

## A survey of travellers carrying host fruit of Queensland fruit fly, *Bactrocera tryoni* (Froggatt), into a fruit fly free area in 1998/99 following road signposting of penalties for infringements

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### Abstract

For the first time external contractors were used for roadside vehicle inspection operations. There were 5556 surveyed vehicles, with an average of 9.7% found carrying fruit, with a range of 4.8% at Kamarah, 8.6% on the Sturt Highway site and 18% on the Newell Highway site. There was no change in the proportion of travellers carrying fruit into the Newell site over the previous four years however the other two sites showed a decline. Of the main fruit types (pome, stone, citrus, bananas, tomatoes), there were 3166 items of fruit seized at an average of 5.9 fruits per vehicle. Tomatoes were the most commonly carried fruit (30.4%), followed by pome fruit (23.7%) and stone fruit (16%). Generally, travellers originating from areas near the inspection site were less likely to carry fruit but pose the greatest threat in a risk analysis. Retired adults remain most likely to carry fruit, followed by families; however families pose the greatest threat in a risk analysis. The erection of road signs in late December, advising of \$200 penalties for the introduction of fruit, resulted in a 50% decline in the proportion of travellers carrying fruit into the area.

### Introduction

Pest management has been adopted at both national and regional levels to protect horticultural industries from harmful pest incursions. Countries, like Japan, New Zealand and Australia have effective quarantine programs to prevent the entry of exotic fruit fly (Hendrichs 1996). The programs may use sniffer dogs, inspection and x-ray to check incoming luggage for fruits (Ivess 1999, Christian 2001) and fines are imposed (Anon. 2001) for the introduction of undeclared goods. In Australia, quarantine at domestic airports has been upgraded (Russell 2002) and there is a program of risk evaluation and inspection of shipping containers (Stanaway *et al.* 2001) at all ports.

At a regional level, pest exclusion is important (Malavasi *et al.* 1994). The Horticultural Policy Council (1991) recommended

the establishment of a pest free area, with roadblocks and spot fines as strategies to exclude the entry of Queensland fruit fly (QFF), *Bactrocera tryoni* (Froggatt) from endemic areas. The Fruit Fly Exclusion Zone (FFEZ) was established on the ecological edge of the QFF range (Anon. 1993) to enable access to domestic and export markets under a fruit fly area freedom status.

Preventing the entry of fruit flies into non-infested areas is considered more economical and feasible than eradication after fruit flies have become established. The importation of infested fruit by the general public is the greatest threat to fruit fly-free areas. The installation of road inspection stations along major highways is a key strategy to protect pest free areas. Public awareness of the program is necessary to obtain their cooperation in preventing introductions of fruit flies and host material into the FFEZ and facilitating inspections at all points (Malavasi *et al.* 1994).

Clift and Meats (2001) reported that the frequency of vehicles carrying infested fruit, along with climatic factors, was important in determining the likelihood of an incursion becoming established in the FFEZ. It is logical that any strategy, such as the penalty plates and road signs, will decrease the frequency of fruit being carried into the Zone and will lower the chances of an incursion population becoming established.

The random roadblock program, the roadside inspection of vehicles, was started in 1994–95 (NSW Agriculture 1997) in the Risk Reduction Zone (RRZ) immediately adjacent to the FFEZ. Subsequent roadblocks (Dominiak *et al.* 1998, 2000a, 2000b, 2001) reduced the amount of fruit, possibly infested with fruit fly, entering the FFEZ. The program continued to be improved as risks were reassessed each year. Dominiak *et al.* (2000a) noted that the rate of fruit carriage was still unacceptably high, despite the many years of community awareness programs including the erection of road signs, several years of roadblock operations and fruit seizures (Marrows and Dominiak 1999) and the issuing of fines via the courts. Dominiak *et*

*al.* (2001) reported on the first year where issuing spot fines (or on-the-spot fines valued at \$200, also known as a Self Enforcement Infringement Notice or SEIN) was used to deter travellers from carrying fruit into the FFEZ. Results were inconclusive but the SEIN seemed to have little impact in the first year of operations. Many offenders complained they did not know the value of the penalties, even though they knew that carrying fruit was illegal.

Roadblocks and road signs have also been used following the detection of exotic fruit flies at Cairns (Cantrell *et al.* 2002) and Darwin to control the movement of risk produce. Exclusion remains an important strategy for regional pest control. New Zealand currently issues \$200 SEINs to incoming international passengers who do not declare restricted items (Christian 2001) while Australia issues \$110 SEINs for similar offences (Whitbread 1997). However fruit continues to be detected on passengers at international terminals. Similarly for the FFEZ, despite fines and advertising, fruit continues to be detected entering the Zone. SEINs and advertising are unlikely to entirely eliminate illegal introductions of fruit but may reduce the importation of fruit to a manageable lower risk level.

This paper reports on survey results, before and after the addition of the 'penalty plates', advising travellers of a possible \$200 penalty. Dominiak *et al.* (2000b) and Campbell (2000) noted the importance of evaluating results at individual roadblock sites; this theme was carried through in Dominiak *et al.* (2001) and in this review.

### Methods

Random roadblocks were scheduled from October 1998 to March 1999 based on results of surveys reported by NSW Agriculture (1997) and Dominiak *et al.* (1998, 2000a, 2001). School and public holiday periods were previously identified as high-risk periods (NSW Agriculture 1997) and more than half of the roadblocks were conducted during these holidays. Random roadblocks were established on the Newell Highway (northeast of Narrandera), Sturt Highway (at Sandigo east of Narrandera), and at Kamarah, all on the entry side of the FFEZ near Griffith (Figure 1), in the Murrumbidgee Irrigation Area (MIA).

For the first time, the operations were offered for tender to external contractors. A security company from Wagga Wagga was the successful tenderer and conducted all roadblock operations, according to the tender specification. Roadblocks were established at the three sites and operated over six months of operations as in Table 1.

Once the roadblock was established, vehicles were directed into the inspection bay until the bay was full. Once the bay was full, other vehicles entering the

roadblock site were waved through the roadblock site without entering the inspection bay. This process was repeated during the day as vehicles left the inspection bay. The driver of each vehicle stopped in the inspection bay was asked a standard set of questions. The survey recorded the presence or absence of fruit, occupant type, origin of trip and destination. While 5556 survey forms were completed, a proportion of forms did not have data in all lines and this variation of information is reflected in the respective tables.

If fruit were found or offered to inspectors during a vehicle inspection, additional information was collected. Depending on the amount of fruit detected and on other information collected, a \$200 SEIN was mailed to the home address of the traveller. All fruit found in vehicles was confiscated and destroyed. Following information gathered in the 1997/98 year, in late December 1998 'penalty plates', which advertised the financial penalties, were added to existing NSW road signs, alternatively advising 'Spot fines \$200' and 'Maximum penalty \$11 000' and responses by travellers were monitored.

*Statistical analysis*

A generalized linear model (McCullagh and Nelder 1989) was used to examine the relationships between fruit traffic into the FFEZ to a number of risk factors where binomial errors were assumed and a logit link function was used. The levels within each risk factor were compared by testing the logit link coefficients from the mathematical models of individual risk.

The Likelihood Ratio (LR) chi-square statistic was used to test the significance of the overall effects of the risk factors. Fruit numbers were analysed using analysis of variance. The analyses were run on Genstat 5 (Genstat 5 Committee, 1997).

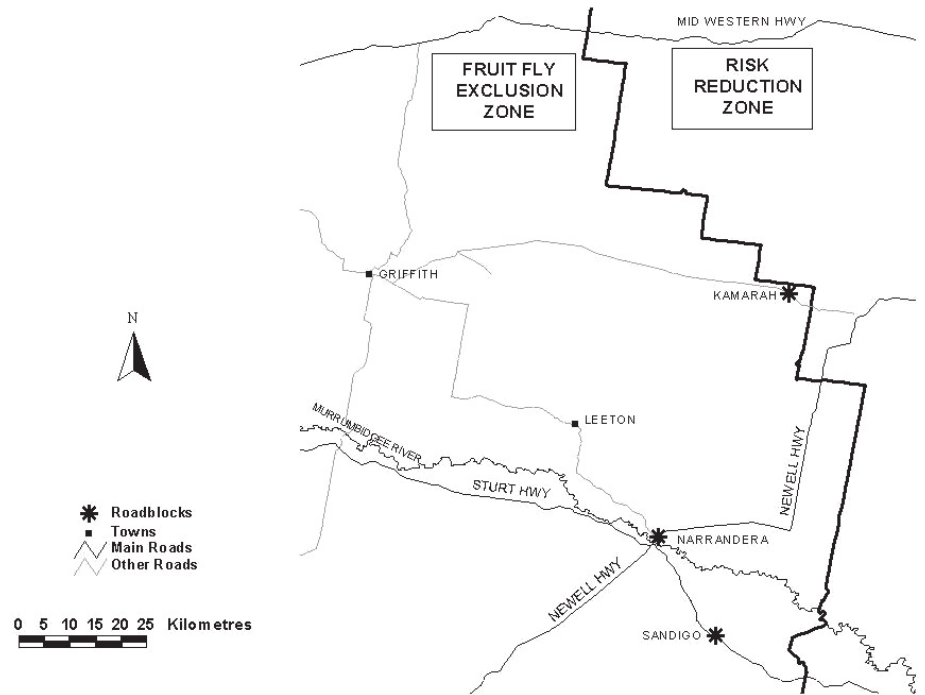
The estimated risk posed by different groups was calculated by multiplying the sample number by the proportion carrying fruit and divided by 100. No analysis was conducted on these estimates.

**Results**

*Overall figures*

Of the 5556 surveyed vehicles, 539 vehicles (9.7%) carried fruit. Of the 539 fruit carrying vehicles, each car carried an average of 5.87 fruits per vehicle. Of the main fruit types (pome, stone, citrus, bananas, tomatoes but excluding strawberries, cherry tomatoes, grapes and cherries) 3166 items of fruit were seized.

Within the parameters evaluated (Table 2), the highway (site of roadblock), origin (of the trip of the travellers), destination (of the trip), and type of traveller were highly significant factors in the carriage of fruit by travellers.



**Figure 1.** Road block sites all on the entry side of the fruit fly exclusion zone near Griffith.

**Table 1.** Number of operational days for the three sites in different months of the year.

Month	Newell highway	Sturt highway	Kamarah	Monthly total
October 1998	3	3	0	6
November 1998	5	2	0	7
December 1998	1	5	0	6
January 1999	2	11	0	13
February 1999	0	9	6	15
March 1999	0	3	3	6

*Highways*

The Newell Highway is the main north-south highway and the Sturt Highway and Kamarah sites intercepted westbound traffic. The Kamarah site recorded significantly less fruit carriage (4.82% of vehicles) compared with the other two sites, and the Sturt Highway (8.57%) had significantly less than the Newell Highway (17.99%). The proportions, in this and previous surveys, are given in Table 3.

There was no change in the proportion of travellers carrying fruit into the Newell site over the survey periods. There was a steady decline in the amount of fruit intercepted at both the Sturt and Kamarah sites.

*Origin of traveller*

Travellers from within the FFEZ, RRZ and Wagga Wagga (inside the RRZ) were significantly less likely to carry fruit than any other groups (Table 4). Victorian travellers were less likely to carry fruit compared with the previous year.

**Table 2.** Factors in the generalized linear model analysis of fruit carrying by travellers.

Factors	Significance (P value)
Terms	
Highway	<0.001
Origin	<0.001
Destination	<0.001
Types of travellers	<0.001

Generally, travellers from origins further away from the RRZ and FFEZ were more likely to carry fruit into roadblock sites. The trip origin with the greatest number of travellers was inland NSW (19.7% of traffic flow) and 16.4% of these travellers carried fruit. Sydney was the second largest origin (17.6%) with 14.1% of these carrying fruit.

Being a fruit fly endemic region, Queensland was perceived as the

**Table 3. Proportion of travellers (with Standard error in brackets) carrying fruit into the three sites during this and previous surveys. Within each column, sites followed by the same letter are not significantly (P=0.05) different. Comparisons with other reports are also given.**

Roadblock site (Highway)	Proportion carrying fruit (1998/99) this survey	Number of vehicle inspected (1998/99)	Proportion carrying fruit (1997/98) (Dominiak <i>et al.</i> 2001)	Proportion carrying fruit (1996/97) (Dominiak <i>et al.</i> 2000a)	Proportion carrying fruit (1994/95) (NSW Agriculture 1997)
Newell	0.1799 (0.0013) a	5589	0.1560 (0.0048) a	0.151 (0.009) a	0.187 (0.011) a
Kamarah	0.0482 (0.0096) c	776	0.0657 (0.0089) c	0.094 (0.010) b	–
Sturt	0.0857 (0.0043) b	2956	0.1252 (0.0061) b	0.140 (0.010) a	0.129 (0.010) b

**Table 4. Proportion of travellers (with Standard Error in brackets) from different origins carrying fruit into roadblock sites. Origins followed by the same letter are not significantly (P=0.05) different. Comparisons with two other reports are also given.**

Origins of travellers	Number of observations this survey	1998/99 this survey	1997/98 (Dominiak <i>et al.</i> 2001)	1994/95 (NSW Agriculture 1997)	Estimated risk posed in 1998/99
New South Wales			0.0825 (0.0036) a	≅0.16	
South Australia			0.2644 (0.0272) b	0.33	
Other			0.2516 (0.0123) b		
Northern NSW	114	0.3070 (0.0432) a			0.35
Queensland	59	0.1864 (0.0507) b			0.11
Coastal NSW	178	0.1854 (0.0291) b			0.33
Inland NSW	719	0.1641 (0.0138) b			1.18
Sydney	644	0.1413 (0.0137) bc			0.91
ACT	458	0.1223 (0.0153) bc			0.56
Victoria	466	0.0901 (0.0133) bc	0.2173 (0.0100) b	≅0.28	0.42
RRZ	454	0.0527 (0.0105) cd			0.24
Wagga Wagga	267	0.0522 (0.0049) d			0.14
FFEZ	294	0.0136 (0.0066) d			0.04
Total	3653				

origin of highest fruit fly risk to the FFEZ. Queensland made up only 1.6% of the traffic flow and 18.6% of vehicles carried fruit. However it is unclear if fruit from these vehicles came from Queensland, or were purchased along the way. Coastal NSW, another fruit fly endemic area, made up 4.9% of the traffic flow and 18.5% of these carried fruit. Also Northern NSW made up 3.1% of the traffic flow however 30.7% of this traffic carried fruit.

In the estimated risk posed by different travel origins, inland NSW (1.18) and Sydney (0.91) were calculated to provide the largest risks. Coastal NSW (0.33) posed about one third the risk of these two origins. Queensland (0.11) posed about the same risk as Wagga Wagga (0.14), both being about one third of coastal NSW.

#### Destination of traveller

A significantly lower proportion of travellers going to the FFEZ and RRZ carried fruit and were not significantly different from each other (Table 5). There was no significant difference between the other destinations (besides 'other').

The FFEZ and RRZ destinations made up 67% of the traffic flow with about 5–6% carrying fruit; this is regarded as 'local traffic'. Travellers going to Western FFEZ, South Australia, and Victoria made up 10.9%, 10.2% and 7.7% of the traffic flow respectively with 17.3%, 16.6% and 22.8% carrying fruit respectively. Other destination groups made up less than 3% of traffic flow.

In the risk calculations, travellers going to the FFEZ (1.79) were the highest risk, largely due to the high traffic volume. Travellers going the Western FFEZ (1.03) posed the next level of risk, and at about the same risk as those going to Victoria (0.96) and South Australia (0.93).

#### Type of traveller

Retired adults remained the group most likely to carry fruit (19%) and they constituted only 12% of the traffic flow. Families were not significantly different from retirees, and made up 44% of the traffic flow and carried fruit at 11.1%. The proportion of all types of traveller carrying fruit fell compared with previous survey periods (Table 6).

The risk factors for families, retirees, single adults and commercial travellers are 2.68, 1.25, 0.70 and 0.07 respectively. Families constitute twice the risk than retirees according to these calculations.

#### Fruit carried

Of the major fruit types seized, there were 963 tomatoes, 751 pome fruit, 505 stone fruit, 491 bananas and 456 citrus. There was no significant interaction between fruit (the main five fruit in Table 7) and either origin or destination. There was also no significant interaction between bananas and any of the four variables, suggesting that what prompted travellers to carry bananas was universally appealing at all sites, traveller types, origins and destinations. There was a highly significant interaction between tomatoes and traveller type. There were significant interactions between most fruits and sites.

#### Fruit carried by site

Based on the significant results in Table 7, additional information of the main fruit types is provided for the three sites in

**Table 5. Travellers (with Standard Error in brackets) to different destinations and the proportions carrying fruit into all roadblock sites. Destinations followed by the same letter are not significantly (P=0.05) different. Comparisons with one other report are given.**

Destination	Number of observations	1998/99 this survey	1997/98 (Dominiak <i>et al.</i> 2001)	Estimated risk posed in 1998/99
FFEZ	3571	0.0504 (0.0037) a	0.1678 (0.0078) a	1.79
Risk Reduction Zone	94	0.0638 (0.0252) a	0.2353 (0.1026) ab	0.06
Other	23	0.0870 (0.0588) a	0.4667 (0.0911) c	0.00
Southern FFEZ	150	0.1600 (0.0299) b		0.24
South Australia	559	0.1664 (0.0157) b	0.3122 (0.0300) bc	0.93
Western FFEZ	596	0.1728 (0.0155) b		1.03
Inland New South Wales	44	0.2046 (0.0607) b	0.4286 (0.0707) c	0.09
Victoria	421	0.2280 (0.0204) b	0.4114 (0.0135) c	0.96
Queensland	16	0.2500 (0.1079) b		0.04
Total	5474			

**Table 6. Travellers (with Standard Error in brackets) of different traveller types and the proportions carrying fruit. Types of risk groups followed by the same letter are not significantly (P=0.05) different. Comparisons with three other reports are also given.**

Types of travellers	Sample size	1998/99 this survey	1997/98 (Dominiak <i>et al.</i> 2001)	1996/97 (Dominiak <i>et al.</i> 2000a)	1994/95 (NSW Agriculture 1997)	Estimated risk posed in 1998/99
Retired adults	658	0.1900 (0.0153) a	0.2281 (0.0140) a	0.24	0.37	1.25
Family	2412	0.1111 (0.0064) ab	0.1608 (0.0069) b	0.16	0.29	2.68
Adult not retired	115	0.0592 (0.0052) b	0.1415 (0.0069) c	*	*	0.07
Single adult	2045	0.0348 (0.0168) b	0.0627 (0.0052) d	*	0.06	0.70
Commercial traveller	243	0.0371 (0.0119) b	0.0351 (0.1069) d	0.06	0.06	0.09

\* No data.

Table 8. The results for Kamarah should be treated with caution as this site made up only 8.96% of the overall survey results and operated only in February and March (Table 1). The largest numbers of fruit carried into the Kamarah site were stone fruit and tomatoes (Table 8). However only 4.8% of the traffic flow carried fruit and this was the lowest of the three sites.

For the Sturt Highway, the other road into the NSW FFEZ, of the average 5.8 pieces of fruit carried per vehicle, the main types of fruit carried were tomatoes, followed by pome fruit. Only 8.57% of traffic carried fruit.

The Newell site carried an average of 5.3 pieces of fruit per vehicle and 17.9% of the traffic flow carried fruit (Table 3). These fruit were mainly pome fruit and citrus.

#### Penalty plates and response by different travel groups

The penalty plate road sign were erected about midway through the program and had approximately halved percentage fruit carriers of the main traveller types (Table 9). The proportion of travellers carrying fruit for the three sites is given in Table 10. Only the Sturt site has figures for all months; there was a decline of about 50%

**Table 7. Summary of F value from analysis of variance of fruit numbers carried by travellers.**

Term	Pome	Citrus	Stone	Bananas	Tomatoes
Site	3.46*	4.37*	8.80**	0.44	5.44**
Origin	1.26	1.77	0.25	0.56	0.84
Destination	1.62	1.80	0.34	0.98	1.26
Type	0.27	0.40	0.75	0.62	15.10**

\* P<0.05, \*\* P<0.01.

**Table 8. Average numbers of each type of fruit carried into the three roadblock sites.**

Site	Pome	Citrus	Stone	Bananas	Tomatoes
Sturt	1.25	0.72	0.98	0.91	1.99
Newell	1.81	1.26	0.31	0.97	0.95
Kamarah	0.88	0.08	4.42	0.54	4.25

in the proportion of the traffic flow carrying fruit after the erection of the signs. The figures for the Newell and Kamarah sites are inconclusive.

The three main traveller types (families, retirees and single) were compared with the Sturt and Newell Sites in Table 11. There were more families on the Sturt site, compared with the Newell. There was a

higher proportion of retirees on the Newell site compared with the Sturt. There was no trend in the proportion of single travellers favouring either the Sturt or Newell sites.

#### Discussion Newell highway

The Newell site carries Brisbane/

**Table 9. Proportion of the three main traveller types carrying fruit during the six months of operation.**

Month	Families		Retirees		Single	
	Sample number	% with fruit	Sample number	% with fruit	Sample number	% with fruit
October 1998	182	16.48	128	25.78	219	9.59
November 1998	228	16.67	146	32.88	286	9.09
December 1998	343	15.74	46	21.74	233	8.58
January 1999	753	8.50	135	11.85	530	5.09
February 1999	636	9.59	132	8.33	605	3.14
March 1999	270	7.78	71	9.86	172	4.65

**Table 10. Per cent of travellers carrying fruit into the different roadblock sites for different months of the year.**

Month	Sturt highway		Newell highway		Kamarah	
	Sample number	% with fruit	Sample number	% with fruit	Sample number	% with fruit
October 1998	335	12.68	249	18.07	*	*
November 1998	318	13.52	402	18.66	*	*
December 1998	603	11.61	58	27.59	*	*
January 1999	1391	6.76	158	12.66	*	*
February 1999	1109	6.76	*	*	372	5.11
March 1999	415	7.71	*	*	126	3.97

\* No data.

**Table 11. Percentage of types of traveller in traffic flow at the two main sites during the six months of operations. Kamarah was not tabulated due to the small sample size.**

Month	Families		Retirees		Single adults	
	Sturt	Newell	Sturt	Newell	Sturt	Newell
October 1998	32	27	15	30	43	27
November 1998	38	27	12	27	46	35
December 1999	54	35	6	20	35	41
January 1999	49	47	8	16	35	33
February 1999	46	*	9	*	40	*
March 1999	51	*	13	*	32	*

\* No data.

Melbourne traffic and most traffic appears not to go into the NSW FFEZ, other than to pass through the eastern edge of the FFEZ on their way to Melbourne or the Victorian FFEZ. This site has the highest proportion of travellers carrying fruit and there seems to be no overall downward change during recent survey periods. The risk of bringing pests into the zone is alarming because this highway was the busiest among the three highways (60% of overall travellers heading into FFEZ) and also is an access into FFEZ from Northern region of NSW, Sydney and Queensland. There is no real change in the proportion of vehicles with fruit with 18.7%, 15.1%, 15.6% and 18.0% in 1994/95, 1996/97, 1997/98 and the current study respectively (Table 3). Travellers primarily carried pome fruit and then citrus.

Compared with the Sturt site, the Newell site carried slightly fewer families,

about twice as many retirees and slightly fewer single adults. Retirees are the most likely traveller type to carry fruit and this may be why there was a higher proportion of travellers with fruit at the Newell site. Retirees were also more likely to carry fruit, even after the penalty plates were erected. However there had been a progressive decline (Table 6) in the proportion of retirees carrying fruit (37% in 1994/95, 24% in 1996/97, 22.8% in 1997/98, and 19% in this survey).

#### *Sturt highway*

The Sturt site had about equal proportions of family and single adult travellers and a lower proportion of retirees (Table 11). This low retiree level and higher single level may partly explain the lower proportion of travellers with fruit.

Given the higher proportion of travellers going to the immediate FFEZ, this

would further explain the low proportion to travellers with fruit. Tomatoes and pome fruit were the most common fruits carried into the site.

#### *Kamarah*

This was the smallest sample size so results must be treated with caution. This site had the smallest proportion of fruit carriage and it was surveyed only after the erection of the penalty plates. There was a steady decrease in fruit carriage over the four recent survey periods. It is a concern that tomatoes were the most commonly carried fruit at this site. Tomatoes are more likely to originate from back yard production and are more likely to be infested with fruit fly. Stone fruit were also popular, however the Kamarah surveys were conducted in the middle of the stone fruit season so higher levels of stone fruit were not surprising.

### Penalty plates

The tool of SEIN was trialled in 1997/98 to get a change in the fruit carrying habits of travellers who were heading into FFEZ. However the results were inconclusive. The introduction of SEIN was mirrored in other programs where SEINs are also issued at international airports on internationally inbound travellers caught with fruit (Whitbread 1997, Anon 1998, Ives 1999). The installation of the penalty plates in late December 1998 has caused a noticeable decrease in the proportion of travellers carrying fruit into the FFEZ. This is consistent with Campbell (2000) for the Broken Hill roadblock site.

The reduction in fruit carriage may not have been caused entirely by the signs themselves. The reduction may have occurred because of the combination of knowledge that SEINs were issued in the previous year and seeing the erection of penalty plates.

Alternatively, the reduction may have been caused by making an association with years for roadblock operations and the erection of penalty plates, without any knowledge of SEINs issued. Again this scenario is unlikely to explain the response on the Newell highway.

The erection of the penalty plates alone would seem to be the main reason for the response in travellers however the added effect of the SEINs, or of the roadblock public profile, or the combination of these, is unknown. It would seem reasonable to assume that the effect on local travellers would diminish if there were no roadblocks or SEINs to 'give teeth' to the penalty plates.

### Fruit types carried

The average number of fruit has declined in this program to 5.9 fruit per vehicle; this is an improvement from 7.4 fruit in 1996/97 (Dominiak *et al.* 2000a). The overall risk (proportion of traffic flow multiplied by proportion carrying fruit) indicated that families were a higher risk than retirees; this is the reverse of the figures reported by Dominiak *et al.* (2000a).

Tomatoes are an increasing concern, generally given their back yard origin (Dominiak *et al.* 2000b) and their high rate of carriage compared with other fruit. It is discouraging that both the Kamarah and Sturt sites found more tomatoes than other fruit, as these roads carry traffic towards the NSW FFEZ. Tomatoes were the most commonly carried fruit in this survey; they were ranked as fourth in 1996/97 (Dominiak *et al.* 2000a) and 1994/95 (NSW Agriculture 1997). The question is why has there been change? Based on many comments on survey forms, we postulate that many travellers do not understand that tomatoes are fruit.

How do we change the public knowledge on this issue? One option is the erect

another road sign in the TriState bank of signs simply stating 'do not carry tomatoes into zone ahead' or similar. This could be monitored in the survey forms, before and after the installation of the signs, similar to the evaluation of the penalty plates.

Of the fruit other than tomatoes, apples are preferred by most age groups. Given that Australia's elderly population has increased by 13.4% between 1991 and 1996 (Haberhorn *et al.* 2002), retirees and their fruit carrying habits remain an important concern for the FFEZ. Laing (1999) reported that food preferences change with increasing age, particularly there is a decreased sensitivity to aromas and tastes, and chewing ability and efficiency also decrease. Therefore apples and pears were less likely to be attractive to older people. Laing (1999) also indicated an increasing preference for bananas as adults become older.

### Conclusions

The erection of road signs, advising the \$200 penalties, resulted in a 50% reduction in the amount of fruit being carried into the FFEZ. Retirees remain the traveller types most likely to carry fruit into the Zone however families pose the greatest risk. Residents are least likely to carry fruit however still pose the greatest risk due to their high proportion of the traffic flow. These groups (families and local residents) need to be targeted in an awareness campaign to gain better compliance. The roads carrying east-west traffic continue to carry less fruit while the north-south road remains unchanged after several years. Tomatoes are an increasing concern due to their high rate of carriage and their perceived backyard origins.

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## Review of community awareness at Riverina fruit fly roadblocks in New South Wales in 1998/99

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### Abstract

**Travellers at three road side inspection points were asked questions about their knowledge of fruit fly quarantine. Road signs were the most frequently recalled awareness tool, followed by radio and television. Radio appeared more effective on travellers with hometowns distant to the Fruit Fly Exclusion Zone while television was more commonly recalled by travellers from the immediate area near the roadblock sites. Retirees remain the group most likely to carry fruit and were most likely to be influenced by magazines, radio and television but least influenced by road signs. Travellers at each of the three inspection sites had different awareness characteristics depending on the trip destination, types of traveller and trip destination. A broad range of awareness tools need to be used as no one tool seems to uniformly influence all types of travellers.**

### Introduction

Queensland fruit fly (QFF), *Bactrocera tryoni* (Froggatt), is serious pest of horticultural crops in eastern Australia and adversely affects domestic and export trade. Control strategies vary from individual farm programs to regional initiatives. Malavasi *et al.* (1994) reported that community awareness was an important component of regional pest management. Once eradication has been achieved on a regional basis, a public education program must be part of an area-wide management strategy to prevent the reintroduction of pest species (Myers *et al.* 1998).

The original regional initiative to start a coordinated fruit fly community awareness program began in 1989. Ballantyne (1992) subsequently reviewed these activities and roadblock operations. Horticultural Policy Council (1991) recommended the establishment of a pest free area, with an integrated community awareness program, roadblocks and spot fines as some strategies to exclude the entry of QFF. The Fruit Fly Exclusion Zone (FFEZ) was subsequently established on the ecological edge of the QFF range (Anon. 1993). Additionally there is a buffer area surrounding the FFEZ where fruit fly populations are reduced. This is called the Risk Reduction Zone (RRZ) and is designed to

minimize the fruit fly introductions into the FFEZ

The FFEZ protects the major horticultural areas in south-eastern Australia covering the States of New South Wales (NSW), Victoria (Vic) and South Australia (SA) including the Murrumbidgee Irrigation Area, Sunraysia, the Goulburn Valley and the Riverland. The awareness program has the objective of preventing the Australian fruit industry from being compromised by fruit fly outbreaks in the FFEZ. Colquhoun (1998) estimated that \$5.1 million was spent annually on fruit fly issues by NSW, Vic and SA.

Sudler and Hennessey (1993) designed the next first promotion based on 'Fang the fruit fly' and the call for the public to be a 'fruit fly fighter'. The program was subsequently re-evaluated and altered slightly (Sudler and Hennessey 1996). The project was again re-assessed in 1999 by Ernst and Young (1999). The community awareness strategy continues to be directed towards the travelling public (particularly from high-risk areas outside the FFEZ), and residents within the FFEZ.

As part of a review of the public awareness campaign, Sudler and Hennessey (1993) designed a coordinated series of eight road signs as travellers approach the FFEZ with the text as follows:

'Defend Your Country Be a Fruit Fly Fighter',  
'Fruit Fly Free Zone 50 Km Ahead',  
'Do Not Carry Fruit into Zone 10 Km Ahead',  
'Fruit Fly Free Zone Ahead',  
'Do Not Carry Fruit into Zone',  
'Fruit Disposal Bin 500 m Ahead',  
'Fruit Disposal Bin'

and finally 'I'm Not Wanted Here' after the disposal bin.

Each sign was 2.4 × 2.4 m and had a 'Fang the fruit fly' disc (1.5 m in diameter) as a common symbol. These road signs were installed over 50 km leading up to the disposal bin, before the current program. NSW Agriculture (1997) reported that 97% of travellers had seen the road signs.

Information signs, thanking travellers for stopping and disposing of fruit, along with a map of the FFEZ and some information about fruit hosts, were erected