches from various internal and external sources are integrated in a platform to generate new organizational and shared values (Lee, Olson, and Trimi 2012).

The ‘expert system’
The position and practices of research and extension experts epitomized the classic transfer-of-technology approach, with an attitude of blaming the farmers if they disregarded scientific knowledge in their practices.

In the study area the researchers are non-rural actors who operate from ‘central places’ (both from the headquarters in the Capital, and the regional office, located in the district). Researchers had periodic interactions with extension actors and made occasional visits to rural areas. This approach closely followed the linear ‘Transfer of Technology’ paradigm with researchers making recommendations to extension agents to pass on to farmers, who were expected to adopt the new technologies. Research experts invited local leaders to the research station where they were shown the imported banana plants which were being prepared for distribution. On their return to the village, the local leaders were energized to facilitate uprooting and burning. In the next step, researchers recommended intensified quarantine measures for bananas which involved restricting the movement of banana planting material from infected to disease-free areas. Researchers were also involved in the introduction, production and distribution of clean planting materials through tissue culture and indexing, through which germ plasma of local varieties was protected for future usage and kept in green houses. Researchers also initiated disease resistance/tolerance variety screening trials and facilitated the importation of tissue culture plants from France and South Africa. The selection of the varieties to be imported was made by researchers in consultation with extension agents. Local farmers were not involved in the selection of the cultivars to import. One researcher whom we interviewed emphatically defended non-involvement of farmers as follows, ‘we [the researchers] had to choose the varieties for import, considering high yielding and sweetness, because farmers don’t know about this’.

The ToT-approach was also reflected in the communication and dissemination strategies of the extension apparatus which provides the link between researchers and farmers. The public awareness campaigns through mass media and village meetings were selective and only targeted at areas affected by BBTD. As a result, farmers from other areas were unaware about the problem of BBTD and some acquired suckers from affected areas and planted them in their backyards and gardens, thereby unwittingly spreading the disease. We found out that some NGOs operating in other districts (i.e. Phalombe District) unwittingly bought suckers from infected areas and distributed them in a virus-free area, also spreading the disease, as they were not linked to the expert knowledge system.

A disregard of scientific knowledge
There had been very little research done on bananas in Malawi, partly because generally research funds in the agriculture sector come from international donors that had not shown any interest in banana research. It is also known that banana is an orphan crop. Orphan crops or ‘neglected or underutilized’, ‘minor’ or ‘promising’ crops are crops
that have been overlooked by research, extension services and policy makers; governments rarely allocate resources for their promotion and development (Tadele 2009, http://www.fao.org/news/story/en/item/1032516/icode/2019). So bananas have always been neglected while research into onions or sweet potatoes has received a lot of funding because of the short term rewards.

This said, even the available scientific knowledge was often ignored. Although the research experts backed up their recommendations with scientific arguments, these were not reflected in the agronomic practices that they suggested. For example they recommended a quarantine period of just three months after uprooting and burning, even though they were aware that the literature recommends two years (Qazi 2016) before introducing disease free banana plants. In addition, the recommendation to maintain a buffer zone of thirty metres (Niyongere et al. 2013) was violated. Disease free planting materials were distributed at the village level, and were planted in some villages while adjacent village gardens had not yet uprooted their infested banana mats. Some farmers also shared the disease free planting materials with farmers from villages, even when these villages had not yet uprooted and burnt their old bananas.

The findings showed that certain groups of actors, such as the extension experts and the research experts, easily bond, as they are on the same side of the interface and share the same type of ‘technical-scientific knowledge’ (TSK) (Sardan Olivier 2005). The acquisition of this shared knowledge not only creates to a common language and shared frames of reference, but also shared social and professional networks as these experts go through a similar kind of education, frequent the same social networks and belong to related bureaucratic and administrative systems.

These two groups are empowered by the TSK-complex when they enter the arena. It allows them to impose their agenda, based on their science-based, but reductionist and singular perspective on the BBTD problem: bananas needed to be uprooted and burnt and be replaced with disease free plants imported into Malawi. Confronted with a number of failed strategies to deal with BBTD, the research and extension experts saw the newly-found way of uprooting, burning and replacing bananas as a science-based, hence non-negotiable, panacea. They did not engage in negotiations or dialogue with the locals, assuming that the latter had no alternative to accepting the logic of their approach.

This reliance on the knowledge generated by the TSK-complex excludes some of the arguments of local farmers which were based on lay, or popular, knowledge – referring to experiences, taste, and ‘territorial attributes’ (Landel, Gagnol, and Oiry-Varacca 2014).

This suggests that researchers and extension experts are (still) stuck in the top down approach although they claim to pursue a bottom up approach as promoted under the District Agricultural Extension Services System (GoM 2006). Comments such as ‘farmers don’t know’ or ‘if you are illiterate, you cannot be knowledgeable’ demonstrate how the representatives of the TSK-complex lack respect for other kinds of knowledge. When selecting the new banana varieties, or deciding on the criteria for distributing the new planting materials, the actors in the TSK complex did not seek any input from farmers, thereby disregarding the role and knowledge of key actors in decision making. Farmers’ interests were not articulated in these processes and the innovation was far from inclusive (Crivits et al. 2014). This may have been an a priori source of farmers’ resistance to recommendations that were being made.
According to extension experts, the practices of the farmers helped spread BBTD by ignoring recommendations coming from the research and extension experts, because of their illiteracy and not belonging to the TSK-complex. However, the popular knowledge (Sardan Olivier 2005) of the farmers, based on generations of experience in and knowledge gleaned from growing bananas, gave them the confidence that they are skilled and knowledgeable enough. Hence they considered themselves to be ‘farmer-experts’, and the research and extension experts to be learners.

**Blaming the farmers**

Researchers and extension experts were often highly critical of banana farmers’ attitudes, knowledge and practices and often resorted to ‘blaming the farmers’ when things did not go as planned.

Research scientists believed that one of the causes of BBTD was poor husbandry practices. As one researcher remarked; ‘farmers were not following good husbandry practices: some have big banana mats, as big as my office, against the recommendation of having 3 or 4 plants per mat’. One of the extension experts’ main tasks, acting as a link between researchers and farmers in the fight against BBTD, was to convince farmers of the seriousness of the BBTD problem. They often interpreted farmers’ resistance towards uprooting and burning, as stubbornness, due to illiteracy, and often mocked farmers as ‘ignorant’.

One extension expert explained, while laughing: ‘you know, it was very hard to convince the illiterate people in the villages … at first, they didn’t even know it was a problem’.

Local banana growers were sceptical of the measures proposed for controlling BBTD, which was in part a reaction to the position and practices of research and extension experts. Bananas mean a lot to the people of Mawonga, as one local resident said: ‘ever since we were born we have been growing bananas, all our fathers did’. Almost every household in the area had banana plants which were a source of food security as well as cash income. Local farmers claimed that most of the improvements in their livelihoods were banana-related: ‘the iron sheets on the houses are the result of bananas’. The farmers expressed an attachment to their district-specific varieties, and wanted to hold on to them: ‘I want these banana varieties to be an inheritance to my children.’ They kept on saying this even though they had not appreciated the new varieties that were being introduced and that were in no way different from what they had been growing.

**Poor communication**

While researchers didn’t invest much in banana (for the reasons discussed above) the extension services connections with the research area were also very limited. With a poor road network, limited electricity supply or, internet connectivity few extension workers were willing to work in such deprived circumstances. Consequently, farmers had become used to growing bananas without any technical advice and did not know about or follow recommended husbandry practices. Growing too many banana plants in one place (a very common observation in the study area) is illustrative of the local lack of agronomic knowledge.

**The ‘unseen costs’ of destroying bananas mats**

The extension service expected farmers to act upon the recommendations from researchers that it delivered to them. However, the banana growers did not respond to the initial
advice to slash their bananas, arguing that the local varieties had a better taste and that they had no alternatives. At the same time BBTD continued to spread over larger areas. Later on, when the recommendation was changed to uprooting and burning all plants, whether or not affected, farmers’ resistance became more pronounced, revolving around a number of arguments.

Firstly, some varieties of bananas were initially able to withstand BBTD and farmers resisted uprooting these, although their immunity was only temporarily. While surviving temporarily, these varieties also acted as carriers which were spreading the disease. The growers believed that leaving the plant for as long as it is bearing a little fruit, was better than uprooting it and harvesting nothing. Since in the words of one grower: ‘half a loaf of bread is better than none’. Aware of the financial consequences of uprooting, also the poorly productive mats of bananas worried farmers. The decline in yields due to BBTD meant that, in words of one farmer: ‘it has been a long time since some of us have seen a K500 note’, but uprooting and destroying a mat would mean that this meagre income would be completely lost. One farmer told us that ‘many farmers are now working in tea and coffee estates, as a coping strategy to raise money for their needs, even though the wages are low and the job opportunities are often far away’. The locally active NGOs who were promoting the introduction of other crops also faced farmer reluctance, as the skills and investments required to switch to irrigation and pigeon pea farming were much higher than for banana cultivation.

Each household had many, and often large, mats of banana, and viewed bananas as a wild crop, not requiring much husbandry, which they allowed to grow without any control. Uprooting was a significant and labour intensive job and farmers preferred to use their time and energy in activities deemed more productive than digging up banana mats that were dying anyway. Further resistance to uprooting and burning banana mats came from the consideration that, aside from providing food and a cash income, they also deliver multiple other benefits: acting as a wind breaker against whirlwinds around the homestead, a soil erosion control mechanism, as livestock feed, a provider of shade and serving as living fences and/or indicators of boundaries. With some awareness of the upcoming threats of climate change, some farmers conceived of BBTD as a result of climate change, and hence didn’t believe the explanations provided by the extension workers, leading to a general atmosphere of distrust between extension workers and farmers.

The local leadership creates a breakthrough in fighting BBTD

Local leaders were initially hesitant to spearhead the uprooting and burning of banana plants. After their visit to Bvumbwe Agricultural Research Station they became more convinced and, after experiencing some pressure from extension workers to lead the uprooting and burning of bananas, they used their influence to persuade resisting farmers in their villages to participate in the campaign.

With guidance from extension officers, the leaders mobilized and encouraged villagers to eradicate BBTD once and for all. At village meetings the villagers were sensitized on the effects of BBTD and how to control it. Later on the villagers agreed to form committees to deal with BBTD, following the recommendations from the researchers that came through the extension service. In principle the Uprooting Committees were meant to oversee the uprooting and burning by the banana growers themselves. However this did not go as
planned, as there was so much resistance from the farmers. Being squeezed between pressure from the extension officers, the danger of a loss of face for failing to implement the recommendation, and the reluctance of farmers to uproot and burn their banana mats the leaders ordered the committees to use force to uproot and burn the mats of resisting farmers in order that the whole village could receive disease free planting materials. In many instances, the presence of the Community Police was necessary to have the mats uprooted. Those farmers that resisted stood by their banana crop and threatened to harm anyone who dared come close to it. In such situations the Community Police led the Uprooting Committee in uprooting the mats.

This caused some divisions in the local community. The Uprooting Committees saw themselves as having the blessings of local leaders and the majority of the other villagers to uproot and burn all the bananas in the village and sometimes became over-enthusiastic in uprooting and burning mats, sometimes doing so without permission from the owners, claiming that this was the only way that the village would receive the new banana plants. The actions of the Uprooting Committees sometimes sparked local reactions and in some instances, disgruntled villagers confiscated the Committees’ equipment or castigated and mocked the committee members, as one committee member recalled: ‘they still mock us, saying that they did not participate in uprooting the bananas and yet they still received the new banana plants’.

**NGOs: operating on the fringe of the development arena**

NGOs operating in the study area only took part indirectly in the BBTD eradication and replacement programme, despite the issue being identified as the main local priority in a participatory scenario planning in disaster risk management conducted by the NGO CARD. As their programmes did not include banana production the NGOs’ programmes could not directly formulate a response to BBTD. Apart from using some funding to create awareness meetings at district level, NGOs continued to work to promote irrigation and other enterprises, irrespective of the gravity of the effects of BBTD on peoples’ livelihoods.

In the village, the local leaders, the Uprooting Committees and the Community Police aligned themselves with the extension and research experts, de facto approving their opinions. These three groups were the first to be in contact with research and extension experts and became privileged clients of the research and extension apparatus. Although their mutual relations are stronger than those with agents of the TSK, their frequent interaction with the research and extension agents, and the privileged relation that they developed with them, led them represent their ideas and become spokespersons of the TSK-complex. After the local leaders were shown the suckers being readied for distribution, they were motivated and pushed the Uprooting Committees and Community Police to work harder. So communication and power differentials between locals and leaders played a role in shaping the strategies employed. Following a ‘what is in it for me’-attitude (Lindstad 2018), the Uprooting Committees and the Community Police may have worked harder in the expectation that local leaders would share more suckers with them than with the other villagers. The Uprooting Committees and the local leaders took on the role of middlemen and brokers, bridging the social interface between the experts and the farmers, and the Uprooting Committees satisfied the experts’ requests by uprooting the bananas themselves and working closely with the local leaders. This relationship between local leaders and the Uprooting Committee was not a new phenomenon, and
also relies on the accumulating of more benefits for themselves from free inputs distributed under the Farm Input Subsidy Program.

The local farmers who resisted the uprooting of bananas did so on the basis of their popular knowledge and the cultural significance of bananas rather than on the grounds of scientific rationality or knowledge about BBTD. In addition, the year-long interaction between the farmers and the research and extension experts in domains other than banana cultivation, eroded the confidence and trust that are fundamental in overcoming challenges of the social interface. This was intensified by the experts’ lack of transparency in explaining their objectives which would, if better explained, have gone a long way to fostering better mutual understanding and overcoming a barrier to agreement (Rogge, Dessein, and Verhoeve 2013). The farmers had many experiences with government officials and their free distribution programmes. For example, only a few farmers benefited from the Farm Input Subsidy Program in 2009 and more often the families of the local leaders were the prime beneficiaries, with the benefits trickling down and following patterns of kinship and clientelism.

The BBTD disease spread slowly and gradually over a long period of time, disguising the gravity of the problem. Farmers’ incomes declined very slowly so it was only after a while that farmers realized the devastating effect of BBTD. Their precarious livelihoods, whose development is constrained by a lack of financial and natural resources, meant that they were unable or unwilling to develop a business-like approach toward banana cultivation, as they were encouraged to do by the extension and research experts. The phrase ‘half a loaf of bread is better than none’ is illustrative of farmers’ attitudes and their willingness to eke out a living at subsistence level with limited risks, rather than adopt a long term, banana-based business development strategy.

Although there was some history of interaction between the farmers and experts over a number of issues, the extension and research services had previously focused their energies on bananas: banana husbandry relied on popular knowledge, which until BBTD, was able to deal with the challenges that arose. The slow appearance of the disease, generated a new set of interactions between the two groups, with a whole machinery of experts entering the rural arena, facilitated by local leaders and their committees, who required the local population to uproot and burn a crop that was at the core of their livelihoods and cultural identity. In such scenario, resistance to change was very likely.

There was no direct response from locally-active NGOs to the BBTD crisis. They chose to address the problems of reduced livelihoods caused by uprooting bananas by implementing programmes that assumed that farmers would swiftly switch to other crops, notably pigeon peas and horticultural crop production through irrigation, and be willing to learn the necessary skills and make the required changes in management practices. This would have forced farmers to adopt a completely different logic. While bananas give a continuous yield throughout the year, the harvest of pigeon peas comes all at once, easily leading to an oversupply. NGOs emphasized that their approach came about because their plans and budgets are rigid and not flexible enough to respond to emergencies. The reality is that NGOs are stuck in a cycle of yearly reporting and funding renewals that are based on them having achieved tangible results in relation to specified targets. Banana growing did not fit in with these requirements.
Conclusions

This article has examined the emergence of BBTD in Thyolo District, Malawi, the relationships between the different actors involved and the subsequent battles that were based on different forms of knowledge and meaning. Data were collected and analysed in a rigorous way. The major limitation of the study is that the data collection was carried out after the uprooting of diseased banana plants and replanting with disease free planting materials; as such it is possible that some of the information may have been missed because data were only gathered afterwards. Probably if the study was done before and during the activities, the results could have been slightly different.

Despite this limitation, we have shown how different kinds of knowledge, exemplified as technical-scientific knowledge and popular knowledge, co-existed and interacted with each other with one clearly having a privileged position (Koutsouris 2008). Through the combination of different knowledges, all actors defined the problem in their own way, leading to different kinds of solutions. The TSK system defined BBTD as a technical problem, requiring technical solutions. The solution of destroying and then replacing the infected bananas was seen and presented as science-based, but little thought was given to how this would be achieved or to possible sources of resistance. The extension agents worked hard to package their messages in order to convince the farmers to implement the researchers' recommendations. But, when the farmers looked at the benefits they derived from the bananas, they were reluctant to uproot and burn the bananas, hence giving rise to inevitable conflicts. The findings show an absence of respect for social cultural values and farmers' realities and of a willingness to integrate these with scientific recommendations. Local leaders, who collaborated with the research and extension agents could have played a key role as intermediaries here, but rather than seeking to synthesize STK and popular knowledge, they used their power to enforce the uprooting and burning, in the face of determined heavy resistance from the farmers. Farmers' refusal to uproot and burn their banana mats was misinterpreted as illiteracy by the experts, rather than a refusal to enter into a relationship where there was a lack of trust, transparency and respect.

While this study is focused on a specific incident in a specific area, broader lessons can be drawn from it as it shows the importance of consulting with, and listening to, farmers in situations like these. Farmers' willing participation in this kind of initiative is paramount and to achieve this they need to be actively engaged in dialogue about issues that affect their livelihoods. Understanding banana production systems and the significance of social cultural values could be a practical first step towards co-innovation of control of BBTD for all actors involved. This study shows that efforts to transfer or disseminate knowledge using the transfer of technology approach or false participatory methods end up in rejections, and destroys any trust that might exist between experts and farmers. The most effective solutions for dealing with BBTD that would be acceptable for farmers would have considered their views regarding the compatibility of the new technical solutions with prevailing management demands and wider social-cultural conditions. This, in turn, implies that farmers must be able to set their own strategic goals, participate actively, and build upon their own experiences and knowledge within a co-innovation process which does justice to individual differences and qualities of people (Koutsouris 2012). Koutsouris (2008) argues that there is need to provide local actors
with the means to engage the management of complex and potentially risky situations, a process that would enhance their capacity for autonomy and their ability to develop and use technical, institutional and political means, empowering them to take purposeful actions to shape their own futures. In this instance the dominant actors in the expert system followed a ‘functional participation approach’ as argued by Cristóvão, Koehnen, and Portela (2005) in which the extension service providers engage communities with pre-packaged objectives and activities in the expectation that peoples’ problems will fit in with these predetermined objectives. This implies that experts should move from the rhetoric of using participatory methods to a more inclusive agricultural innovation system, based on co-innovation (Turner et al. 2016). Delivery of pluralistic and demand driven extension services demands that there should be co-innovation amongst actors through multi-stakeholder settings, such as Innovation Platforms (GoM 2006). It is recommended that future programmes and initiatives direct the diverse actors to explore the benefits of engaging in such Innovation Platforms.

Future research could usefully focus on understanding the complex knowledge dynamics amongst the main brokers (the village chiefs and the Uprooting Committees) that motivated them to align themselves; their actions with the experts from the research and extension communities; and the possible pathways to direct actors towards multi-stakeholder Innovation Platforms.

**Disclosure statement**

No potential conflict of interest was reported by the authors.

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