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## Economic Analysis of Honey Bee Disease Management Strategies for the South Australian Apiary Industry

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### Key Words:

Apiary industry, honey bee disease management, program evaluation, self reliance

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### Abstract:

A range of honey bee disease management options were evaluated on disease prevalence and economic criteria as part of an SA Government appointed Apiary Task Force to select and implement a 'best' strategy for industry and government. Importantly, the terms of reference specified that the strategy should also lead to greater self-reliance in disease control by the apiary industry in the next two years.

Three economic 'screens' were applied to aid program evaluation - market failure, public:private benefit and benefit:cost analysis. 'Quality assurance' (QA) had the best benefit:cost ratio (BCR) at 9.0, but a poor apiary operation disease prevalence (AODP) of 50 percent by 2002. 'Eradication' had the best AODP projection (7 percent) but the worst BCR (1.0). A mandatory disease control strategy (BCR=1.8; AODP=20%), which includes QA, has been recommended by the Task Force to wind-in the current 32 percent AODP before considering QA as a stand-alone strategy.

Market failure, due to negative externalities (infection from diseased apiaries to disease-free apiaries) is at the root of the industry's disease management problems and provides grounds for government intervention. Information gaps about disease diagnosis and management are a contributing factor.

A public:private benefit split of 10:90, when government has been the principal fund provider, is a case for improving funding alignment under present agency policy. In the context of a relatively small primary industry with a low capacity to pay the evaluation adds challenge to implementation of the new strategy, especially the transition to greater self reliance in funding disease control programs.

The Australian Honey Bee Industry Council is developing a national plan for the control of American Foulbrood (AFB), involving honey testing all beekeeper's for AFB, a comprehensive quality assurance program and accreditation of beekeepers.

## 1. Introduction

"Policy changes in a number of states and countries have changed American Foulbrood (AFB) control procedures. Government inspection programs have been scaled down, withdrawn or continued only at the industry's expense. These changes have caused beekeepers to question the importance of AFB and inspection programs, making timely a review of AFB and its place in modern beekeeping" ([Matheson & Reid, 1992](#)).

In late 1996, following representation from South Australia's apiary industry, the Minister for Primary Industries, the Hon Rob Kerin (now Deputy Premier and Minister for Primary Industries, Natural Resources and Regional Development) announced the establishment of a two year inquiry by an Apiary Industry Task Force into the management of honey bee diseases; the principal disease of concern being American Foulbrood (AFB).

In essence the Minister directed the Task Force to:

"develop and implement a strategy for the on-going management of bee diseases and related honey/industry productivity issues in South Australia, leading to greater industry self-reliance in these matters in two years."

The Task Force duly reported to the Deputy Premier in November, 1998, ([Apiary Industry Task Force, 1998](#)) with industry invited to comment on the report by the end of January, 1999.

This paper incorporates an earlier paper to industry on the economic analysis of honey bee disease management strategies for the South Australian apiary industry ([Ronan and Petrenas, 1998](#)), overviews the contribution of economic analysis to the Task Force and encourages the shift to self-reliance reflected in the adoption of a national AFB control plan.

## 2. Economic Analysis

As the Task Force got down to work they identified an array of disease management strategies. Economic services were enjoined to see if order could be created from the list of options, involving overlapping elements. Benefit:cost analysis was the obvious tool; a tool which other workers in Western Australia and New South Wales had applied to the eradication strategy ([WA Department of Agriculture, 1995](#), [Fraser et al. 1995](#)).

The Task Force options included:

1. No program - Nil;
2. An information Extension program to beekeepers;
3. A honey packer Quality Assurance (QA) program;
4. A Buy-Back program for abandoned hives;
5. A Mandatory Disease Control program;
6. A combined Buy-Back and Mandatory Disease Control program;
7. A Mandatory Eradication program

**Table 1** in Appendix 1 describes all the options and the assumed outcomes in greater detail.

Just prior to the Apiary Task Force seeking economic assistance to their dilemma Primary Industries and Resources SA (PIRSA) adopted a project appraisal method developed by departmental [Economists 1](#). That method involves a three step "screening" process:

- Step One: Testing the project for the presence of market failure;
- Step Two: Splitting the benefits of the project into public and private proportions; and
- Step Three: Analysing the projects expected benefits and costs.

So, the opportunity presented to subject the Apiary Task Force options for management of honey bee diseases to the "three screen tests". The disease control strategies, the epidemiological projections and the economic results for the seven options are in Tables 1, 2 and 3 of [Appendix 1](#).

Did any of the options pass through the three economic screens and achieve a satisfactory disease prevalence outcome? At the Apiary Industry's Annual Conference we gave the answer: "unfortunately not". The first two screens are not a problem: the nature of the AFB disease is such that negative externalities proliferate - good beekeepers are always at risk of getting the disease in their hives as a result of the neglect and abandonment of apiaries and the poor management practices of other beekeepers. We also identified information problems as a type of market failure in that paper, but we are now less inclined to that diagnosis and more inclined to the view that information problems are a contributing factor to the negative externality [market failure. 2](#)

And although it has proven to be a very contentious point with some apiarists, all programs for honey bee disease management are rated of high private benefit on our PIRSA public:private benefit test. We apportion about 90 percent of the benefits of honey bee disease programs to be captured by private beneficiaries, which allows for some 10 percent public benefit from the good work of bees in conservation parks and other public property.

The real problem with AFB occurs at the third and final screen - the benefit cost analysis. Our analysis could not find a program that made any substantial progress in disease management that also represented a good investment, irrespective of who paid the bill. In PIRSA, project Benefit Cost Ratios (BCR) of less than 2 are marginal in an "across the board" comparison of potential projects. Only the Quality Assurance (QA) program with a BCR of 9 is an obvious good investment, but the disease outlook at 50 percent prevalence after four years is not impressive.

Whether it was a good investment or not most apiarists would prefer the government to pay for an eradication program based on inspection services, and why wouldn't they given the annual costs of about half a million dollars? A well resourced inspectorial service, involving about a dozen people, was projected to achieve the best reduction in disease prevalence. But the problem lies in the qualification, "well resourced". In South Australia, the PIRSA inspection service of less than two people has not been able to contain the disease, indicated by the 32 percent apiarist operation disease prevalence (AODP) measured during the Task Force activities.

The Task Force report recommended the Mandatory Disease Control program. Although they did not refer to it as such it represents a compromise strategy on several criteria. It achieves a better disease outcome than QA alone and it costs a lot less than an Eradication program. It makes progress on AFB prevalence and is likely to be acceptable in cost to government and has a chance of being afforded by industry as it addresses the issue of funding a program after a two year transition. These elements made for it being the preferred strategy.

However, some apiarist groups were not ready to see it that way following the release of the draft Task Force Report at the Apiarist Association Annual conference in mid-winter. The invitation for comment saw a submission from the Riverland and South East Branches of the SA Apiarist's Association which was critical of the lack of progress by the Task Force in cleaning up AFB, the economic analysis and referred to the public/private benefit concept as "economic rationalism gone mad"! The Branches were sent a short reply from the Task Force Chairman rebutting their arguments. The full text of my notes to the Task Force are attached ([see Appendix 2](#)).

The report of the Task Force was forwarded to the Minister in November, 1998, and circulated to registered apiarists soon after as part of a consultation process with industry. Notes on "Economic Screening of PIRSA's Honey Bee Disease Management Program" are included in the report ([Apiary Industry Task Force Report, 1998](#)) ([see Appendix 3](#)).

### 3. Conclusions

- a. South Australia's [Apiary Industry Task Force](#) has been a timely opportunity for industry and government to review strategies and respective roles in the management of honey bee diseases. Industry's concern about the prevalence of AFB and dissatisfaction with an ineffective 'eradication' program was welcomed with government proscribing that any strategy for managing honey bee diseases in future should be chosen with an awareness that greater industry self-reliance is expected.
- b. Economic analysis became an integral part of the appraisal of honey bee disease management options by the [Apiary Industry Task Force](#) during its two year operation. Though welcomed by the Task Force to rank options objectively and playing a more influential role than initially envisaged by the Task Force, the results of the analysis have not been received warmly by all apiarists. This is not unusual in PIRSA, where the "three economic screen" project appraisal methodology has introduced additional information for priority setting by managers which can be used in conjunction with industry to negotiate resourcing and funding.
- c. AFB has proven to be a difficult disease to eradicate, but there are real choices for its control. Doing nothing about the disease could cost the industry export markets. However, the benefits from control programs are not so great as to justify very expensive eradication programs based on inspectorial services. Government requirements for the 'beneficiary to pay' (or at least increase contribution in the first instance) requires different thinking by the apiary industry about its future, with increased responsibility for disease control, greater interest in industry development and less dependence on government.
- d. The SA [Apiary Industry Task Force](#) has recommended a Mandatory Disease Control program which is little different in resource requirement from that of the "eradication-inspectorial" strategy that it replaces. What is different is that industry now has a better appreciation of the necessity to make the market work to advantage via price discrimination in favour of quality products. The QA strategy was the only clear winner from the analysis with a benefit cost ratio of 9. Although that is an attractive BCR, the projected increase in disease prevalence of 50 percent encourages a more multi-pronged approach at least until the disease is measurably under greater control than the present 32 percent prevalence among apiarists.
- e. Reviewing of government funded AFB management strategies in various states within Australia has increased industry interest in a national approach to control. **3** A national approach to QA, pivotal to the industry taking charge of its own destiny, is part of the industry's objectives. **4** Interestingly, the national objectives also recommend elimination of the categories "amateur" and "commercial" in reference to beekeepers. Bees make no discrimination between beekeepers in their work, nor in their transmission of disease!

### References

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## Appendix 1 - Disease Control Strategies

Table 1: Disease Control Strategies

Option	Description	Outcome
<b>NIL PROGRAM</b>	In this option there is no organised program by industry or Government. It presumes there is no Quality Assurance (QA) program and apiarists respond as individuals to disease and financial pressures.	<ul style="list-style-type: none"> <li>The disease prevalence increases to 60% by 2002 (from 32% in 1997)</li> <li>Significant export markets are lost</li> <li>The mature domestic market does not absorb any more product</li> <li>25% of commercial apiarists leave the industry by 2002.</li> </ul>
<b>EXTENSION ONLY</b>	This program provides timely advice and encouragement to apiarists to control AFB. There are no compulsory components. Service delivery is by private and/or PIRSA consultants.	<ul style="list-style-type: none"> <li>Three quarters (75%) of commercial apiarists are able to eradicate the disease</li> <li>There are no compulsory components or QA program</li> <li>The disease prevalence increases to 55%</li> <li>Most of the non-commercial apiarists fail to control AFB.</li> </ul>
<b>QA PROGRAM ONLY</b>	This program relies on implementing a quality assurance program. It is implemented by honey packers.	<ul style="list-style-type: none"> <li>Export markets are enhanced</li> <li>Non-commercial apiarists do not control AFB</li> <li>Commercial apiarists reduce disease by 80%, but overall prevalence increases to 50%</li> <li>Rate of re-infection for commercial apiarists is highest in this scenario.</li> <li>Increased productivity by commercial apiarists of 20%.</li> </ul>
<b>BUY BACK SCHEME</b>	This program places emphasis on identifying all beekeepers and monitoring for AFB. It is accompanied by an industry QA program. There is compulsory and enforced annual registration. There is compulsory and enforced honey testing. The program is introduced with an incentive scheme to remove unwanted hives. Inspectors enforce removal of unregistered hive owners from the industry with expiation fines. The same applies for those who fail to submit a honey test. AFB control is voluntary for four years. This program is short term and must be followed by a more conventional program after 4 years or disease would re-establish.	<ul style="list-style-type: none"> <li>Exports are enhanced</li> <li>Disease prevalence is reduced to 9% over 4 years</li> <li>Two thousand non-commercial hive owners leave the industry by 2002.</li> </ul>

<b>MANDATORY DISEASE CONTROL</b>	<p>This program relies on commercial QA procedures for controlling AFB in commercial apiaries. Disease control is achieved by orders imposed and monitoring of success with increased honey testing in infected apiaries. AFB is a notifiable disease. Control is compulsory and enforced. Inspectors impose expiations for failure to comply with registration, testing or eradication requirements.</p> <p>NOTE:  <b>Because Buy Back achieved a better reduction of disease, a further option was examined. Buy Back was compressed into one year, followed by the mandatory disease control program. This achieved a disease prevalence of 12% by 2002 at an intermediary cost.</b></p>	<ul style="list-style-type: none"> <li>• Disease prevalence is reduced to 20%</li> <li>• Exports are enhanced</li> <li>• Frequent property visits to infected apiarists are not required</li> <li>• Five hundred non-commercial apiarists leave the industry by 2002</li> <li>• Twelve hundred owners are registered and thirteen hundred are not registered.</li> </ul>
<b>MANDATORY DISEASE ERADICATION</b>	<p>This program super-imposes the traditional apiarist inspector role onto an industry QA program. Eradication is compulsory. Inspectors impose quarantine restrictions to ensure removal or treatment of unwanted hives and to prevent travel of infected hives. Enforcement is by property visits and court orders. Inspectors enforce registration and honey testing. Inspectors enforce removal of abandoned and neglected hives.</p>	<ul style="list-style-type: none"> <li>• Disease prevalence is reduced to 7% over 4 years</li> <li>• Exports are enhanced</li> <li>• This program is costly.</li> </ul>

Table 2a: Disease Prevalence between Options, by Apiarist

Apiary Operation Disease Prevalence (%)	Current Status 1997	Nil Program	Extension Only	Packer QA Program	Buy Back Program	Mandatory Disease Control Program	Buy Back + Mandatory Disease Control Program	Mandatory Disease Eradication Program
		4 yrs	4 yrs	4 yrs	4 yrs	4 yrs	4 yrs	4 yrs
<b>Commercial *</b>	33%	60%	54%	13%	13%	9%	9%	9%
<b>Hobbyist/amateur** Registered</b>	29%	60%	53%	60%	8%	9%	11%	7%
<b>Hobbyist/amateur** Unregistered</b>	33%	60%	60%	60%	0	30%	30%	0
<b>TOTAL</b>	<b>32%</b>	<b>60%+</b>	<b>55%</b>	<b>50%</b>	<b>9%</b>	<b>20%</b>	<b>12%</b>	<b>7%</b>

Table 2b: Disease Prevalence between Options, by Number of Infected Hives and Percentage

Estimated Hive Disease Prevalence (No.) and Percentage (%)	Current Status 1997	Nil Program	Extension Only	Packer QA Program	Buy Back Program	Mandatory Disease Control Program	Buy Back + Mandatory Disease Control Program	Mandatory Disease Eradication Program
		4 yrs	4 yrs	4 yrs	4 yrs	4 yrs	4 yrs	4 yrs
<b>Commercial*</b>	1,905 (3%)	2,858 (6%)	3,429 (5%)	238 (0.4%)	238 (0.4%)	179 (0.3%)	179 (0.3%)	169 (0.3%)
<b>Hobbyist/amateur** Registered</b>	277 (3%)	554 (6%)	511 (6%)	554 (6%)	67 (0.7%)	90 (1%)	89 (1%)	55 (0.6%)
<b>Hobbyist/amateur** Unregistered</b>	360 (3%)	720 (6%)	720 (6%)	720 (6%)	0 -	390 (4%)	14 (6%)	0 -

<b>TOTAL</b>	<b>2,542</b> <b>(3%)</b>	<b>4,132</b> <b>(6%)</b>	<b>4,660</b> <b>(6%)</b>	<b>1,512</b> <b>(2%)</b>	<b>305</b> <b>(0.4%)</b>	<b>659</b> <b>(0.8%)</b>	<b>282</b> <b>(0.4%)</b>	<b>224</b> <b>(0.3%)</b>
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Note: In this exercise a:

- Commercial apiarist has 100 or more hives; and
- Hobbyist/amateur apiarist has 99 or less hives.

Table 3: Economic Analysis of AFB Control Strategies

<b>Market Failure</b>	<b>Status at 1997</b>	<b>Nil Program</b>	<b>Extension Only</b>	<b>Packer QA Program</b>	<b>Buy Back Program</b>	<b>Mandatory Disease Control</b>	<b>Buy Back + Mandatory Disease Control</b>	<b>Mandatory Disease Eradication Program</b>
<b>Does the program address negative externalities?</b>	No	No	No	No	Yes	No	Yes	Yes
<b>Short term</b>		No	No	No	No	Yes	Yes	Yes
<b>Long term</b>								
<b>Private Benefit</b>	90%	90%	90%	90%	90%	90%	90%	90%
<b>Benefit Cost Ratio</b>	NA	NA	NA	9.0	1.6	1.8	1.6	1.0
<b>Total Program Cost Per Annum</b>	\$110,000	NA	NA	NA	\$223,000	\$145,000	\$218,000	\$452,000
<b>Registration Cost for Total Program (based on 850 apiarists)</b>	\$130	NA	NA	NA	\$263	\$171	\$257	\$532
<b>Registration Cost Assuming Govt. Assistance (based on 850 apiarists)</b>	NA	NA	NA	NA	\$157	\$65	\$151	\$426
<b>Total Program Cost Per Annum</b>	\$110,000	NA	NA	NA	\$223,000	\$145,000	\$218,000	\$452,000
<b>Registration Cost for Total Program (based on 850 apiarists)</b>	\$130	NA	NA	NA	\$263	\$171	\$257	\$532
<b>Registration Cost Assuming Govt. Assistance (based on 850 apiarists) 5</b>	NA	NA	NA	NA	\$157	\$65	\$151	\$426

## Appendix 2 - Reply to Submission to Apiary Task Force from South East & Riverland Apiary Association Branches re Economic Analysis of Management Strategies for American Foulbrood Disease

### 2.1 Background

A combined meeting of the South East and Riverland Branches of the South Australian Apiarists' Association (SAAA) at Coonalpyn on 24<sup>th</sup> July, 1998, lead to a submission to the SA Apiary Industry Task Force in response to the Task Force Interim Report, which includes an economic analysis of American Foulbrood (AFB) disease management strategies. The submission was critical of:

- PIRSA's Chief Veterinary Officer's advice to the Task Force about its role,
- the lack of progress by the Task Force in cleaning-up AFB, and

- the economic report presented to the Task Force and the apiary [industry.6](#)

"This meeting rejects the economic report as presented at the Annual General Meeting of the South Australian Apiarists Association. It is flawed because of the following (issues)".

## 2.2 The Issues

### (a) Flow-on Effects

"No account has been taken of any flow-on effects of the industry. For example, improved pastures, livestock, dairy, racing industry, export hay, vegetable seed, stone fruits, cucurbits and tomatoes."

Correct, but not because of unwitting omission. The analysis did not take into account the flow-on benefits of the honey bee industry to other primary industries, in particular unpaid pollination. While inclusion of flow-on benefits would boost the benefit-cost ratio it would not alter the fact that AFB programs are predominantly of private benefit (see p5 of the analysis).

As with most agricultural and other industries there are flow-on benefits elsewhere in the economy. It may be that the honey bee industry has more flow-on benefits than some other industries - there are a lot of good side-effects (positive externalities) via pollination from honey bee activity and no bad side effects (negative externalities) that I am aware of. Of course, if there were no honey industry (ie honey had no value in our economy) then the commercial value of pollination would be much higher, with much less pollination provided without charge, as it is in its dual product context in South Australia in most areas at most times of the year.

Economic Analysis of Honey Bee Disease Management Strategies for the South Australian Apiary Industry, Glenn Ronan and Elena Petrenas, PIRSA. Paper presented to the 54<sup>th</sup> Annual Conference of the South Australian Apiarist's Association, July, 1998.

The existence of the honey industry is a boon to other benefiting industries. Because many apiarists are willing to supply hives for honey, without expectation of cash payment for pollination, then the market for pollination services remains much smaller and with less commercial potential than it would otherwise have. The apiary industry is a classic example of joint products, where the incentive to produce one (ie honey) results in the simultaneous but un-remunerated supply of the other (ie pollination). So, it is honey producers who cruel the market for paid pollination services! However, this is not market failure.

To achieve consistency in project analysis within PIRSA it has been agreed that flow-on effects not be included in benefit cost analyses. The reason for this is twofold: the difficulty in estimating flow-on benefits and the problems of distorting the results if one industry group were to claim more than another.

The existence of positive externalities is not in itself a justification for government assistance to the honey bee industry. Let us be quite clear on this point: the 'positive externality' benefits of pollination do not equate to public benefit. Government intervention in markets is more appropriately justified by the presence of market failure, by a high public benefit associated with an intervention program and/or a willingness by industry to contribute to the private benefit and that any spending represents a sound investment, as indicated by a reasonably positive benefit cost ratio.

In the case of AFB it is recognised that there is market failure: apiarists with good management practices are unable to protect themselves from the spread of AFB by other apiarists with infected hives and poor management practices. This could be described as un-neighbourly behaviour. This is why honey packers need to make the presence of AFB spores part of Quality Assurance, to apply market pressure on apiarist behaviour to achieve AFB control. A second type of market failure also occurs as a result of information gaps.

[Table 4](#) indicates the connections between factors contributing to disease in the field, market failure type and actions and responsibilities that may be pursued to overcome AFB and other honey bee diseases. Market failure is the economic taproot of the AFB problem. Since the market alone is incapable of solving the AFB problem, intervention by industry and government is essential to control of the problem.

### (b) Industry Failure

*"No account has been taken of the potential catastrophic effect if the horticultural industries fail, and the domino effect that will occur in the dependent infrastructures and the dependent rural communities."*

The failure of the horticultural or any other cropping industry which benefits from pollination, free of charge or charged for, is not in prospect. Well prior to the failure of horticultural industries the value of pollination services would increase. The commercial value of pollination services can only increase if the supply of "free" pollination is reduced. Currently it is not necessary for the majority of pollination "beneficiaries" - ie cropping industries that benefit from honey bee pollination - to pay for pollination services. Only when honey production and pollination are not linked, as in the SA almond industry and the NT melon industry, do we see the "shock value" of pollination reflected in the commercial value of pollination services.

### (c) Regional Benefits

*"That this industry is a decentralised industry, the length and breadth of the agricultural industries of South Australia."*

Yes, there are regional benefits from a decentralised apiary industry and they are very important in some regions. These benefits are part of flow-on benefits and are not included in the estimate of benefits in PIRSA's benefit cost analysis of AFB control programs.

#### **(d) Economic Rationalism**

*"The terms public and private benefit are economic rationalism gone mad. Any person, especially primary producers, produces wealth from the environment which is then used in our society, which is part of the SA economy."*

The estimation of project public and private benefit, along with identification of market failure and evaluation of benefit cost ratios, is part of an objective economic screening process being adopted by PIRSA. The aim of economic screening is to assist in best spending of limited government funds to a wide variety of project and program choices in PIRSA. The community requires wise spending of government funds and is the beneficiary of improved practices in this area.

So, PIRSA's project economic screening is adoption of a rational planning process rather than "economic rationalism" 7. It is readily accepted that for the apiary industry the issues relating to American Foul Brood disease are complex, costly and have implications which are not necessarily welcomed by all in the industry. PIRSA Officers, including Economists are not unaware of that fact. PIRSA aims to be very fair with all primary industries, including the apiary industry, in its incorporation of economic screening to program decision-making.

The Apiary Task Force has provided opportunity for PIRSA and Industry to thrash out the issues in detail and agree on a strategy for future management of the disease that will be effective and consistent with the principles of wise spending and to recommend same to the SA Government. The AFB economics paper that I presented to the SAAA conference was a contribution to that end. The reference to "economic rationalism" by the Riverland and South East Branches of the industry in response to that paper is probably best interpreted as a need for additional explanation. The Task Force have decided that the best time for additional explanation, in workshops and other forums, will be after their Final Report to the Minister.

#### **(e) Industry Assistance**

*"The Department's economists have not taken into account assistance provided by industry members. Labour, hired staff, vehicles, and associated costs have been made available to Inspector Stedman on many occasions to assist him in cleaning up someone else's mess or disease problem, at no cost to the Department."*

PIRSA is happy to acknowledge the assistance provided by industry to improve the efficiency and effectiveness of PIRSA programs. Unfortunately, if the cost were imputed and added to on-farm costs and/or external funding the benefit cost ratio would be worse than it already is.

### **2.3 Overview**

The apiary industry needs a successful strategy for the management of AFB. The difficulty for both industry and government in dealing effectively with AFB is that the control costs are high, while the size, value and profitability of the industry is low relative to other major primary industries.

A second aspect of the AFB problem is that many of the direct, but uncontracted, beneficiaries of pollination services do not have to pay. If they did the industry would be wealthier and better able to pay for its disease and other programs. Although pollination is undeniably a "good thing" it is not a "public benefit" on accepted economic definition. There is no sound economic ground for the apiary industry to believe that government has an obligation to compensate industry for its inability to be paid for all the pollination that it supplies. While conflict in perspective prevails on this point the focus on the AFB problem and its solution will not be as sharp as its needs to be.

Of the options available to industry, an eradication program requiring a team of PIRSA inspectors cannot be afforded by industry and is not consistent with the governments position in the Task Force terms of reference, where greater industry self-reliance is an objective. On epidemiological criteria, AFB prevalence is currently too high at 32 percent of apiarists for eradication to be an appropriate strategy. And on economic criteria the analysis indicates that eradication is a poor investment, irrespective of who pays. On the other hand, no program at all would be courting an epidemiological "blow-out" of the disease.

A more sensible path is down the middle where industry and government cooperate on a program involving implementation of Quality Assurance (QA) through packer honey testing and strategic inspectorial services aimed at disease control. Although the middle path is not a brilliant investment it does have a good chance of gaining better control of the disease in the medium term. In several years QA may be a more viable "stand alone" option than it appears at present, though it remains the most important first step that the apiary industry has the opportunity to implement.

In principle, part of the best solution to the AFB problem would be to make the perpetrators pay: that is, the non registered and/or non-complying apiarists. These are the people who should be billed for the disease clean-up costs. That would "internalise" the costs of the disease. Levying expiation fines in the order of several hundred dollars on offenders will be a good beginning to that end, but fines of that order fall well short of the real costs of PIRSA's Inspectorial services. The limitation of "internalising the costs" as a solution is the difficulty



of catching up with the offenders and the effort and cost involved in pursuing prosecution with few inspectors. QA is the best hope as a circuit breaker; a strategy where industry and government should be cooperating fully.

I hope that the above explanations of PIRSA's economic analysis of AFB strategies are helpful to achieving the degree of cooperation which is required between government and industry to effectively progress adoption of an effective strategy.

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Table 4: Actions and Responsibilities to Overcome Market Failure in the Control of AFB and other Honey Bee Diseases in the [Apiary Industry 9](#)

Disease Contributing Factors	Impact	Type of Market Failure	Actions and Responsibilities
<p>1. Neglected and abandoned hives and/or mis-managed hives</p>	<ul style="list-style-type: none"> <li>• Residue of infection, from which disease spreads.</li> <li>• Poor beekeeping management practices and fear of income loss, fines or apiary burn-out motivates non-disclosure of disease and avoidance of help seeking, which aids the spread of infection.</li> <li>• Litter and visual pollution is a poor, image for the apiary industry.</li> </ul>	<p>Negative externalities</p>	<ul style="list-style-type: none"> <li>• Industry to "own" AFB/EFB and their control. <i>Industry responsibility.</i></li> <li>• Locate abandoned and neglected hives, identify owners and report. <i>Industry responsibility.</i></li> <li>• <i>Industry trust fund set up to pay for the salvage service, destruction of hives and any compensation (ie buyback). Industry responsibility.</i></li> <li>• <i>Inspectorial service provided by the government with supportive legislative powers. Protocols to be developed. Government responsibility.</i></li> <li>• <i>Salvage service paid for by the trust fund, with cost recovery paid by the owner of the hives. Industry responsibility.</i></li> <li>• <i>Industry code of conduct to promote and progress "clean" industry. Industry responsibility.</i></li> <li>• <i>Compulsory registration, hive branding, and honey testing to identify disease outbreaks. Joint Industry/Government responsibility.</i></li> </ul>
<p>2. <b>Information Gaps</b> which express themselves as non-adoption of proven management practices in the control of honey bee diseases.</p>	<ul style="list-style-type: none"> <li>• Little knowledge of AFB and control methods.</li> <li>• Disease remains due to poor adoption of efficient technologies and disease control practices.</li> <li>• Out dated technologies in use, which contribute to</li> </ul>	<p>Information problems.</p>	<ul style="list-style-type: none"> <li>• <i>Develop an extension/education service which will encourage apiarists to voluntarily:</i></li> </ul> <p><i>Change their apiary management practices and technologies to allow for productivity changes, which will pay for disease control,</i></p> <p><i>or</i></p> <p><i>Exit from the industry.</i></p> <p><i>(Advice can be extended that failure to exit on a "clean" basis will lead to later costs, as indicated above).</i></p>

	<p>low productivity, low incomes and poor disease control capability.</p> <ul style="list-style-type: none"> <li>• Low awareness and non participation in available educational services, such as field days and workshops.</li> </ul>		<p><b>Industry responsibility</b></p> <ul style="list-style-type: none"> <li>• <i>Develop and extend on farm industry based low cost AFB control systems, such as hot wax dipping.</i></li> </ul> <p><b>Industry responsibility</b></p>
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## Appendix 3 - Economic Screening of PIRSA's Honey Bee Disease Management Program 8

"All PIRSA programs are appraised on a three step 'screening' process involving:

- tests for the presence of market failure,
- splitting benefits into public and private components, and
- benefit:cost investment analysis.

This appraisal is an aid to prioritising PIRSA programs, in terms of budgeting, planning the allocation of resources and in negotiations which may need to occur with industry about resource allocation and funding. PIRSA's position on any program will depend on an overall assessment of the three tests and not on the outcome of any one test in isolation.

The epidemiology, prevalence and economic significance of honeybee diseases makes their management a complex matter for both the apiary industry and government. It is hoped that the following general observations about some key economic aspects of honeybee diseases may be helpful to both industry and PIRSA Animal Health in program planning and management.

### Market Failure

The presence of market failure is the 'first screen' to pass through to justify involvement of government with industry in any program. However, the presence of market failure does not automatically imply that government has a responsibility to resolve the market failure or to fully or partially fund programs to address the market failure. There are four broad categories of market failure - externalities, information gap, public benefit and market power. With respect to honey bee diseases, including American Foulbrood (AFB), negative externalities have been identified. It is this market failure which is at the root of the apiary industry's problems in managing the disease, because the market alone cannot and will not solve the problem of AFB and other honey bee diseases.

The epidemiology of the disease is such that transmission, or spread, of spores from poorly managed apiaries and abandoned/neglected hives to uninfected, well managed apiaries in proximity is beyond the control of good management. To state the obvious, but important fact in appreciating the market failure, this type of situation occurs because bees - potential robbers of apiculture products contaminated with AFB spores - cannot be restricted within a physical boundary like most other agricultural activities. In fact, bees have been known to fly approximately 5 kilometres from their hive in search of food. Thus commercial and hobbyist/amateur (both registered and unregistered) apiary operations all have the potential to harbour the long-living AFB spore, thereby acting as a potential reservoir to reinfect. The hobbyist/amateur apiary sector further exacerbates the problem as many of these operations are unknown to either the diligent, migratory, commercial apiarist or the Department.

With honeybee disease not only is the infection transmitted, but the new and additional costs of surveillance and control are also transmitted to the recipient apiarist without prospect of compensation for the damage from the source offending apiarist. It is this inability to internalise the costs of disease transmission that constitutes the negative externality - apiarists of unknown identity are responsible for inflicting cost on others and neither industry nor government is able to bill them for the damage.

In the case of abandoned and neglected hives the situation involves another economic concept; that of poorly defined property rights. The ease of entry and exit from the apiary industry, without deposit to cover the potential costs which may be left for others, contains the ingredients for the spillover of costs to infection-free apiarists. The fact that the industry does not require land ownership and is based on mobility of hives provides perfect conditions for easy entry and exit with the attendant problems of pinning costs of poor management to disease transmission offenders.

Another factor in the prevalence and lack of progress in managing honeybee diseases has been a lack of technology and information about the detection and cleaning up of the disease. The development of the honey culture test this decade opened the way for increasing the chances of early and effective detection of AFB. In turn, this increases the chance that the costs of disease transmission may be pinned to apiarists who offend under the Act in not attending to the disease speedily and effectively. The slow adoption of the honey test by the industry probably reflects the lack of compulsion or financial incentive to do so. The benefits of protecting the industry's markets at home and abroad provides the main reason for price discrimination in favour of infection-free, residue-free, quality honey. This market-based process will internalise more of the costs of honeybee diseases.

Recent development of extension manuals and other printed material with photographs to aid detection and management of AFB are excellent examples of information resources essential to closing the information gaps of apiarists. These problems are not a separate market failure, but rather a possible consequence of the 'negative externalities' market failure. The strong presence of negative externalities has likely diminished the incentive for better information, adoption of superior detection techniques and better management practices.

The absence of an industry quality assurance scheme for disease and residue free honey has not helped to overcome this market failure; there has not been an economic message, in the form of a price signal to apiarists from honey packers, that disease and residue free honey is more valuable to the industry than infected or contaminated honey. A market linked, quality assurance program for honey marketing has been a missing strategy in the past; it can be the cornerstone of addressing negative externalities. By penalising infected or contaminated product offenders will bear more of the cost of AFB and illegal, misuse of antibiotic treatment. At the same time quality producers will be rewarded and the industry will give itself a chance to be more competitive with its products in all markets.

So, while there is market failure with respect to honeybee diseases in the apiary industry, due to the strong presence of negative externalities, this is not a fatal, obscure economic malady. The diagnosis is in fact one step towards tackling the problem at root. Better appreciation of the type of market failure that is at the core of the industry's problems can unlock the door to market based solutions. Making the market work more effectively is in the interests of industry, government and consumers: less money will be wasted on costly and ineffective programs, more money will flow to quality honey producers and customers can be assured that their confidence and satisfaction with honey quality is well placed. These are the ingredients for a growth industry.

### **Public : Private Benefit**

An estimate of the split of the benefits of any program into its share to the public and its share to the industry and participant businesses is a 'second screen' for all programs. The benefits are assessed on the basis of their first order or direct benefit, not attempting to account for benefits to other parties in other industries or elsewhere in the economy. This is not to say that those 'second order' benefits do not exist; simply they would be very difficult to measure with any reliability and consistency for the many programs that PIRSA is involved in.

Further, the existence of indirect benefits does not influence the value or validity of the first order split for the purpose involved. In practical terms this may mean that although the apiary industry provides positive externalities for other primary industries, in the form of pollination, the existence of those beneficiaries does not affect the validity of a first order split for the purposes described. In relation to who benefits from improved control of AFB it has been estimated that 90 percent of direct benefits accrue to apiarists and the apiary industry at large.

It can be illustrated however that some public benefit is gained from disease control measures as this improves the strength of a hive, which could result in better pollination of native flora by hives while in-situ in national parks and reserves where the natural pollinator has been reduced (Paton unpublished, 1993). This is allowed for in the 10 percent public benefit.

The public/private split is an indicator for alignment of the costs of certain programs with the respective share of the imputed benefits for the public and private beneficiaries. It is a target for preferred alignment from the governments perspective. It is appreciated that industries will vary in their capacity and willingness to contribute to various programs.

It is recognised that this alignment may be difficult to achieve in the apiary industry as approximately two thirds of participants are hobbyists/amateurs who contribute very little to the economic value of the industry but have a disease prevalence similar to that of commercial operators. Moreover, as stated earlier, the location of a large portion of this sector is unknown. Thus, seeking financial contribution from registered apiarists for a program that may provide benefits to "unregistered" apiarists will be costly, inequitable, and not likely to be 100 percent successful.

It is also recognised that the apiary industry is not a large or wealthy industry and its ability to organise and raise funds for research and extension is therefore less than many other primary industries. However, it has a longer history and more mature markets than some other primary industries. These are matters of circumstance that the Apiary Industry and Animal Health need to work with in prioritising, funding and managing honeybee disease management programs.

### **Benefit:Cost Analysis**

There is not a lot of interest by industry or government to spend money on programs which are not good investments, irrespective of the presence of market failure. This is the context in which benefit:cost analysis is important to program assessment and should be of mutual interest to industry and government in jointly funded programs.

### **Foot Notes**

1 Several PIRSA Economists presented papers on this methodology at the 1998 AARES Annual Conference held at Armidale, NSW.

2 A Manual for the Control of American Foulbrood ,(Stace and Stedman, 1998) is a significant extension aid to the identification and management of the disease by apiarists.

3 The recent postal survey by QDPI in Queensland (Franco-Dixon & Jarratt, 1998) reported 96 percent support among apiarist respondents for an AFB control program in all states.

**4** Australian Honey Bee Industry Council National Plan for the Control of American Foulbrood. Recommendations from workshop held in Brisbane, October, 1998.

**5** It is assumed that the value of 1.5 employees, plus operating expenses, equates to approximately \$90,000.

**6** This response addresses each of the issues referred to and concludes with an overview of the key issues facing the apiary industry in relation to economic management and epidemiological control of honey bee diseases.

**7** Economic Rationalism is a vogue term for describing market driven economic policies which may lead to reduction or withdrawal of public or private services. Use of the term often carries emotion, implying that the decision was irrational and unfair, which it may have been for the user! For example, losers in the change process may not have been adequately consulted, considered or compensated. Further reading on the term is in "Economic rationalism vs the entitlement consensus," by T Valentine, Policy, 3, 1996, pp 3-10.

**8** Extract from South Australian Apiculture Industry: Report of the Apiary Industry Task Force to the South Australian Government, November, 1998, pp.36-38.

**9** Table developed by Peter Stace, Apiary Industry Development Officer and Glenn Ronan, Principal Economics Consultant, Primary Industries and Resources SA

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Date Created: 04 June 2005

Last Modified: (none)

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