

## Conclusions and Recommendations

*In this final chapter we briefly review some of the salient information produced by the Regional Coffee Wilt Programme (RCWP) and make a number of recommendations on what should be done to bring the disease under control.*

### 16.1 Resurgent Coffee Wilt Disease

Over the last two decades, CWD has become a major disease in three African countries. If it spreads, it will threaten production in many more. Such a major outbreak need not have happened – an account of the situation 60 years ago in what is now Democratic Republic of Congo (DRC) is worth reading:<sup>1</sup>

During 1949, certain robusta coffee plantings at Yangambi, Belgian Congo, developed tracheomycosis caused by *Gibberella xylarioides* and month by month the condition grew worse. In March, 1950, control measures were put into operation, all dead or affected trees being extirpated. In August, the disease reappeared on a large scale, and all affected trees were tagged, uprooted, and burnt in situ. This practice has remained the main principle of the control methods employed. The disease develops with great rapidity, death usually ensuing two or three weeks after the appearance of the first symptoms. The interval at which the trees are inspected depends on this, the aim being to reduce spread as much as possible. At Yangambi monthly inspections have given good results over a period of three years, but more frequent ones would probably be even more satisfactory.

Outbreaks have been identified in about 15 localities, mostly in the Eastern Province, especially near Paulis-Rungu; others have been reported from Kasai and Katanga. In only about five plantations has the disease reached epiphytotic proportions, and in these it may have been present for a number of years. The problem is regarded as a limited one, and it is expected that the control methods adopted will prove effective, practical, and inexpensive.

These authors seemed to view CWD rather more as a nuisance or symptom of neglect than as the major production constraint that it has now become. Their account suggests that by identifying outbreaks and reacting quickly, i.e. within weeks or months, the spread and significance of the disease could be limited.

As we have seen in Chapter 2, there were plenty of early warnings about the resurgence in DRC, which started in the 1970s, but these were not picked up and acted upon by decision makers at the national level, nor by international authorities. The reasons are surely linked to the weakness of institutions (see Section 16.10), both national and international. Similar events have occurred with other plant diseases such as banana bacterial wilt.

<sup>1</sup> CAB International abstract of a paper by Fraselle *et al.* (1953).

**Conclusion:** The present approach to plant disease control in Africa is not working; early warnings of emerging disease problems on coffee and other crops in Africa are being missed, and unless something is done it will happen again.

**Recommendations:**

1. Establish an international task force to regularly visit coffee-growing countries to carry out farm surveys, collect plant material for subsequent analysis, conduct training and interview plant protection personnel, so that any information of an emerging threat reaches decision makers quickly and can be acted upon in a timely fashion at minimal cost. This should include countries that are currently CWD-free. We are confident that if such a facility had been available since the 1970s, it would have detected the disease at a much earlier date and control measures could have been instigated before it became the billion-dollar problem that it has now become.
2. Carry out regular socio-economic surveys to continuously evaluate the status of African coffee.
3. Carry out studies of *Fusaria* on wild coffees and other species to learn more about the origins of the disease.

## 16.2 Quarantine and Surveillance

Quarantine services were not studied during this project, but it is evident that country borders are extremely porous to the spread of plant diseases. Currently the biggest risks are that Arabica CWD will spread south to Kenya as well as to any remnant wild coffee in the highlands of Sudan. In the case of the Robusta CWD, the disease could spread north to Central African Republic (CAR) or west to Cameroon and beyond.

**Conclusion:** CWD presents a major threat to other coffee-growing countries, and everything possible must be done to stop it spreading further.

**Recommendations:**

1. Regular surveys should be instigated in coffee zones most likely to be invaded, to look for signs of the disease.
2. An international workshop should be convened to discuss quarantine services in the region with a view to major upgrading of facilities, training and ways in which this can be funded.
3. A contingency plan is needed for special emergencies such as regional unrest or natural disasters, when large populations suddenly move across borders, bringing plant material with them, e.g. a rapid reaction team to organize incineration of plant materials brought with refugees when they cross borders.

## 16.3 Ethiopia

The CWD situation in Ethiopia has a different history and origin to that of Robusta in DRC, Tanzania and Uganda. Instead of a major epidemic following a few years after

detection – which has been the experience of Robusta CWD in several countries – the story of the Arabica variant of CWD in Ethiopia has been one of a more gradual and insidious spread. It is only in the past few years, some 50 years after it was first reported, that it has achieved the status of a major disease. Even so, the aggressiveness of the disease there seems to be less than Robusta, for reasons that are not understood.

What is clear though is that CWD is now widely spread in Ethiopia, and occurs not only on commercial coffee but also on forest coffee. There are some serious implications of this:

1. CWD is apparently attacking a wide range of genotypes that are an important part of the genetic base of the Arabica species, which is unique and of the utmost importance to the global coffee industry.
2. A disease now so widely dispersed within Ethiopia is, at some point, highly likely to spread to another country. The most likely country where it would next appear is Kenya.
3. It is not clear how Ethiopia is going to manage CWD in the future – it does seem that there is natural resistance of part of the very heterogeneous collection of landraces employed on most farms – so it may be that through natural selection and farmer experience, resistance to the disease will improve. However, this still risks permanent loss of important variation within the genome, which is widely believed to be responsible for the unique cup qualities of Ethiopian coffees.

**Conclusion:** Despite the apparently less aggressive nature of the disease, the Ethiopian situation is nevertheless very serious and there is no doubt that the disease could continue to spread and get worse, even if farms increasingly adopt a narrower range of genetic material in order to combat other problems such as coffee berry disease (CBD) and coffee leaf rust (CLR). It would be greatly to the advantage of the coffee industry if the Arabica CWD can be brought under control and eventually eradicated before it can spread further and irreparably damage the genetic base of the Arabica genome.

**Recommendations:**

1. A new and detailed survey to update our knowledge on the status of CWD in Ethiopia, to know how farmers are coping, how much diseased wood is being moved around (especially south towards Kenya), as well as an assessment of quarantine activities at the Ethiopia–Kenya border. Much more too needs to be understood about the great range of severity of the disease in Ethiopia, and how much of this is related to natural resistance to the infection and how much to agronomic or other factors.
2. A workshop with national and international experts to discuss CWD in Ethiopia with the aim to review options and prepare a research, control and/or eradication strategy for Arabica CWD – if at all possible this disease should be eliminated before it escapes Ethiopia.

## 16.4 Robusta Conservation

The collections made in Uganda in forest areas reveal a major source of genetic variation of wild Robusta, showing that Ugandan Robusta is quite distinct from Congolese

and Guinean genotypes. This is an important resource not only for purposes of breeding for resistance to CWD, but also for other breeding traits. However, the forests in which these genotypes are found are under threat from deforestation.

**Conclusion:** Uganda is a centre of diversity for *Coffea canephora*, so any threat to its diversity is a threat not only to Ugandan coffee production but for the coffee sector as a whole.

**Recommendations:**

1. Further collections of Robusta material from forest areas in Uganda should be made and conserved in Uganda and other countries in order to maximize the probability that this material is permanently available for future breeding activities.
2. A workshop should be conducted to discuss the threats to Ugandan Robusta diversity and what can be done to protect it. Subsequent to the workshop, a conservation plan should be drawn up and funds sought to implement it.

## 16.5 The Tanzanian Experience

CWD was found in Tanzania in 1996 but the subsequent percentage of farms infected and the severity of infection found on farms are both substantially less than in Uganda and DRC. Additionally it has not spread from the relatively small infected zone in the north-west corner of the country – indeed Robusta production has increased in recent years in Tanzania, unlike Uganda and DRC.

The reasons for the different experience of Tanzania are not clear, though it seems likely that Tanzanian authorities, having seen the problems caused in neighbouring Uganda, were more prepared than their neighbours, and that their subsequent eradication activities have been more successful. Additionally, the north-west region is separate from the rest of Tanzanian Robusta and possibly there is less movement of people between the regions than occurs in Uganda.

**Conclusion:** The CWD situation in Tanzania is sufficiently different to warrant further investigation.

**Recommendation:** To commission a short study of the present CWD situation in Tanzania as well as a detailed account of the various monitoring and eradication activities carried out there in recent years to understand the reasons for the reduced impact of the disease in this country, with the view to learning lessons that other countries could build upon in their attempts to halt the advance of the disease.

## 16.6 Breeding

Uganda is about to release seven clones to farmers, which possess resistance to CWD as well as other good agronomic properties. This is a major achievement for Ugandan scientists, and has been achieved in a very short time and with slender resources. However, seven clones is a relatively small number and it is uncertain how long they will remain free of the disease. Efforts need to continue therefore to find more resistant material to continuously develop resistant lines.

**Conclusion:** Further support is required to ensure that the advances in breeding made over the past decade are permanent.

**Recommendation:** Further funds to support long-term breeding activities in Uganda as well as in DRC and Tanzania, in order to be able to continue to produce new lines to broaden the genetic basis of resistance to the disease and closely monitor the field performance of the new clones.

## 16.7 CWD Management on the Farm

Several interesting results were obtained on possible ways to prevent or slow the spread of the disease at the farm level including mulching, cover crops, reduced use of cutting implements, etc. However, the results are very preliminary and many more field experiments are needed.

**Conclusion:** There is every reason to suppose that farmers can substantially reduce the rate of spread of infection by taking one or more actions. However, most farmers only have very limited resources and much further work is required to determine the most cost-effective strategy to employ. The strategy may vary according to local conditions.

**Recommendation:** There should be multi-site, multi-year on-station and on-farm evaluations of the various options to prevent infection in all affected countries. These need to be part of a bigger plan to revitalize African smallholder coffee (see Section 16.12).

## 16.8 Molecular Taxonomy and Pathology

Major advances were made in understanding the variation present both in the pathogen and the Robusta genotypes. We now know that the Robusta CWD variant present in DRC, Uganda and Tanzania is very uniform, and the research confirms that it spread from DRC, where it probably never completely disappeared from the country and remained for years undetected from the previous outbreaks of the 1940s and 1950s.

This is encouraging from the point of view of breeding since it is harder to produce a variety resistant to several different strains. The worry however is that if the disease continues to spread, it may find and breed with low levels of a different strain (perhaps existing on wild coffee or another plant species) in which case resistant clones could break down.

We also know that the *Fusarium xylarioides* strain that affects Arabica and the one affecting Robusta are different though distinguishable only by laboratory tests. Various lines of research suggest that they are different species of the disease and that there may be as many as four different diseases within the CWD complex.

**Conclusion:** Considerable expertise now exists on how to distinguish the strains of the CWD complex. However, this expertise resides in very few places and with very few people. The capabilities to execute the work need to be transferred to several centres in Africa.

**Recommendations:** A major international effort to develop:

1. A rapid test to detect the presence of CWD which can distinguish it from other *Fusarium* species;
2. More research to discover genetic markers for CWD resistance in the coffee genome;
3. More research to study the genetic variation of the CWD disease complex;
4. Substantial upgrading of disease recognition and research facilities in Africa.

## 16.9 Project Development and Management

The programme of activities recounted in this report took much too long to develop and get under way – from the initial surveys in 1996 it took until 2001 to get activities going in the field. The logistical problems of activities in five countries were severe, and national institutes, suffering under the substantially reduced budgets that global deregulation of the industry had required, found it difficult to assign sufficient counterpart staff and resources.

Such are the funding difficulties of national and international agricultural institutes that very few, if any, scientists working on the project could devote their time fully to CWD over extended periods. Many felt that the activities that they could carry out did not do justice to the importance of the problem.

**Conclusions:** Although much has been achieved during the RCWP, much more could have been done with more resources and more trained personnel assigned full time to the project.

**Recommendations:** For urgent matters such as a spreading disease, project development, approval and start-up activities all need to be streamlined. We suggest that a special fund is required that could be sourced to initiate activities quickly without the time lags that are customary in getting a major international project started.

## 16.10 Rebuilding Institutions

Over 20 years have elapsed between detection of the disease in DRC in the 1970s and official international recognition of the fact. The reasons for this delay are not clear, but it is insufficient simply to blame the problem on civil disorder in that country, since there was no major breakdown in law and order over the whole of this period.

Uganda was also evidently unready for the possibility of a new disease entering the country, indeed the authorities seem to have been unaware of the risk until just before it was first detected in the country in 1993.

**Conclusions:** We suggest that poorly funded institutions, staffed by very few poorly paid multi-tasking scientists and field staff, exacerbated by inadequate monitoring and support from international organizations all played their part in a major failure to identify and report what was happening.

We believe the roots of the problem lie in the secular decline in support to public sector agriculture suffered by many countries over the last part of the 20th century as the international community (think tanks, governments and donors) all lost faith

in agriculture as a vehicle for growth – channelling available funds instead towards promoting trade, value addition and direct poverty alleviation.

The total spend on the new CWD outbreak by countries, donors as well as institutes such as CAB International and CIRAD is not known but is probably not more than US\$50 million. Losses caused by the disease on the other hand are probably in excess of US\$1 billion. A few million dollars spent on surveys and rapid response over the years could have been extremely cost-effective. The problem has always been how to convince governments, the industry and donors to fund such activities when the continued non-appearance of a disease is not a sufficiently portentous outcome.

**Recommendations:** A much greater investment in research and extension is required in all countries. It is probably too ambitious to create a cadre of scientists that can carry out long-term field and laboratory studies in all countries, but a few regional centres of excellence should be supported, together with a basic level expertise in detection, identification and monitoring activities in all countries, backed by a reliable source of long-term funding.

### 16.11 An African CWD Strategy

CWD is now endemic in Africa, and a regional decision needs to be made about whether countries will have to live with it or whether it is feasible to eradicate the disease. At present we are at a halfway house, the research programme reported here has made strenuous efforts to study the disease but the funding is now insufficient to maintain the intensity of activities required to ensure that control can ultimately be achieved.

**Conclusion:** The present efforts by affected countries will not be enough to ensure that the disease is eradicated or reduced to an insignificant level. A further major international effort is therefore required – otherwise the disease will eventually spread to more countries. Doing nothing is not a cost-effective strategy.

**Recommendation:** An international conference is required to review progress and discuss what needs to be done next – essentially the work reported here could be regarded as Phase 1 of the project, Phase 2 needs to develop and role out wide-scale control programmes as well as expanded research to follow up on potentially fruitful lines of investigation. Phase 3 could be to eradicate the disease or arrive at a situation where the problem is maintained under tight control.

### 16.12 Revitalization

The socio-economic surveys carried out during this project confirmed that coffee in many places is in very poor shape, characterized by ageing farmers with little knowledge of modern production techniques carrying out only the most rustic management of their coffee with extremely low yields – often only 10% of the yields that Vietnamese or Brazilian farmers can produce. The large number of other crops that they grow attests to the very diversified nature of their farming strategy and suggests a fundamental lack of confidence in coffee to provide anything more than some occasional ready cash. We conclude therefore that much of the African coffee that we have studied in this project is fundamentally uncompetitive, and the increasingly erratic climate in East and Central Africa will only add to these problems.

Globally, however, African coffee has much to offer to the world because of its genetic resources and its very low carbon footprint (perhaps less than a quarter of Brazilian or Colombian production), i.e. it is likely that the coffee industry could most easily reduce its carbon footprint by modestly increasing production in Africa.

If the coffee industry is to continue to promote its sustainable credentials, it must surely make a major effort to resuscitate African coffee. For the continent that has given coffee to the world and received no royalties in return, the continent that has least contributed to climate change but is becoming most affected by it, African coffee surely cannot be allowed to decline any further. The economic, social and environmental costs are just too high, and the public image of coffee will suffer accordingly as this tragedy becomes more apparent in the coming years.

**Conclusions:** A concerted effort to control CWD that ignores the many other pressing problems affecting African coffee will not have a major effect in reviving it, since such poorly productive coffee is unlikely to prosper in a world of mounting food insecurity, declining availability of good quality land and an increasingly erratic climate. Farmers will not want to commit to such a crop when the price of food rises and they can turn the land to more productive crops.

The principal reasons that we can see for major revitalization efforts are:

- *Economic:* Coffee originated in Africa where it harbours the vast majority of genetic material that will be needed to face future threats.
- *Socio-economic:* African coffee brings cash to diverse rural communities where it sustains tens or hundreds of millions of the rural poor. Many African countries are unlikely to be able to develop industrially in the short term – so a new paradigm must return towards increased support for sustainable rural livelihoods, of which coffee is an important element.
- *Environmental:* Coffee production, even when intensive, is relatively benign to the environment; alternatives are often less so, e.g. qat in Ethiopia.
- *Climatological:* The decline of coffee in Africa inevitably means increasing exploitation of natural resources in Latin America and Asia – African coffee has a low carbon footprint so that moderately increasing production intensity in Africa is the best way to control and even lower the global greenhouse gases (GHG) footprint of coffee.

**Recommendation:** A major programme of activities to revitalize African coffee is required. This would look at all aspects of coffee growing, and develop a range of activities to develop sustainable coffee strategies for long-term revival of the crop.

## 16.13 Final Thoughts

CWD is now a touchstone for African coffee. The resurgence of this disease reveals deficiencies in support structures that need to be remedied if the industry can continue to lay claims to be a modern and sustainable enterprise. Coffee farming has always needed a minimum level of institutional support to flourish, and sufficient flexibility

to respond to urgent problems such as this disease. Such support has weakened over the past two decades, and a phenomenon such as CWD is the almost inevitable result of this weakness.

The African coffee industry must re-establish an adequate support infrastructure or otherwise expect to degenerate further. It is difficult to escape the conclusion that the African coffee industry is going to have to change rapidly – with a completely new approach to growing, commercializing, researching and monitoring coffee. As things stand, there are just too many problems to expect current levels of support to get control of them all. It is, however, unthinkable that we should continue to allow this to happen.