TWENTY-FIVE YEARS WITH COCONUT RESEARCH AND DEVELOPMENT A PERSONAL VIEW OF SIGNIFICANT EVENTS FROM 1968 TO 1993

by

Hugh C. Harries[1]

ABSTRACT

In January 1968, the author joined the research department of the Coconut Industry Board, Jamaica as plant breeder. Twenty-five years later, in July 1993, he completed a contract as plant breeder at the National Coconut Development Project, Tanzania. In between, he undertook coconut research and development work in a variety of situations. The twenty-five year span coincides closely to that of the Asian Pacific Coconut community's own jubilee from 1969 to 1994. A twenty-five year jubilee is a good excuse to look back on what has passed and review what has been learned. What events seemed to be important at different times during this period? What other, seemingly important events, turned out to be non-starters? Can any recent events be identified that will affect future research and development? What follows are personal views. other people will have different ideas of what is important and-what is not. But a twentyfifth anniversary is also a time to plan for the future. That is what APCC will be doing. Like APCC, the author intends to continue to take an interest in this, the most worthwhile of all crops.

INTRODUCTION

After graduating from the University of London agricultural college at Wye I began work as a tomato breeder with the Glasshouse Crops Research Institute at Littlehampton. Six years later, I joined the research department of the Coconut Industry Board, Jamaica as botanist/plant breeder. It was a three year contract and when I left England in mid-winter my best friend told me "three years in the sun can't be bad". That was January 1968. Ten and a half years later I was still in Jamaica. The decision to go to Jamaica had been the right one and l was sorry to leave when the country's economic problems coincided with my own need to give my two sons a good secondary education. They got that in England while my wife and I went on to Thailand. Still as a plant breeder, now with ODA, still on coconuts and based at the Sawi research station at Chumphon. Although I moved on after five years the project itself continued and prospered. My move to Papua New Guinea was to a different crop - oil palm. I felt that after fifteen years I might have over-specialised in coconut (although the work at Dami OPRS included coconut, cocoa, robusta coffee and even rubber, as well as oil palm). Yet five years with oil palm only strengthened my feeling that coconut was by far the more interesting crop of the two. The next move was to become an independent consultant for two and a half years. That is another way of saying out of work, in the sense of not having a permanent employer. But in that time I was employed by FAO, ODA, GTZ, ACIAR and the Asian Development Bank; by commercial and national organizations in Central America, the Horn of Africa and the Gulf; I circumnavigated the globe, travelled to twice as many countries as I had ever been to before, including all major continents (except Antarctica) and even broadened my scope to work on date palm. Latest, but my no means last, I became a plant breeder for GTZ, working with the National Coconut Development Project in Tanzania. when I completed that three year contract in July 1993 I had spanned a jubilee period of twenty-five years in coconut research development.

[1] International Coconut Cultivar Registration Authority 17 Alexandra Road, Lodmoor Hill, Weymouth Dorset DT4 7QQ, U.K.

This close coincidence to the span of the Asian Pacific Cocanut Community's own jubilee encourages some thoughts. The first of these is that unlike most other coconut research workers I have been incredibly lucky. Instead of working for one organization in one country, I have worked for different organizations and in different countries. I have worked for money and sometimes just for the challenge of a problem. I can compare government research officers with those in commercial companies or at universities. Despite being practically dumb in any but my native language I have learnt that an interest in coconut is almost as good as a common language. This is not to say that others, in my place and given my opportunities, could not have done a better job. The important thing is to leave a fully referenced record, in journals like CORD or oleagineux. Then, others coming later can read and learn. And if they disagree they can attempt to find better answers by the time honoured principles of scientific research.

HIGHLIGHTS

What events seemed to be important at different times during this period? What other, seemingly important events, turned out to be non-starters? Can any recent events be identified that will affect future research and development activities? There is no time, and perhaps this is not the place, for detailed examination of who did what research, where and when, or why some research succeeded and how other research apparently failed. But the questions - who, what, where, when, why and how - can be applied to a few examples that the author knows about. others who want to do the same from their knowledge might consider the following set of questions: why is an event important (why not another); where did the event take place (or more than one place) ; when did the event take place (could it have happened earlier); who were the leading figures (human interest sells news); what happened (details are soon forgotten); how has it, or how will it, affect the coconut industry (are all research results beneficial).

It is not possible to cover every scientif ic discipline in detail, especially the modern biotechnological techniques. Perhaps these are the important places where future breakthroughs are already happening. In which case, as a "seat of the pants" plant breeder, l can only write about that I think I understand. I have tried to choose examples from the following areas of general interest: agronomy, breeding, diseases, farming systems, pests, plant protection, processing, socio-economics.

MLOs, viroids and virus

Three success stories of the period would seem to be the elucidation of three major diseases - lethal yellowing, cadang cadang and foliar decay. Yet even these successes have to be qualified. With lethal yellowing, the naming of the pathogen as a mycoplasmalike-organism (MLO), the possibility of control by antibiotics and the identity of the probable vector all look like victories. MLO in plants were a new discovery and the coconut MLO was the first in any palm species. MLO were actually discovered three times in three separate laboratories all in the same year. Priority of publication is important to scientists. Yet knowing the pathogen and the probable vector in Florida, did not stop the disease spreading to Mexico and similar diseases in both west and east Africa have remained more difficult problems to crack. Even the chemical control could only be used on decorative palms on mainland USA and is not an acceptable control measure anywhere else. MLO have been found in at least thirty other palm species and even on coconuts in the Far East. There is a fourth factor, that of resistance, which is dealt with in the next section. The positive result of successful research is that the disease still occurs in Jamaica and Florida but no longer in epidemic proportions. The negative result is that research stopped but disease spread did not and it takes a lot of energy to get the research started again.

The discovery that cadang cadang disease was caused by a viroid seemed like a breakthrough at the time but other important factors, such as the identity of a vector still have to be

resolved. And the fact that viroid-like RNA are being found by the same research workers in coconuts in many other countries and in other palm and in monocotyledonous weeds, only serves to confuse the situation. Many of the viroidlike RNA are isolated from apparently symptomless palms growing in countries from where no serious epidemic coconut disease has ever been reported.

Foliar decay turned out to be a virus transmitted by an insect vector. Three odd features are that it seems to be limited to introduced coconut varieties, only occurs in vanuatu and the vector is of the same genus as the vector of lethal yellowing disease. Fortunately, when coconut seed is taken to other countries it does not seem to carry the virus. Coincidentally, the Vanuatu coconuts introduced to Jamaica (under the name New Hebrides Tall) were highly susceptible to lethal yellowing and all died before the virus had been discovered - so if it was introduced hopefully it died out at the same time.

In summary, these three diseases are still as great a problem as they ever were, either because they are still active in important areas of coconut production or because they have the potential to move into new areas despite whatever quarantine barriers are established.

Fl hybrids, dwarf seed parents and disease resistance

If any subject deserves to be considered a success it is that of Fl hybrids with Malayan Dwarf as the seed parent. Yet only in the area of disease resistance has real success been achieved and that is restricted by the quarantine considerations mentioned above. At the beginning of the period under review there were a number of dwarf x tall hybrids under test in countries such as the Ivory Coast, Jamaica and the Solomon Islands (then the British Solomon Island Protectorate) . The ability to mass produce these economically was developed simultaneously in Ivory

Coast and Jamaica in the mid 1970s. It can be no coincidence that the plant breeder from the Ivory Coast visited Jamaica in 1968 and that the plant breeder from Jamaica visited Ivory Coast in 1970. Was there a cross-fertilisation of ideas?

Unfortunately, the work in Jamaica was both stimulated by, and yet limited by, the presence of lethal yellowing disease. The hybrid used two resistant parents and has remained highly resistant throughout. Reported loss of resistance has not resulted in new epidemics. It seems probable that the disease has come under natural control as it must once have done in the Far East because that is where the resistant varieties come from. As a bonus, one of the two hybrid parents was also selected for windstorm tolerance and the hybrid has survived hurricanes better than other varieties.

On the face of it the Ivory Coast hybrids can be counted a success as they have been taken to almost every coconut growing in the world and massive seed gardens are still being established to produce them. Yet for all this, the success has been more apparent than real.

The underlying problem with the Fl hybrid has been the reluctance of many people, both scientists and farmers, to accept the Malayan Dwarf as a seed parent. There was no alternative in Jamaica because of the high natural resistance of the Malayan Dwarf to lethal yellowing disease. It has worked well there but it was never intended to be the last word and research continues to find better hybrids. Elsewhere, hybrids with a dwarf seed parent have failed in drought prone areas. The answer, to avoid exposing any coconuts to drought stress, is impractical in the real world. The real answer, learned by bitter experience, is to produce and test hybrids under local conditions and plant and care for them in a manner acceptable to the local farmers, instead of importing hybrids and extension recommendations from external sources.

Beetles, mites, flagellates, nematodes, and weevils The infamous rhinoceros beetle can successfully controlled by baculovirus and muscadine fungus, where circumstances are favourable.

During this twenty-five year period interest in the problem has waned. But not because of the comparatively few successful cases of control. Simply because the visible damage to mature palms does not result in many palm deaths. Any lowering of productivity is confused by other environmental factors.

The discovery of a coconut fruit damaging mite in Mexico was quickly followed by reports of its spread to the Caribbean and to Africa. Yet a literature survey identified similar damage in South America in 1949 and a worldwide survey of symptoms showed that similar mites were present in Asia and the Pacific without causing serious problems. This is not much consolation to farmers who do have problems and unless economical biological control can be developed the problem will only get worse.

Another new pest in the period under review is the trypsanomid flagellate causing leaf break and heart rot diseases in south America and the eastern Caribbean. In contrast to the mite, which seems to spread in dry weather, the flagellate requires moist conditions. Very few coconuts are planted that are not sometimes too dry and other times too wet, so it is likely that these problems will remain.

A similar problem that occurs in the moist areas of Latin America is red ring. This is caused by a nematode transmitted by a weevil. The weevil can also be serious problem in the absence of the nematode and similar weevils cause problems on wherever they grow. Research into red ring, which was active at the beginning of the twenty-five year period under review, continues but perhaps less intensively. But the real breakthrough has probably occurred and hopefully might be copied in other pest control programmes. This is the use of a pheromone lure to attract the weevils to traps where they are safely poisoned with insecticide. This works well for the weevil in Latin America and hence for red ring as well.

Embryo and tissue culture

Probably the greatest breakthrough in this period was by Dr Emerita de Guzman when she cultured makapuno embryos. The work succeeded and achieved practical results in the field. It also stimulated research in other laboratories and embryo culture is well on its way to becoming a standard technique for germplasm exchange and storage. Long-term cryopreservation of embryos and the screening of cultured tissue for disease indexing are two areas under active investigation that hold future promise.

In contrast, tissue culture has proved a disappointment. Despite the best efforts of research workers in laboratories that have had successes with other crops, coconut tissue culture has been limited to a few plants and little prospect of scaling up to practical levels. Whatever may happen in the future, and perhaps the technique is just around the corner, it seems likely that tissue culture may be useful to breeders and plant pathologists but is unlikely to be directly relevant to coconut growers.

Timber, cocopeat and sustainability

Efforts to make coconut timber competitive came into prominence during this twenty-five year period, stimulated by the need to eliminate over-aged coconut stands to make way for new Fl hybrids. There is every reason to believe that coconut will increasingly become an important agroforestry crop.

Cocopeat is not a new idea, the term was coined in about 1949. But the idea did not catch on until environmentalists became anxious about the destruction of wetlands by the excavation of peat moss. At the moment coir dust and coir fibre are still seen as substitutes for peat moss and not as superior growing media in their own right. That must come and should help coconut production

wherever soil improvement programmes are needed. And these will become an increasing needed as population pressure on land use increases.

The idea that coconut can be a key f actor in successful sustainability of tropical agricultural farming systems is correct. But bringing such systems into practical operation is going to be a continuing problem in the future.

Wet processing, small-scale processing and the decline of copra

The coconut had already been displaced from its position as the pre-eminent vegetable oil crop before this twenty-five period began. Subsequently other oils have become more important than coconut oil, even though coconut oil still leads over direct substitutes such as palm kernel oil. Wet processing and smallscale processing were both seen to be answers to the problem, by improving the quality of the end product, and by reducing production crops. Yet the old tradition of copra production has been hard to break. But there is so much copra processing equipment already in place that the new methods stand little chance to be introduced, except in very limited areas. The appearance of canned and powdered coconut cream on supermarket shelves is a good sign but the supply to this specialist market will be easily met. The problem faced by coconut processors (including desiccated coconut), is the amount of hand-labour involved in harvesting, peeling and cracking the nuts. Only if these problems can be solved does coconut stand any chance of regaining its rightful position.

CONCLUSIONS

These are personal views. Other people will have different perceptions of what is important and what is not. But a twenty-fifth anniversary is a time to take stock of the past and plan for the future. That is what APCC will be doing. And, like the APCC, the author intends to continue an active role with coconut, which is the most interesting and worthwhile of all crops.

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It is impossible to mention all the people involved in carrying out the research and development programmes mentioned above. For that reason no detailed references are given. Chapter and verse can be provided for those requesting evidence for the various statements made in the text. Nor is it possible to pay tribute to all the people who over twenty-five years have knowingly, or unknowingly, influenced my thinking. Indeed, they may not want to be associated with some of my more outrageous ideas. I look forward to the opportunity of reappraising some of the evaluations made here at the next opportunity the fiftieth APCC jubilee in 2019!