Submission to the Senate Rural and Regional Affairs Committee in relation to the inquiry into the import risk analysis for bananas from the Philippines

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A Submission from

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1. Qualifications and Experience: Prof James Dale

- I completed my Bachelor of Science in Agriculture (with Honours) in 1971 through the University of Sydney.
- I completed by PhD specialising in plant virology in 1975 through the University of Sydney.
- I have been continuously involved in research on the characterisation, diagnosis and control of plant viruses since I commenced by PhD, a period of 32 years.
- I have published more than 80 scientific papers and supervised more than 18 PhD students.
- I have been researching viruses of bananas for a period of more than 22 years.
- I am currently the Director of the Science Research Centre at the Queensland University of Technology and lead the Plant Biotechnology Research Program, a research team of more than 25 members.
- I have conducted or am conducting collaborative research projects in the Philippines, Malaysia, Thailand, Vietnam and Uganda as well as reviewing projects in the Philippines and the South Pacific.
- Funding for my research has come from the World Bank, the Australian Research Council, the Australian Centre for International Agricultural Research, the Sugar Research and Development Corporation, the Horticultural Research and Development Corporation, Horticulture Australia Limited, the CRC for Diagnostic Technologies and the CRC for Sugar Industry Innovation through Biotechnology.
- I am currently a member of:

    - The Australian Research Council's College of Experts
    - The Gene Technology Technical Advisory Committee of the Office of the Gene Technology Regulator
    - The Queensland Biotechnology Advisory Council

2. Declaration

I wish to declare that the Australian banana industry through the Queensland Fruit and Vegetable Growers has contributed to funding for my research in the past but does not currently contribute funding to my research program. This funding was for the development of transgenic bananas with resistance to banana bunchy top virus.

3. Preamble

Viruses, including plant viruses, are the most genetically diverse of all organisms and, of the disease causing organisms, viruses are amongst the most difficult to contain or control. The general public are well aware of virus diseases of humans and, to a lesser extent, animals: HIV, influenza, hepatitis A, B and C, smallpox, polio, Ebola, Dengue, rabies etc.

Viruses of plants are considerably less well known but are very probably more widespread and cause very large economic losses. Most crops are affected by virus diseases and the yield loss per annum on a global scale is extremely large. For instance, barley yellow dwarf virus is estimated to cause greater than US$3 billion loss in cereals each year; losses due to African cassava mosaic virus are estimated to be in excess of US$2 billion per year; and losses due to cotton leaf curl virus in cotton in Pakistan alone are estimated at US$1 billion per annum. If losses due to all viruses in all crops could be calculated, the dollar figure would be massive.

Australia is no exception; most of our crops are affected by virus diseases. However, through the development of sophisticated diagnostics and implementation of numerous control schemes, the losses of most of these viruses have been held within acceptable limits. This has been at a high cost to both the producers and the Australian taxpayer and economy. Most importantly, the vast majority of viruses affecting Australian crops have been introduced from other countries. Almost certainly, these viruses have been brought into Australia in plant material such as seed, whole plants or parts of plants or vegetative planting material (suckers, bud wood etc).

One of the best documented introductions of a plant virus into Australia with subsequent devastating results for the local industry involved bananas. In 1913, banana planting material was shipped to Australia from Fiji. A virus disease of bananas, banana bunchy top disease or bunchy top, was already known to occur in Fiji. Unfortunately, the planting material imported into Australia was infected with banana bunchy top virus. The virus quickly became established in southeast Queensland and northern NSW. It was unknowingly moved over larger distances in planting material such as suckers but within plantations it was moved from plant to plant by an insect, the black banana aphid. In the ensuing epidemic, the number of commercial banana plantations in this region was reduced from more than 500 down to 4. From the mid-1920s, an incredibly strict program was instituted to control this disease. The program was backed by strong legislation. It involved the control of all aspects of banana growing including licensing all growers, controlling the movement of bananas and the regular inspection of plantations and domestic premises with subsequent eradication of infected plants. The banana industry recovered but at a very large cost.

The program has been largely successful but the ultimate aim, eradication of the virus from Australia, has not been achieved and the program of control remains in place.

Plant viruses can only multiply in living tissue and they can move into virtually all parts of the plant they infect including the fruit. Because they need living cells to multiply, plant viruses rarely kill their host. Rather, they cause symptoms of infection which can range from quite severe to virtually undetectable. The ability to diagnose a

virus disease in a plant can and usually is quite specialised. Very often, plant viruses have very drastic effects on the performance of the infected plant which is normally translated into a loss of yield. A good analogy would be a person infected with influenza virus; the symptoms are not extreme but the infection has a major impact on the person's energy and performance. However, there is a major difference; the human will recover from the influenza infection whereas once a plant becomes infected with a virus, the infection remains for the lifetime of the host plant. There are no treatments available to cure plants in the field from virus infections.

4. Banana Bract Mosaic Virus

Banana bract mosaic virus is a virus that infects bananas. It is a member of the family *Potyviridae*, in the potyvirus genus. Other members of this genus include papaya ringspot virus and plum pox virus. The virus is known to be widespread in the Philippines, parts of India and Sri Lanka. It has never been recorded in Australia. The virus is transmitted from plant to plant by aphids and is transmitted through planting material. The aphids that transmit banana bract mosaic virus are widespread and common in Australia. There is no recorded resistance to the virus amongst the commercial banana cultivars.

5. The Risk of Importation of Banana Bract Mosaic Virus in Bananas from the Philippines

Banana bract mosaic virus was known to be widespread in the Philippines, particularly Mindanao, in the early 1990s and this was documented in a report by an Australian plant virologist in 1993. Importantly, that report indicated that the virus occurred in plantations and where, it did occur, between 4% and 14% of mats were eradicated each year. The Philippines Department of Agriculture has indicated that the virus is now "rarely encountered" following a process of routine weekly inspections and eradication as reported in the revised Draft IRA Report and as a result "the likelihood that a tonne of harvested fruit will be infected or infested with the pest" was determined to be very low. I believe this is a very unsafe conclusion.

I base this on a number of points:

- Banana bract mosaic virus is a potyvirus that infects a perennial crop. Other viruses in the same genus in perennial crops have proven to be almost impossible to eradicate. On the contrary, they have continued to spread and cause losses. The best example is papaya ringspot virus. It infects the perennial crop papaya or papaw and is transmitted by aphids. Throughout the tropics where this virus occurs, it has been responsible for devastating losses and has been impossible to control let alone eradicate. If the Philippines had been able to control and nearly eradicate banana bract mosaic virus in the past decade, this would be a very significant achievement in plant virus control internationally.
- The Philippines have provided no evidence to support their assertion that the virus is rarely encountered. There has been no documentation regarding the

incidence at any point in time or no survey data indicating the continuing reduction of the incidence of the virus.

- One must assume that the routine weekly surveys were visual surveys and therefore dependent on identification of infected plants by symptoms. This is an unsafe practice as: (i) the ability to identify infected plants is usually quite specialised, (ii) there is good evidence that the symptoms induced by this virus are quite variable and therefore much more difficult to identify and (iii) there is always the potential to select symptomless strains of the virus by using symptoms as the sole means of disease identification.

The absence of any independent and documented scientific information that proves that the Philippine plantations in Mindanao have been able to reduce the incidence of this virus to "rarely encountered" whereas equivalent viruses have been impossible to eradication in similar situations, leads me to suggest that the "the likelihood that a tonne of harvested fruit will be infected or infested with the pest" would rather than being "very low" is more likely to be moderate to high.

6. A Previous Assessment by AQIS.

In the 1990s, I led a research program funded through the World Bank to develop transgenic bananas resistant to both banana bunchy top virus and banana bract mosaic virus. We generated a number of transgenic bananas with potential resistance to banana bract mosaic virus but to prove resistance, we needed to challenge these bananas with the virus under glasshouse conditions.

Initially, we resolved to test these plants in the Philippines. However, it became clear that the necessary facilities and technology was not available there. We therefore applied to AQIS to import the virus and challenge these plants in a certified quarantine glasshouse in Melbourne under insect-proof conditions. The experiments would have been conducted by a qualified plant virologist. We believed this level of security was more than sufficient to ensure that the virus did not escape and infect bananas and threaten the Australian industry.

Our application was rejected on the basis that there was insufficient information available regarding the host range of this virus.

There has been no new information on the host range of this virus since that time.

7. Conclusion

The available scientific evidence is that, in the 1990s, banana bract mosaic virus was common in bananas in Mindanoa plantations. AQIS has previously determined that importation of the virus for scientific purposes under extreme security was too great a risk. No new credible scientific information has become available in the intervening period that could challenge either of these positions. Until such information becomes available, I believe that the importation of bananas from the Philippines poses an unacceptable risk through the introduction of banana bract mosaic virus and subsequent spread into Australian bananas.