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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

at disposal bins. Following the 1997/98 year, 'penalty plates' were added to bottom of existing NSW signs, alternatively advertising 'spot fines \$200' and 'Maximum penalty \$11,000'.

Considerable time was spent with news bulletins, editorials and information messages to a wide variety of newspapers, magazines (including 19 ethnic publications), television and radio stations (Marrows and Dominiak 1999). The 1997/98 traveller television community service announcement was used, including a warning about the \$200 spot fines, and sent to 11 stations in NSW, seven stations in VIC, eight in QLD, and to six other stations. A new radio community service announcement, based on a 'Dagnet' theme, was produced and sent to 40 NSW radio stations.

In addition to community awareness programs, Malavestri *et al.* (1994) reported that exclusion of risk fruit by vehicle inspections was a good strategy to maintain a pest free status. Vehicle inspections at random sites on major highways intercept some fruit but the roadblock presence itself also has a community awareness function. This function is likely to be more effective with local residents who regularly see the operation and are reminded about their obligation not to bring fruit into the Zone. Campbell (2000) reported that travellers passing through a roadblock site more than once quickly decreased the amount of fruit being carried into the roadblock site on subsequent trips, even without the imposition of fines.

Dominiak *et al.* (2000a) 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 which seeks to evaluate the effectiveness of community awareness programs on the travelling public.

Methods

Random roadblocks were established on the Newell Highway (north east of Narrandera), Sturt Highway (at Sandigo east of Narrandera), and at Kamarah, all on the entry side of the FFEZ near Griffith, in the Murrumbidgee Irrigation Area (MIA) in the Riverina region (see map in Dominiak and Barchia 2005). School and public holiday periods were previously identified as high-risk periods and more than half of the roadblocks were conducted during these holidays. Details of the roadblock operations are given in Dominiak and Barchia (2005).

The driver of each vehicle stopped in the inspection bay was asked a standard set of survey questions. Travellers were asked where they obtained their fruit fly quarantine message and were given a choice from six answers. Some travellers answered yes to more than one option.

Only 'yes' or 'no' answers were entered into the data base and an absence of an answer was not assumed to be a 'no' answer. In an attempt to estimate the relative value of different tools, the per cent of vehicles with fruit and answering 'no' was divided by the per cent of vehicles with fruit and answering 'yes' to estimate the proportional drop in carriage for different risk traveller groups.

The surveys also recorded the presence or absence of fruit, fruit dumping, vehicle type, occupant type, state of origin of vehicle registration number and trip destination. While 5556 survey forms were completed, a proportion of forms did not have data in all lines and this lack of information is reflected in slight variations the respective tables.

Statistical analysis

The aim of this analysis is to relate the presence or absence of fruit to where travellers had obtained their fruit fly quarantine information from. A generalized linear model (McCullagh and Nelder 1989) assuming binomial errors and logit link was used to examine fruit carriage for each risk factor. The analyses were run on Genstat 5 (VSN International Ltd 2003). Coefficients from the models were compared to detect differences between levels of risk factor at a 5% level of significance. Where multiple answers could be given by travellers, it is not possible to directly compare 'awareness tools' but rather compared relative merit within a particular tool (e.g. road signs, motels, etc).

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. Within the community awareness survey, magazines, road signs, television and radio were highly significantly ($P < 0.001$) factors influencing where travellers got their information (Table 1). Motels were significant ($P < 0.05$), and tourist information centres being not significant.

Road signs remain the community awareness tool which was most frequently reported about 96.7% (there are slight variations in tables) as being recalled by all travellers. However it should be remembered that the questionnaire was asked at a roadside site; travellers had just driven past eight signs. They may have been listening to the radio but certainly were not watching TV or reading a newspaper. Only 7.08% of travellers who saw the signs carried fruit however 51.41% of those who claimed not to see the signs also carried fruit. This pattern was repeated for the other awareness tolls to different levels.

TV (50%) and radio (30%) were the second most likely awareness tools recalled by travellers. Tourist information centres, magazines and motels all recorded less than 8% of travellers reported getting their information from these sources.

Community awareness by site

Only 3.3% of travellers said they did not get information from road signs, compared with 96.7% who did. Awareness of road signs corresponded to decrease in fruit carriage (Table 2) of between 80.3% and 92.11%. Given the high level of positive responses and the estimated high proportional drop in fruit carriage, this would appear to be the most effective tool.

TV was the source of information for about 50.6% travellers. The highest proportional decrease was associated with the Kamarah site (86.2%), followed by the Sturt site (80.47%), with the least at Newell (76.94%). Given the high proportion of local traffic on the Sturt and Kamarah sites (Dominiak *et al.* 2001), it is not surprising that TV rated more highly on these sites compared with the Newell site.

Radio was not recalled as a source of information for 67.2% of travellers compared with 'yes' for 32.8% of travellers. Radio was generally associated with a smaller proportional drop (range 72.13% to 79.15%) compared with road signs (range 80.3% to 92.11%) and TV (range 76.94% to 86.20%). Radio was most effective on the Newell site.

This proportional drop in carriage (Table 2) must be viewed with consideration for the sample size, particularly where differences are small. Magazines appeared to be equally associated (about 55%) with reducing the rate of fruit carriage between 'no' answers and 'yes' answers (Table 2 on the Sturt and Newell sites). However it should be noted that 92.4% of travellers did not recall getting information from magazines, compared with 7.5% who did. It would seem that magazines had some effect (about 54%), but only 7.6% of travellers recall magazines as a source of information.

Similarly, 98.8% of travellers said they did not get information from Tourist Information Centres compared with 1.2% who did. Regarding the brochures mailed to motels, 98.7% travellers did not recall getting their information from motels while 1.3% did. These three information systems (magazines, motels and tourist information centres) appear to be used very little by travellers interviewed at the three sites.

At the Sturt site, motels caused a proportional change just less than radio, however there was insufficient data at the other two sites. Both Kamarah and Sturt sites (both west bound traffic) ranked road signs, TV and radio in that order, however radio and TV were re-ordered for the south bound Newell site.

Table 1. Main methods of community awareness tools, the sample size and the proportion reported as being recalled by travellers. Also the proportion (with Standard Error in brackets) of fruit-carrying travellers answering 'Yes' or 'No' to questions relating to where travellers had heard about fruit fly. Significant differences between the two groups within each tool was given by the probability values.

Tool	Sample size	% of travellers who recall this form of awareness tool	1998/99 this survey	
			Yes answer	No answer
Road signs	5432	96.7	0.0708 (0.0035)	0.5141 (0.0376)
TV	5223	50.6	0.0235 (0.0029)	0.1337 (0.0067)
Radio	5092	32.8	0.0237 (0.0036)	0.1064 (0.0053)
Magazine	5142	7.6	0.0282 (0.0080)	0.0825 (0.0034)
Motel	5068	1.3	0.0157 (0.0136)	0.0798 (0.0038)
Tourist information centre	5221	1.2	0.0496 (0.0262)	0.0792 (0.0038)

Table 2. Responses from fruit carrying travellers at the three roadblock sites to the six method of community awareness with the numbers and percentages of 'no' and 'yes' answers, and the calculated proportional drop in fruit carriage between travellers who gave the 'yes' answer and those who gave the 'no' answer.

Site	No answer		Yes answer		Proportional drop in carriage
	% of vehicles with fruit	Total vehicles	% of vehicles with fruit	Total vehicles	
Sturt					
Road signs	48.36	122	6.27	3988	87.03
TV	12.11	1849	2.37	2156	80.47
Radio	9.53	2508	2.37	1478	75.15
Magazines	7.20	3654	3.28	274	54.35
Motels	7.04	3823	2.00	50	71.57
Tourist Information Centres	7.02	3963	2.70	37	61.47
Newell					
Road signs	68.57	35	13.51	792	80.30
TV	18.07	581	4.17	144	76.94
Radio	17.66	606	3.60	111	79.59
Magazines	15.65	690	6.67	30	57.41
Motels	15.76	698	0.00	11	*
Tourist Information Centres	15.45	699	8.70	23	43.72
Kamarah					
Road signs	40.00	20	3.16	475	92.11
TV	10.60	151	1.46	342	86.20
Radio	5.88	306	1.64	183	72.13
Magazines	5.16	407	0.00	87	*
Motels	4.16	481	0.00	5	*
Tourist Information Centres	4.30	488	0.00	1	*

* insufficient data for analysis.

Community awareness by traveller types
Families and retirees were most influenced by motels however less than 2% recalled motels. Families and single adults were next most influenced by road signs and TV. Retirees were most influenced by magazines, TV, radio and road signs were ranked fourth (Table 3).

TV was most effective for retirees, although the range for all groups was only 79.45% to 86.89%. Radio was recorded by 32.8% of traveller types as a source of in-

formation. Retirees were also most likely to not carry fruit as a result of hearing the radio, followed by families.

Magazines were recorded as a source of community awareness information by only 7.6% of the sampled population. Families were least affected by magazines while retirees were most likely not to carry fruit as a result of reading magazines. Even fewer traveller types (1.2%) recorded tourist information centres as a source of information and sample sizes were too small

for any meaningful conclusions. Similarly only 1.3% of travellers recorded motels as a source of fruit fly information.

Of the three main methods of community awareness, families were most likely to be affected by road signs, TV and then radio in that order. Retirees were more likely to respond to TV, radio, and then road signs.

Community awareness by origin of trip
Only sample sizes that exceeded 10 were

Table 3. Responses from the three main traveller types to the six method of community awareness with the numbers and percentages of 'no' and 'yes' answers, and the calculated proportional drop in fruit carriage between travellers who gave the 'yes' answer and those who gave the 'no' answer.

Traveller types	No answer		Yes answer		Proportional drop in carriage
	% of vehicles with fruit	Total vehicles	% of vehicles with fruit	Total vehicles	
Family					
Road signs	62.12	66	8.22	2288	86.77
TV	15.41	1038	2.84	1234	81.60
Radio	12.03	1421	2.73	842	77.30
Magazines	8.83	2118	6.40	125	27.51
Motels	8.73	2199	0.00	22	100.00
Tourist Information Centres	8.75	2205	6.67	30	23.83
Retirees					
Road signs	66.67	30	14.50	600	78.25
TV	25.64	351	3.36	238	86.89
Radio	21.43	434	3.36	149	84.34
Magazines	17.96	529	2.17	46	87.89
Motels	17.20	558	0.00	7	100.00
Tourist Information Centres	17.08	562	0.00	9	*
Single Adults					
Road signs	38.03	71	4.20	1951	88.95
TV	8.46	981	1.74	979	79.47
Radio	6.63	1298	2.15	650	67.49
Magazines	5.48	1788	1.45	138	73.56
Motels	5.30	1868	3.70	27	30.12
Tourist Information Centres	5.22	1895	5.88	17	-12.60

* insufficient data for analysis.

used in this assessment (Table 4). Road signs were the most effective method with 96.7% of travellers indicating that the road signs had given them information. It was least effective on travellers starting from Inland NSW (77.74%), while travellers from Victoria were most affected (89.75%).

TV was about equally acknowledged by travellers from different trip origins as being and not being a source of information. Most travel origins had an equal calculated drop in fruit carriage except Queensland, which recorded only 18% decrease however the sample size is very small. For Wagga Wagga and ACT, TV and radio were ranked in that order, and this is the same order as at the Sturt site. Radio and TV were about equal for RRZ. For coastal NSW, radio caused the largest proportional drop, even greater than for road signs.

Magazines, tourist information centres and motels all paid little contribution to where travellers picked up their quarantine message.

Penalty plates being noticed by travellers

As soon as the penalty plates were erected at different sites (Dominiak and Barchia 2005), travellers (particularly those carry-

ing fruit) made comments about the new road signs. We decided to capture this information and added a question on 14 January 1999 asking if travellers had noticed the signs advising of the fines. Of the remaining 3234 travellers in the survey period, 48.6% responded that they had seen the penalty plates.

Discussion

Roadblocks have been used in the past (Dominiak *et al.* 1998, 2000a) and more recently (Dominiak *et al.* 2000b) to reduce the amount of fruit, possibly infested with fruit fly, entering the FFEZ. Recent reports (Dominiak *et al.* 2001) indicated that the proportion to travellers carrying fruit was not declining. The tool of SEIN was trialled to get a change in the fruit carrying habits of travellers. Spot fines are also used at airports on international travellers (Whitbread 1997, Anon 1998). There were additional changes in road signs and other awareness tools (Dominiak and Barchia 2005) to hopefully create a higher level of awareness.

Traveller types

Retirees were most likely to carry fruit (Dominiak and Barchia 2005). They were most affected by magazines, TV,

radio and finally road signs. Any attempt to gain an increased compliance from this traveller type should not rely strongly on road signs. However road signs were more effective on most other traveller types.

Newell Highway

This site had the highest proportion of travellers carrying fruit and there seems to be no overall downward change during recent survey periods. Travellers were more likely to carry pome fruit and followed by citrus.

The three main awareness tools were fairly evenly ranked regarding the proportional drop in carriage (road signs 80.3%, radio 79.6% and TV 76.9%). Radio is more important than TV at this site, perhaps because travellers are more likely to be passing through the region and hence have less chance to see local TV fruit fly advertisements.

Compared with the Sturt site, the Newell carried slightly fewer families, about twice as many retirees and slightly fewer single adults (Dominiak and Barchia 2005). Retirees were more likely 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

Table 4. Responses from different traveller origin to the six method of community awareness with the numbers and percentages of 'no' and 'yes' answers, and the calculated proportional drop in fruit carriage between travellers who gave the 'yes' answer and those who gave the 'no' answer.

Origin	No answer		Yes answer		Proportional drop in carriage
	% of vehicles with fruit	Total vehicles	% of vehicles with fruit	Total vehicles	
Wagga Wagga					
Road signs	29.79	47	4.30	2002	85.57
TV	8.77	707	2.16	1299	75.42
Radio	6.37	1083	2.29	916	64.01
RRZ					
Road signs	28.57	14	3.96	429	86.13
TV	8.84	181	1.59	251	81.97
Radio	6.62	272	1.28	156	80.62
Coastal NSW					
Road signs	66.67	12	10.76	158	83.86
TV	21.88	96	4.17	72	80.95
Radio	17.46	126	2.44	41	86.03
Sydney					
Road signs	64.00	25	9.41	595	85.29
TV	13.88	425	3.33	180	75.98
Radio	12.70	496	1.92	104	84.85
ACT					
Road signs	58.82	17	9.05	431	84.61
TV	15.98	244	2.72	184	82.99
Radio	12.65	324	2.97	101	76.52
Inland NSW					
Road signs	56.00	25	12.46	666	77.74
TV	16.51	424	3.76	213	77.25
Radio	14.75	495	3.62	138	75.43
Victoria					
Road signs	58.33	24	5.98	435	89.75
TV	15.66	198	2.41	249	84.60
Radio	10.99	273	4.12	170	62.53
Queensland					
TV	12.20	41	10.0	10	18.00

were erected. Retirees were least affected by road signs and most affected by radio. The higher proportion of retirees might explain the higher rate of fruit carriage on the Newell and the relative position of radio to TV at this site.

Sturt Highway

The Sturt site has about equal proportions of family and single adult travellers and a lower proportion of retirees. This low retiree level and higher single adult level may partly explain the lower proportion of travellers with fruit. There was a 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 (Dominiak and Barchia 2005).

In relation to the proportional decrease in fruit carriage, the three main awareness tools were spread through a broader range than at the Newell site (road signs 87.0%, TV 80.5% and radio 75.2% compared to the range from 76.9% to 80.3% at the Newell site). TV was more important than radio at this site and would be consistent with a higher proportion of local traffic, which would be more likely to see fruit fly items on the local TV stations.

Kamarah

This was the smallest sample size so results must be treated with caution. This site had the smallest proportion of fruit

carriage however it was surveyed only after the erection of the penalty plates. There is a steady decrease in fruit carriage over the four recent survey periods. It is a concern that tomatoes are the most commonly carried fruit at this site.

Road signs resulted in the highest proportional drop in carriage at Kamarah, compared with the other two sites however this site was only operational after the penalty plates were erected. This site was most affected by TV and least by radio compared with the three sites.

Tomatoes

Tomatoes are an increasing concern (Dominiak and Barchia 2005), generally given their back yard origin and their high rate

of carriage compared with other fruit. The question is 'why has this occurred'. It is postulated that many travellers do not understand that tomatoes are fruit, based on many comments on survey forms.

How do we change the public knowledge on this issue? This message is part of many fruit fly awareness messages however perhaps this detail is missed amongst all the other messages. Is it worth having a targeted campaign to educate the public on this one 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. However the highest risk traveller type (retirees) are least likely to be affected by road signs based on our current results. Alternatively TV or radio community service announcements could be specifically formulated to provide this message as the message, compared to the current messages carried in these education tools.

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