SRA Grower Group Innovation Project
Final Report

Sugar Research Australia

Research Funding Unit

SRA project number:	GGP066
SRA project title:	Integrated Feral Pig Management for the Herbert cane area- (Here Piggy Piggy!)
Group name:	The Hawkins Creek/ Lannercost/ Leach United Pig Management Group.
Contact person(s): Name(s) Phone number Address Email address	Ian Kemp 0418771617 PO Box 135 Ingham QLD 4850 kempparis@bigpond.com
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Sugar Research Australia Ltd
ABN 16 163 670 068

Head Office
50 Meiers Road
Indooroopilly QLD 4068
Australia

Postal Address
PO Box 86
Indooroopilly QLD 4068
Australia

Tel +61 7 3331 3333
Fax +61 7 3871 0383
Email sra@sugarresearch.com.au
Web sugarresearch.com.au

Executive Summary:

The damage caused by feral pigs (*Sus scrofa*) in Wet Tropics cane growing regions can be significant, with losses in cane proceeds exceeding $1M in certain years within the Herbert region. The management of the pest is difficult, due to the landscape in which the feral pigs are found, the varying success of hunting, baiting and trapping activities and the overall intelligence of the pest being managed. In the Herbert, community partners have invested in managing this pest through a coordinated regional approach through the Hinchinbrook Community Feral Pig Management Program (HCFPMP) and research by this project. The group utilizes a multiple approach to manage feral pigs within the landscape through the use of GIS, genetic mapping and targeted on-ground activities (like shooting, dogging, baiting and trapping). This report on the approaches adopted by the group and the research findings to date undertaken by the community partnerships group funded by the SRA funded research project.

Background:

Losses in cane proceeds can exceed $1M in certain years within the Herbert region caused by feral pig damage. The financial losses caused by feral pigs is now the highest of any economic pest within the Herbert cane region (including cane grubs and rats) over the past 5 years.

The environmental impact caused by these pests is difficult to gauge however impact on water quality and native animals like turtles & cassowary populations are well researched or documented.

To date the cane industry has relied upon the following methods to control feral pig population:

1. Feral pig hunting (usually using dogs and shooting).
2. Feral pig trapping.
3. Fencing
4. Baiting (using sodium fluroacteate -1080)

The toxin sodium fluroacteate (1080) and its registration for pigs was up reviewed in 2012 and the continued registration of this product is at times uncertain.

The Invasive Animals CRC has been undertaking research into alternative replacements to 1080. The CRC through a commercial partnership with Animal Control Technologies Australia developed an alternative toxin (Sodium Nitrite) for controlling feral pigs. So far, all trials of this new toxin have taken place in rangeland areas and none have taken place within a cane landscape. This project developed a link with the CRC to undertake trials of the new toxin within a cane growing area to determine the efficacy of the bait on feral pig populations.

To date managing feral pig populations in a cane landscape has limited or varying degrees of success. Most research undertake on feral pigs in the past has been in dry tropic areas or open forested areas of Western Queensland; with little research undertaken in the Wet Tropics area.

The Hinchinbrook Community Feral Pig Management Program (HCFPMP) already operates in the Herbert with financial contributions from the cane (via HCPSL), forestry industries, Hinchinbrook Shire Council, DERM & Terrain NRM. The program employs one full time employee to service the whole region. The financial contributions of the partner groups of the HCFPMP were not included in this project; however the activities of the research project did compliment the activities of the HCFPMP.

A group of growers in the Herbert Sub-Districts of Hawkins Creek, Lannercost and Leach formed and worked together in an attempt to manage the difficult issue of feral pig management. The research activities undertaken by this project focused on sub-district region, however some activities did occur in the whole region.

Project Activities:
The project proposed the following activities to be undertake at the commencement of the project:

- An assessment of Sodium Nitrite as an alternative to sodium fluroacteate (1080). This research will be linked to research undertaken by the Invasive Animals CRC and Animal Control Technologies Australia. Investigate opportunities to utilize trap cropping (using different cane varieties). Capture data geo-spatially through a survey of all Herbert growers in relation to identification of areas of damage caused by feral pigs and estimates of crop yield losses. HCPSL will be responsible to collecting and collating this data.
- Using GIS to assist in the understanding and management of feral pig populations.
- Gain a better understanding of the impact of varieties, adjacent habitats, habitat management and land uses. It is well noted by industry that feral pigs have particular preferences for certain varieties (ie. feral pigs dislike Q96 and have a preference for Q208). The reason why feral pigs have this preference is not well understood. There is also antidotal evidence that particular adjacent habitats harbour more feral pigs than others; the project will investigate this issue and attempt to develop some management strategies.
- Investigate feral pig population dynamics and genetics to better manage and control feral pigs. Research in other locations in Australia indicates that such assessments of wild pig populations may significantly assist in understanding migration of feral pigs across a landscape. This work will be undertaken by Dr. Susan Fuller's team at QUT.

Objectives:
(As stated in the original proposal and a statement of the extent to which the project has achieved them.)

The project seeks to achieve the following:

- Bring together growers to focus on managing a feral pig population through collective action and developing a regional specific integrated pest management program. Management of a pest population such as feral pigs requires a coordinated approach. Individual farms attempting control have minimal impact on a population
- Assess "Hog Gone" (sodium nitrite) baits as an alternative to 1080 baiting; as a part of an IPM program.
- Investigate feral pig genetics to determine the structure of feral pig populations and whether there are source areas of feral pig populations.
- Reduce the significant financial losses (greater than $570,000 annually) and environmental impacts caused by feral pigs.

Methodology:

The project assessed various control methods, alternative baits to attract feral pigs, the use of pheromones, and the use of genetic population mapping, cane variety impacts and habitat influences.

The research trials were established in three different locations throughout the Herbert River cane region to assess management strategies for varying landscapes and topographies. The locations were the Lannercost area, the Hawkins Creek area and the Coldwater area. The Lannercost area is predominately open cane land adjacent to grazing and forestry plantations. The Hawkins Creek area has cane land situated between the World Heritage listed rainforest (managed by National Parks) and the Herbert River. The Coldwater area is located adjacent to State owned and managed forested land; the country is broken up by gulleys and creeks. These locations were selected due to their diversity of habitat, their long history of cane crops being damaged by feral pigs and the cooperation of the landholders in the area. As a part of the project the influence of habitat adjacent to cane lands was assessed.

In each of these three locations various control methods (trapping, dogging and baiting using a commercially available feed dispensing unit, HogHopper™) or various bait materials were assessed. Numerous trial sites were established to assess the effectiveness of each method in each location. Pheromones were also assessed for their usefulness and ability to attract feral pigs.

As a part of the project genetic material from pigs captured and killed in the shire was collected and forwarded to the Queensland University of Technology (QUT). A total of 403 feral pig tissue samples were obtained from 100 locations in the Herbert River region for analysis.

Microsatellite DNA markers are extremely useful tools for examining population genetic questions of this nature and have been applied in a number of feral pig genetics studies (Hampton *et al.*, 2004a, b; Spencer and Hampton, 2005). Microsatellites are highly variable, with rapid rates of mutation and are useful for revealing localised population structure. They consist of tandem repeats of short nucleotide sequences, are randomly distributed across the genome and occur at a high frequency in non-coding regions of eukaryotic DNA.

Total DNA from samples sent to QUT was extracted using the salting-out methodology of Miller *et al.* (1988). Eight loci that have previously been shown to be polymorphic and unlinked in *Sus scrofa* (Alexander *et al.*, 1996) were analyzed in this study (SW240, SW632, SW857, SW911, SW936, SW951, S0002, S0068), following conditions outlined by Hampton *et al.* (2004a), and were resolved using an ABI3500 genetic analyzer.

A bayesian clustering approach implemented in STRUCTURE v2.3 (Pritchard *et al.*, 2000) was used to estimate the number of populations (K) in a sample and to assign individuals to one or more of these populations (k). Ten runs of $K = 1$ to 25 was performed at 100 000 MCMC repetitions and 20 000 burn-in period using no prior location information, independent allele frequencies and a model of admixture. The posterior probability was then calculated for each value of K using the estimated log-likelihood to choose the optimal number of populations. Individuals were assigned to each of the inferred populations based upon the highest percentage of membership (based on the percentage of ancestry that can be attributed to each inferred population).

Data on pig damage and incidence was collected from all farms involved with the research project. A HCPSL employed officer inspected all farms in the study area during the period from 1 June 2012 to 1 June 2013 for the presence of crop damage; multiple inspections were undertaken during this period on some farms were feral pig activity was high. Data on the cane variety, the percentage damage, adjacent habitat, crop age and other relevant information were collected and analyzed. These data were used to assess the level of impact on particular cane varieties within the study area.

Herbert Cane Productivity Services Limited (HCPSL) survey all cane growers in the Herbert annually for crop losses incurred by feral pigs. The data are geo-referenced to cane blocks and yield losses can be calculated. As a part of the project the economic losses were calculated using the data provided by growers. A field validation of reported losses by growers was undertaken by the project to validate the grower reported figures. The assessment required stalks from both the damaged and non-damaged locations within a block to be weighed to calculate a crop yield for each treatment.

Results and Outputs:

Control methods and bait materials

The use of sodium fluoroacetate (1080) baiting method proved to be the most effective method in controlling feral pigs in the project area. Bananas and mangoes were found to be the best carrier for 1080. The 1080 is injected into the bananas and mangoes prior to being dispatched to the field. This finding agrees with Mitchell (2011) who reported that tropical fruits (like mangoes and bananas) were more effective than baits based on meat and grain in sugarcane production areas of the Wet Tropics.

In the project, alternative bait materials like various grains, pineapples, PIGOUT®, worm castings, cat food biscuits, milk and bread were assessed (without the presence of 1080). Uptake by feral pigs of bait materials varied considerably in the field trials. In the trials the following observations were noted: no uptake of worm casting; limited to no uptake of grain based products (like maize, soybean and cowpeas), PIGOUT® and pineapples; and good uptake of cat food biscuits, milk and bread. The issue with the latter two bait materials are that they are not registered for use with 1080 and their use could have possible off-target impacts; the use of these products was discontinued and should not permitted in the future. Pineapples were eaten only in the area south of Ingham where pineapples are grown. PIGOUT® is a commercially available packaged bait for the control of feral pigs sold in Australia.

One of the main reasons why the landholders were interested in assessing alternative baits, was because mangoes and bananas, which are the preferred baits, are not available at times. Mangoes are seasonal and there have been numerous times throughout recent history when bananas were not available for periods of 6-8 months (e.g. post cyclones Larry and Yasi).

The research undertaken by the project and the wider Hinchinbrook Feral Pig Management program concluded that 1080 baiting accounts for over 55% of pigs killed, with the remaining 41% being due to trapping and 4% due to dogging practices, during the period of the 30 June, 2012 to the 1 July, 2013 (unpublished data).

To date, hunting (especially dogging) has been found to be the least effective method assessed in managing feral pigs. Dogging also poses the problem of dispersing pigs and is ineffective in managing larger groups of feral pigs (Mitchell, 2011).

Mitchell (2011) reported that 1080 poisoning efficacy is generally around 60 to 70 %, with a population knockdown in Queensland reported to be as high as 81%. Based on remote camera photographs and subsequent field inspections, population knockdown from the research project is as high as those reported by Mitchell (2011).

Figure 1 is a photograph taken of 1080 baits being applied in the Lannercost area. Figure 2 is a photograph of a feral pigs consuming1080 bait in the Lannercost area. Time stamps on the photographs indicate that the baits were consumed 22 minutes after being applied.

Figures 1-4 indicate how remote camera photographs were used to monitor feral pigs feeding on 1080 baits. The number of feral pigs consuming baits were recorded through the use of the remote camera photography and the number of dead feral pigs found in field was recorded to calculate the efficacy of the bait. Figure 3 is of a feral pig consuming 1080 baits and figure 4 showing the same feral pig dead after consuming the 1080 bait a few days later.

Figure 1. Applying 1080 baits in the Hawkins Creek area.

Figure 2. Feral pigs that consumed1080 in the Hawkins Creek area.

Figure 3. A feral pig consuming 1080 baits laid within a cane crop, in the Lannercost area.

Figure 4. The same feral pig in Figure 3 found dead in field after consuming 1080 baits

The project consulted with staff from Animal Control Technologies Australia (ACTA) concerning the use of current formulations of HOGGONE®. Research undertaken by ACTA found that the current sodium nitrite formulation in HOGGONE® was highly unstable and unpalatable to pigs. ACTA are currently investigating alternative formulations of sodium nitrite for use in HOGGONE® (L Staples, pers comm., 2012).

The HogHopper™ was assessed as a part of the project and was found to have very limited success when compared to conventional baiting and trapping methods in the Hawkins Creek area. The limited success of the HogHopper™ appears to be due to the feral pigs being shy of coming into contact with the bait station.

Pheromones

As a part of the project, feral pig pheromones were imported (under license) from the USA. The pheromone was applied to a number feral pig traps and adjacent areas in the Lannercost area, to access if they would be useful in a feral pig management program. In the study area, it was observed (through remote cameras) that the pheromone had no impact on feral pigs.

Genetic testing for assessing feral pig movement (gene flow) among sites

The STRUCTURE analysis clearly indicated the presence of population structure, with two groups inferred, as represented by the two colours in Figure 5. Broadly, these two colours can be aligned with geographic location; sites close to highland rainforest constitute one population (predominantly red) and sites in the lowland region south of Palm Creek constitute a second population (predominantly blue). The majority of individuals in each management unit exhibited pure ancestry (>80% ancestry to one colour), representative of the management unit from which they were sampled. However, some individuals clearly exhibited ancestry from the management unit outside from which they were sampled, indicating recent dispersal or translocation.

A potential explanation for the difference between the highland and the coastal lowland pigs could be that the lowland pigs represent a separate introduction or release. It may be that insufficient time has passed for genetic homogenisation and that limited migration has occurred. This suggestion is consistent with Mitchell *et al.* (2009) who found feral pigs to be relatively sedentary in tropical habitats and to have defined home ranges. Mitchell *et al.* (2009) also reported that feral pigs in far north Queensland have an average home range size of 8 km^2 and move an average distance of 1 km at a time.

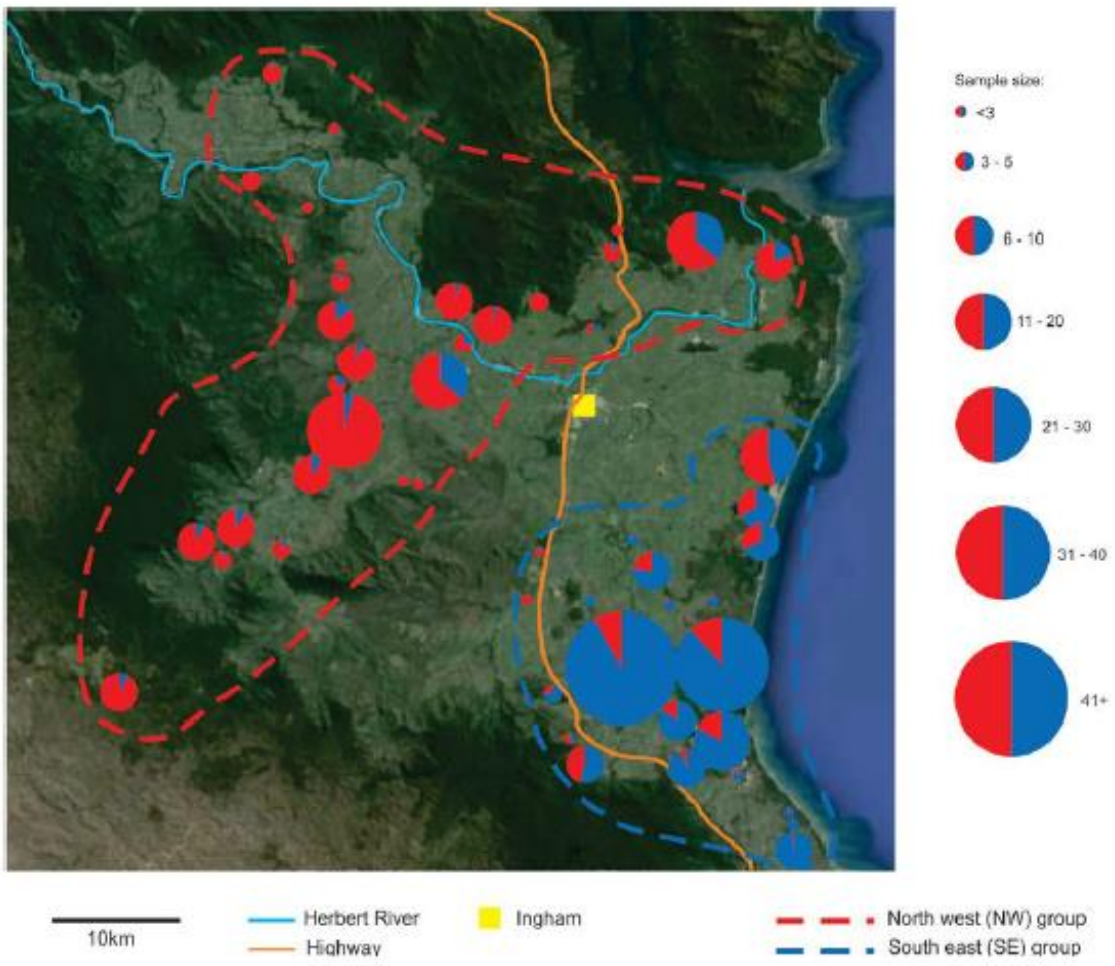

Figure 5. Proportion of individuals at each site with ancestry to each of the two inferred groups (red and blue) based on Bayesian structure analysis and positioned on a map.

Refer to Appendix 1 for a complete report on the genetic research findings from the project.

Cane variety impacts

It has been observed that feral pigs have preferences for particular cane varieties, however no previously known research has attempted to quantify the variety preference by feral pigs.

Between June 2012 and June 2013, Q208 was the most recorded variety for incidence of feral pig damage with 52% of fields impacted (Q208 comprised 20% of the harvested area for the Wet Belt area of the Herbert cane region (Anon., 2012)). The incidence of fields of other varieties damaged was: KQ228 - 8% (being 10% of the harvested area), Q200 - 38% (being 33% of the area harvested), Q183, Q186 and Q204 - combined at 2% (being 7% of the area harvested). MQ239, which was 11% of the area harvested in 2012, had less than 1% damage caused by pigs. This clearly highlights significant differences between varieties like MQ239 and Q208 in relation to susceptibility to pig damage. Previous observations in the Hawkins Creek area indicate that feral pigs will usually avoid Q96 and H56-752 in preference for other varieties.

Cane fibre characteristics may be the reason for the differences between varieties. Data was obtained from the Sugar Research Australia (SRA) plant breeding program for the following cane fibre characteristics: cane fibre impact, shear strength and percent short fibre. When reviewing the data, there was no significant trend for any of the fibre characteristics accessed. The only difference between varieties in relation to feral pig preference appears to be CCS content and crop architecture (especially an open crop habit).

Q208 has a very open crop habit and is prone to more weed infestation compared to varieties like Q186 and KQ228. It was frequently observed and reported in field notes taken during the project period, that feral pigs would enter fields of Q208 in in preference to other cane varieties. The open crop habitat and weed infestations found with Q208 may explain the reason why the high levels of feral pig damage occur in this variety when compared to other varieties.

Field observations also indicate that feral pigs will cause damage to Q208 throughout the year while damage to KQ228 and Q200 appears to be more prevalent from June and until the crop is harvested. The KQ228 and Q200 crops appear to be targeted when they are increasing in CCS content.

Based on the research undertaken in the project, trap crops of Q208 were established in the Lannercost area. The purpose of the trap crop is to lure pigs into an area where feral pig baiting activities can occur; this technique has proven to be successful where there is a limited area of susceptible varieties or where non-cane habitats that are refuges for feral pigs are adjacent to the cane.

Crop loss assessments

Estimated crop losses associated with feral pig damage in the Herbert are given in Table 1. These figures do not take into account the financial losses incurred with damage caused to drains and headlands.

Table 1. Estimated value of cane losses associated with feral pig damage in the Herbert.

Year	Estimated loss in income ($)
2009	1 190 000
2010	719 000
2011	570 000
2012	504 000

Figures are based upon a sugar price of $40/t of cane.

During 2009-12, feral pigs caused higher crop yield losses (tcph) and higher losses of income to the Herbert area than other pests like cane grubs and rats.

Field validation trials indicated no significant difference between the growers reported estimated yield losses and field validation trials. This indicates that grower crop damage estimates are adequate when attempting to estimate crop loss in income across a region or district.

Habitat influences

The field data collected by the research project and by HCPSL indicate that cane blocks adjacent to forestry plantations, grazing properties, protected land areas (i.e. National Parks), forests and grass areas are more prone to significant increased feral pig damage. Figure 6 highlights the cane blocks impacted by feral pig damage and adjacent land uses.

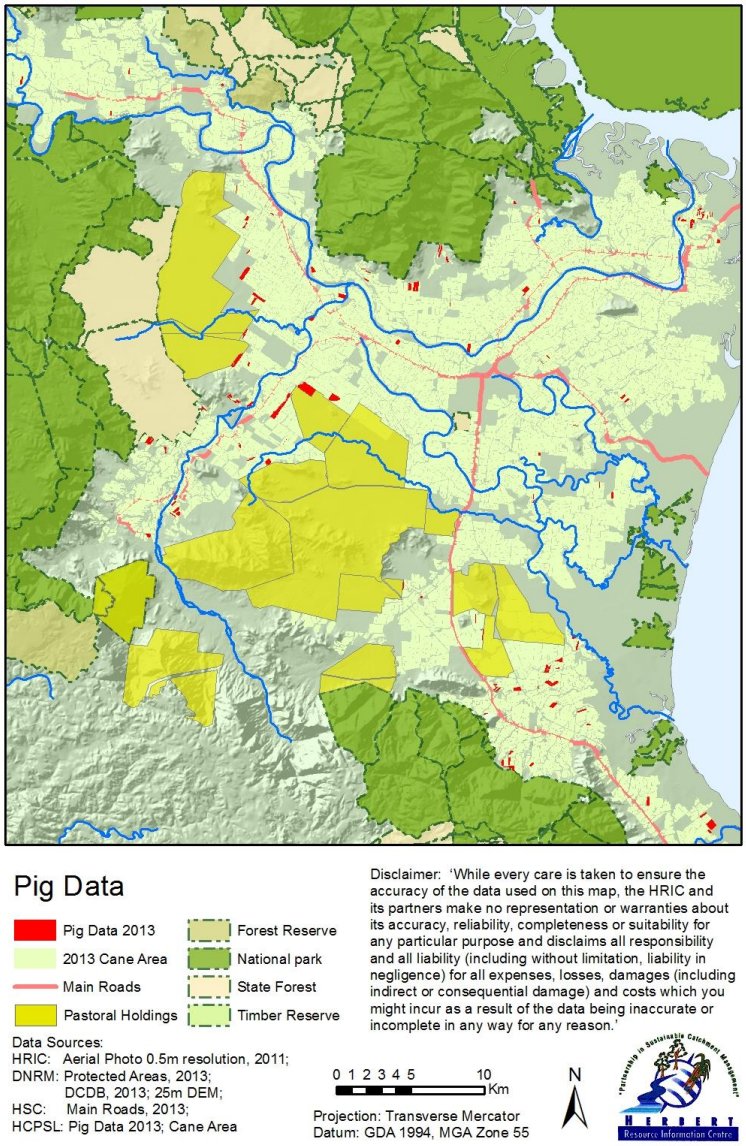

Figure 6. Location of feral pig damage in 2013 in association with land use practices.

Intellectual Property and Confidentiality:
The IP associated with PIGOUT®, HOGGONE™ and the HOGHOPPER™ will remain the property of ACTA.

Capacity Building:
It appears that a significant amount of knowledge has been gained from the project by the grower group members and in relation to feral pig management in the Herbert. As a part of the project growers selected randomly from the grower group membership and surveyed by the project. The results of the grower survey can be found in Appendix 2.

Based on the interviewee's responses, this project did increased the amount of sugar cane harvested and thus the money earned by the growers. Farmers also recognize the feral pig project has had positive impacts on the environment as feral pigs can be a nuisance for other animals and on water quality outcomes.

The project has increased the knowledge of the grower group participants and the wide cane industry through the publication of the ASSCT paper and presentations undertaken at the "Step Up" conference 2013 (Gold Coast), GIVE 2014 (Innisfail), ASSCT 2014 (Gold Coast) and though numerous ABC radio interviews.

The project has provided the wider cane industry information and methodologies on ways to undertake feral pig management through the various publications developed.

The biggest success of the project is that this project has achieved is that growers and community realise that they need to work together to address the issue of feral pig management. The Grower Group participants now have the skills to manage a feral pigs and undertake activities to do so, after the conclusion of the project.

Environmental and Social Impacts:
Environmental the project and the HCFPMP had a significant impact on the landscape through the management of feral pigs. Annually the HCFPMP and the Grower Group project removed annually hundreds of feral pigs from the region. It is believed that this action will have a significant benefit to native ecosystems and native animals (like turtles, cassowary and emus). During the duration of the project it was noted by Grower Group members that there was significant improvements in water quality when feral pigs did not dig along water courses and farm drainage systems (as in photo 4).

Feral pigs are a declared Class 2 pest in Queensland requiring land managers to take reasonable steps to keep their properties free from feral pigs (Mitchell, 2011). The cane industry in the Herbert and throughout Australia will need to work collaboratively with other land managers to manage this pest that knows no property boundaries if it is to be successful in minimizing the damage incurred to the sugarcane industry (Di Bella, 2014).

Outcomes:

The project has achieved the following outcomes:

- Has highlighted feral pig management strategies for wet tropics sugarcane production areas to cane farmers working within this region.
- The project has provided grower training in the effective management of feral pigs using baiting, fencing and trapping techniques.
- The project has highlighted the importance of 1080 as an effective tool for the management and control of feral pigs. The withdrawal of 1080 without an appropriate replacement would have a significant impact on the effective control of feral pigs on a landscape.
- The project has identified appropriate bait carrier options for the management of feral pigs in a Wet Tropics sugarcane production area.
- The project has produced a number of written resources that are being used by landholders in the cane industry at present.
- The project has highlighted the opportunity for landholders to work together instead of alone, to manage a pest that knows no boundaries. The interaction between neighboring cane growers to manage feral pigs has continued after the conclusion of the project.
- The realization by industry what financial impacts feral pigs cause to the cane growing industry.
- The genetic data and population mapping has assisted the HCFPMP better target feral pigs within the landscape. The HCFPMP partners are currently in discussions with National Parks concerning the "Nest to Ocean" project. The HCFPMP have submitted a project proposal to the State Government for funding to target the South Eastern coastal population of feral pigs which impact on feral hatcheries in the area. The research undertaken by QUT into feral pig genetic population mapping, has highlighted that there is a distinct group of feral pigs that could be targeted and managed which prey on turtle rockeries.

Communication and Adoption of Outputs:

The following communication activities occurred as a part of the project:

Written communications:

- Herbert Sugar Industry Report 2012 p.
- Herbert Sugar Industry Report 2013 p.
- Exclusion fencing of feral pigs booklet
- Poisoning of feral pigs booklet
- Shooting hunting of feral pigs booklet
- Trapping of feral pigs booklet
- HCPSL Manager's report October 2013
- HCPSL Manager's report January 2014
- Feral pig management survey report 2013
- Australian CANEGROWERS magazine article, June 2014.
- ASSCT paper published in the 2014 ASSCT proceedings.

- QUT final report- Integrated Feral Pig Management for the Herbert cane area (Here Piggy Piggy!): Feral Pig Population Genetics Component.

Oral communications:

- The "Step Up" conference 2013 (Gold Coast)
- GIVE 2014 (Innisfail)
- ASSCT 2014 (Gold Coast)
- ABC radio interviews during the duration of the project

Web based delivery:
The booklets created by this project can be found on www.hcpsl.com under the factsheets section. SRA PEC staff have also created a link from the SRA website to the HCPSL website.

Based upon HCPSL website records, multiple parties from the whole cane industry have accessed the booklets that are found on the website.

Recommendations:
Various control management strategies (like hunting, trapping and baiting) are important and vital for the management of this pest species; however there is no one approach that will singularly manage feral pigs in a landscape.

The continued use of 1080 baiting is an important tool in the management of the feral pigs. At present, 1080 is the most efficient, humane and species-specific pesticide available for the management of feral pigs (Anon., 2009). Strict management of 1080 is essential through trained and accredited personnel in the application and handling of the product to ensure that the product is not misused.

In the Wet Tropics area, it appears that banana and mangoes are the most suitable bait material. The ability to access and store large enough quantities of bananas and or mangoes for use after events like cyclones and other periods of unavailability, is essential for the continuation of baiting and trapping throughout the year.

The use of genetic mapping and GIS can assist land managers with identifying the extent of pig movement throughout a region, link movement to land use and consequently, inform targeted management. For example, feral pig control should be undertaken simultaneously at all properties within a population to reduce recolonization.

Pig samples from within adjacent rainforest and National Park Estates are required to determine whether rainforest 1) is a source for either of the two management units sampled in this study, and 2) harbours other undetected genetic populations (refer to Figure 3). An analysis of mtDNA is also required to examine whether pigs in the study area belong to the same pig breed.

Further research is required in relation to the cane crop's physiological mechanisms that cause different varieties to show different susceptibilities to feral pigs. In the meantime, cane farmers need to manage varieties planted adjacent to non-cane habitat areas in which feral pigs are found or utilize identified feral pig susceptible varieties (like Q208) as a trap crop to lure feral pigs to where baiting activities can occur.

Feral pigs are a significant economic pest to the Herbert and Australian cane industry. Long term funding security is essential to maintain feral pig management programs in the region. Failure to maintain investment into feral pig management will result in pig populations increasing and significant increases in cane losses and the costs associated with repairing infrastructure like headlands and drains on farming land. Environmental impacts caused by feral pigs should not be ignored either when considering a feral pig management program.

Feral pigs are a declared Class 2 pest in Queensland requiring land managers to take reasonable steps to keep their properties free from feral pigs (Mitchell, 2011). The cane industry in the Herbert and throughout Australia will need to work collaboratively with other land managers to manage this pest that knows no property boundaries if it is to be successful in minimizing the damage incurred to the sugarcane industry

Publications:

The following publications were generated as a part of this project:

- Appendix 1- QUT final report into DNA mapping of feral pig populations in the Hinchinbrook Shire region, 2014.
- Herbert Sugar Industry Report 2012
- Herbert Sugar Industry Report 2013
- Appendix 2- Feral pig management survey report 2013.
- Appendix 3-Exclusion fencing of feral pigs booklet
- Appendix 4- Poisoning of feral pigs booklet
- Appendix 5- Shooting hunting of feral pigs booklet
- Appendix 6- Trapping of feral pigs booklet
- Appendix 7 HCPSL Manager's report October 2013
- Appendix 8 HCPSL Manager's report January 2014

ASSCT paper published in the 2014 ASSCT proceedings. Paper title: The impact and management of feral pigs in the Herbert cane growing region of North Queensland.

Acknowledgements:

Special thanks to the partners of the Hinchinbrook Feral Pig Management for providing additional resources to the SRA funded Grower Group project-'An integrated feral pig management for the Herbert cane area' during the research project period. Thanks to the land managers and HCPSL staff who assisted with the research activities. Thanks also to the Herbert Resource Information Centre (HRIC) for the generation and provision of maps for the report.

Photographs taken during the project period:

Photo 1. Hawkins Creek Grower Group members

Photo 2. Cane damaged by feral pigs in the Lannercost area

Photo 3. Feed baiting trials at a Lannercost farm.

Photo 4. Damage caused by feral pigs to farm drains- Hawkins Creek area

Photo 5 (left). A feral pig captured in a trap in the Hawkins Creek area, 2013.
Photo 6 (right). Collecting DNA sample material for the project.

Photo 6 (above). Feral pigs photographed in the Lannercost area using a night vision camera, 2012.

Photos 7 (above). Ray Stallan undertaking baiting trials.

Photo 8 (below). Yoana Faure (University student from Ecole Superieure D'Agriculture) interviewing grower group member- Tony Palmas, 2013.

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