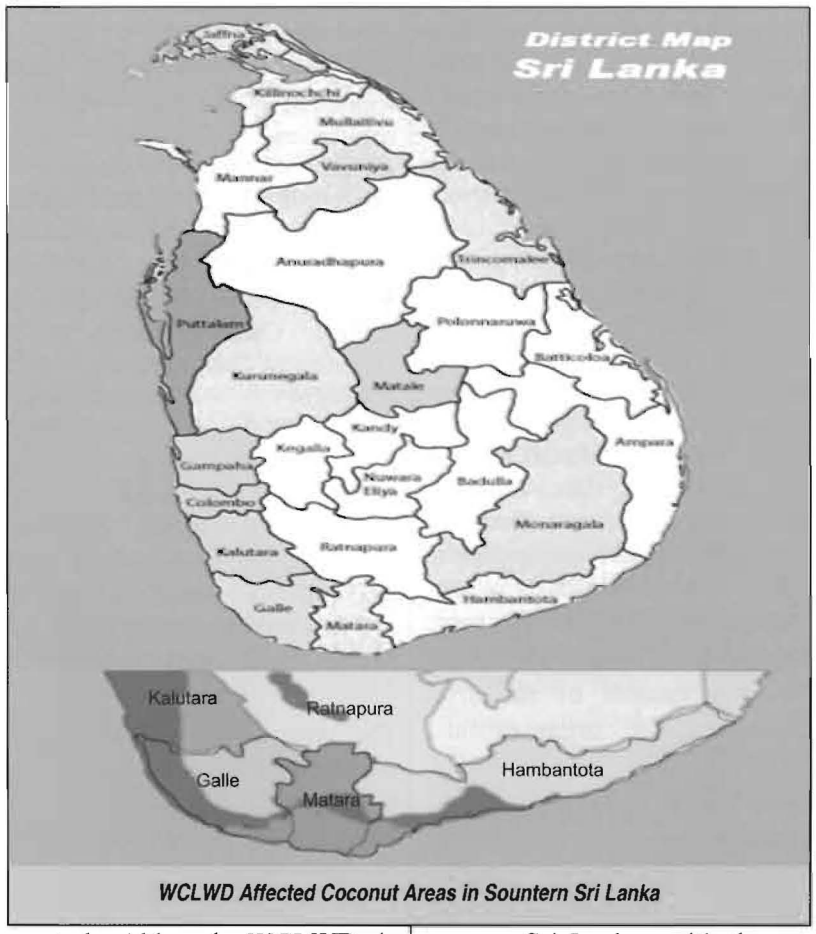
WELIGAMA COCONUT LEAF WILT DISEASE (WCLWD) INTEGRATED MANAGEMENT PROGRAM IN SRI LANKA: PRACTICAL IMPLEMENTATION STRATEGIES, QUARANTINE MEASURES AND CHALLENGES

Dr. J.M.D.T. Everard

The Weligama Coconut Leaf Wilt Disease (WCLWD) was first reported in 2006 from the Weligama DS Division, Matara District in the Southern Province of Sri Lanka. According to most recent surveys conducted by Coconut Research Institute (CRI) and Coconut Cultivation Board (CCB) the disease has now spread to adjoining districts, Galle and Hambantota and also to a greater area within the Matara District. The number of palms affected in Galle, Matara and Hambantota districts by now are 65,838, 251,980 and 14,344 respectively.

The total coconut extent in Sri Lanka is about 400,000 ha and of which about 62% is distributed in the coconut triangle, which is in the north-western province. WCLWD affected area is about 6% of the total extent. Therefore, at present the impact of the disease has not seriously surfaced despite the threat of spreading it into the coconut triangle.

The significance of the WCLWD is it has now being confirmed as phytoplasma borne disease similar to Kerala Wilt in India. The disease can affect palms of all ages and is a debilitating disease with no cure. It persists in the palm until its death and while spreading into other palms *via* phloem feeding common insect vectors (plant hoppers and lace bug). These vectors are abundant in the country and hard to control. Although WCLWD is not a fatal disease, it weakens the palms reducing the production capacity and predisposes them to fungal borne leaf rot disease which rapidly kill the palms if not treated.



WCLWD Affected Coconut Areas in Sountern Sri Lanka

WCLWD therefore, is a serious matter of concern to Sri Lanka because coconut plays a very significant role in the country's economy. Coconut is only second to rice as a food crop and is the major source of edible oil. Coconut accounts for 22% of daily caloric requirement of an average Sri Lankan with the per capita consumption rate of 109 nuts/annum, the highest in the world. It mostly belongs to poor farmers with 74% being small-holdings (< 20 ac). About 135,000 people in the country are directly employed in the coconut industry while providing livelihood for over 400,000.

The coconut industry contributed 1.1% to the GNP, 34.3% to the total plantation GNP and 8.4% to total agriculture GNP. Coconut exports contributed 3.25% to country's total exports with a

value of Rs. 32,433 million (US $ 320 million) in 2010. The total value of the industry at present is around US $ 530 million. More importantly, coconut has a very prominent place in the Sri Lankan culture among all communities. Therefore, WCLWD is a threat to the country's food security, employment and livelihood, rural poverty alleviation, GNP, exports and venturing into new markets, tourism, social well being, culture and the political stability.

Sri Lanka has taken several courses of action to address the problem of WCLWD since it was reported in 2006. The Plant Pathologist of the institute was immediately trained in Kerala, India (CARP/ICAR/CPCRI) to acquaint with the disease symptoms and train officers of CRI and CCB to identify disease affected palms. Multidisciplinary research studies were commenced at the CRI with the involvement of scientists from various organizations; Research Institutes, Department of Agriculture and Universities to develop disease diagnostic tools, identify and categorize symptoms, study disease epidemiology and identify vectors and disease transmission, and study soil, nutrient, agronomic and socioeconomic aspects.

CRI, by amplification and sequencing a fragment of phytoplasma 16S Ribosomal gene (NCBI database-EU 635503 in 2007), confirmed the presence of phytoplasma in WCLWD affected palms. This was reconfirmed by Dickinson and Abeysinghe (2011). More work is in progress at CRI and university of Nottingham to improve the detection efficiency and accuracy of the PCR diagnosis. Further studies conducted by CRI found that the yellowing associated with WCLWD is not related to palm's nutrient status.

A Steering Committee was appointed at the very outset to recommend, implement and monitor appropriate management program of WCLWD. The Committee comprised of representatives from the line Ministry, Principal Entomologist (CRI), Chairmen/Heads and Deputies of CRI, CCB and CDA (Coconut Development Authority), Senior Entomologists and Pathologists from Universities, Dept. of Agriculture, other Research Institutes, representatives of Coconut Growers Association and Regional Managers (CCB) of Matara, Galle and Hambantota.

The area where the disease is prevalent was demarcated by conducting a survey. The boundary demarcated was Galle to Tangalle along the southern coast and Galle to Tangalle *via* Angulugaha, Henegama, Akuressa, Kamburupitiya, Kirindda, Hakamana, Walasmulla and Beliatta along the A17 route from the land covering an extent of 23,000 ha.

Action was taken to declare WCLW and Leaf Wilt Disease causal agents as quarantine pests by the gazette notification; No. 1542/7 (24 March 2008) to prohibit transport of any palm species and their live parts out of the demarcated boundary. Around 60 Officers of CRI, CCB and DOA were granted enforcement power to issue licenses to cut disease affected coconut palms in any part of the country. Measures were taken to disallow planting of coconut and areca nut seedlings raised in the diseased area and close down the Weligama Coconut Nursery, of the CCB.

Training programs on disease identification were conducted for all research, technical and field staff of CRI, all regional and field staff of CCB in particular trainers and CDO (even those outside the area), all officers authorized for enforcement, formal leaders at GN levels; Samurdhi, Agriculture Research and Production Assistants (Agrarian) Agricultural Instructors (DOA).

At the outset, CRI proposed two management options; a) remove all diseased palms and make use of the land for planting high value crops other than coconut or b) maintain a disease-free boundary and improve vigor of palms to lengthen their productive life and promote intercrops and livestock integration to improve farmer's income. Option a) aims at eradication even at the cost of removing over 300,000 palms at the initial round and more in repeated cycles until the disease disappears. Losses of crop, poverty among rural farmers, high operational cost, compensation to owners, economic loss, social and political issues were seen as serious concerns. Option b) aims at containing the disease with low operational cost and minimum economic loss even at the high risk of spreading the disease to the coconut triangle.

The decision of the Steering Committee at the outset was the second option due to foreseen difficulties such as problems of diagnosis, subjective judgments, protests from owners to remove infected but high bearing palms, operational difficulties, lack of alternative crops for coconut, beach desertification, mass defiance (refusal to accept) and difficulties in communication.

The operations began by establishing a Project Management Office under the CCB with a Project Director to work with a sufficient number of field staff recruited on contract. CRI assisted by training and attending to other routine technical matters encountered during the implementation of the program. Maintaining the 86 km long and 3km width disease free boundary by removing all infected palms disregarding the stage of infection (mild/severe) was strictly attended. Continuous surveillance conducted to find and remove newly infected palms. Kept alert on areas immediately outside the border and took immediate action for clearing by removing all infected palms. Affected people were compensated by Rs. 2000.00/palm and assisted by providing assistance for planting other crops wherever possible. Public was made aware by publications and mass media campaigns etc., for obtaining their cooperation.

Maintaining the border and containing the disease to areas inside the boundary to date has been successful but an alarming increase in the intensity and the spread of the disease was observed within area with significant reduction of yield. Percentage incidence reached over 90% in some highly infected foci with high infestation of leaf rot the more lethal disease. How long this boundary can be maintained? What would be the economic viability of coconut inside the border? High risk of spread to the major coconut areas were the questions raised by the implementing organizations.

Following the situation analysis, the authorities decided on a more stringent disease management program; marking all infected palms and issuing licenses to uproot all severely affected palms in the first round and repeat the cycle until alternative schemes are offered. The boundary will maintain as it is with strengthened awareness to get public assistance. Further, it was decided to provide seeds/seedlings, live stock etc., free or subsidized rates and small quantities of putative WCLWD resistant dwarf green coconut seedlings for planting in home gardens.

In order to strengthen the new strategy CRI was entrusted to give overall technical advice, train staff and monitor and maintaining the border (3km zone – 2km interior and 1km exterior) and immediately attend to WCLWD foci that emerge outside the border. CCB was entrusted to mark infected palms and give license for uprooting and follow up.
Divisional Secretaries and staff of DS Divisions in Matara were also given the authority for issuing licenses for uprooting, following-up, paying compensation particularly in the Matara District. District Secretary, Matara now chairs the steering committee and coordinates all Departments to provide alternative crops/live stock to affected people under current program.

The progress of the program as at May 2011 with regard to maintaining the border (32,800 ac in 44,536 lands) is that 7562 diseased palms have been removed. Inside the border number of palms marked as infected are 15,000 in the Galle District, 115,000 in the Matara District and 4,000 in the Hambantota District.

Several serious constraints were observed during the implementation of the current WCLWD management program. Regular monitoring of the entire area needs staff commitment and finances as this has to go on for a very long period. At the current rate of removal of WCLWD affected palms it will take a very long time even to complete the first round. Palm marking is difficult, tedious and time consuming and hence retaining trained staff is difficult. Most people affected are very poor and many are totally depending on coconut for their income and hence they have to be provided with an immediate income avenue. Alternative crops does not work for all as lands are too small, lack of technical know how and market fluctuations.

Continuous maintaining of the border and removing nearly 400,000 palms within a short period of time is a daunting task given the above constraints. The commitment of all parties at all levels is important for implementing the management program successfully. Scientists have a big challenge. i.e., to

WCLWD Affected Coconut Tree

convince all relevant parties with proper scientifically validated information, breeding for WCLWD tolerance as the only lasting solution, if one can succeed. Given the difficulties in maintaining buffer and strengthening surveillance outside the most desired need of the day is a quick, consistent, reliable diagnostic procedure for WCLWD.

International collaboration is needed for developing a rapid and sensitive molecular based diagnostic tool. The collaboration already existing with University of Nottingham is a great opportunity for CRI to venture with the assistance of FAO. Identification of vector species and transmission studies, surveillance studies using GPS/GIS tools, screening techniques for identifying resistant/tolerant varieties with high yield and strengthening capacities for awareness programs too are important developments for furthering.

CRI wishes that this consultation will form a platform for internationally collaborated research programs for developing a rapid, efficient and a reliable diagnostic procedure for detection of WCLWD, which can also aid vector studies and disease transmission studies and for disease surveillance countrywide by vector screening. Further it is important to find possibilities exchange of germplasm in the international gene banks for screening for WCLWD tolerance.

Dr. J.M.D.T. Everard is Deputy Director (Research) Coconut Research Institute, Sri Lanka.