WILD DOG CONTROL INITIATIVES IMPACT ASSESSMENT

Abstract

From 2011 to 2019/20, AWI provided funding for "On Ground" control assistance to over 208 WD control groups. Collection of data measuring changes in losses pre and post program(s) commenced in 2014. The long-term (2014-2022) average reduction in losses to predation due to AWI Community WD Control Initiative (CWDCI) and other "On-Ground" support, averaged 81%

Published by Australian Wool Innovation Limited, Level 3, 24 York Street, Sydney, NSW 2000

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Overview

Wild dogs (WD), including dingoes, feral domestic dogs and their crosses, have been a longstanding issue in Australia, impacting various aspects of the ecosystem and economy, sheep, and cattle populations through predation. Aside from this impact, the existence of WD influences the decision making of landholders to not stock sheep and goats, which causes economic impacts in times of relatively high wool and sheep meat prices.[1]

Several studies have aimed to estimate the economic impact of pest animals in Australia, including WD. McLeod (2004) estimated annual losses for agricultural industries of $336 million in 2004 which was subsequently updated by Gong et al (2009) who estimated the production loss costs of foxes, rabbits, WD, and feral pigs to be $285 million. Other authors, such as Khairo (2018) explore the difficulty of estimating the real losses due to vertebrate pests especially when many losses are not reported. AWI continues to fund and support projects that focus on reducing predation on sheep through establishing and assisting with WD removal by baiting, trapping, exclusion fencing and support for community groups and coordinators that promote and support a nationally coordinated, strategic, and risk-based approach to WD management.

From 2011 to 2019/20, AWI provided funding for "On Ground" control assistance to over 208 WD control groups.[2] Collection of data measuring changes in losses pre and post program(s) commenced in 2014. The long-term (2014-2022) average reduction in losses to predation due to AWI Community WD Control Initiative (CWDCI) and other "On-Ground" support, averaged 81%.[3]

Summary

WD have a multifaceted impact on the Australian economy. Their predation on livestock, disruption of agricultural activities, and potential threat to human health and safety contribute to substantial economic losses. Additionally, efforts to control WD populations involve significant expenditure.

Impact assessment results

The annual benefits generated by the project are estimated to be $3.3 million, , with a benefit-cost ratio of 5.74 (Table 1)

Table 1: Impact Assessment results

Key measure	Value
Estimated gross benefits	$4.02 million
Average annual project costs (2017-2021)	-$0.74 million
Net estimated benefits (per year)	$3.3 million
Benefit-cost ratio (BCR)	5.74
Estimated net benefits of AWI contribution	**$3.3 million**
Estimated BCR of AWI contribution	**5.74**

[1] McLeod, R. (2016). Cost of Pest Animals in NSW and Australia, 2013-14. eSYS Development Pty Ltd, 2016. Report prepared for the NSW Natural Resources Commission.

[2] AWI's Strategic plan evaluation, 2019-2022

[3] Average reduction in losses reported by the end-of-group-project survey respondents (the "7 Questions survey")

Methodology

The benefit of WD control measures' calculations used on this impact assessment rely on the methodology used by McLeod, R. (2016) and the estimations made by Gong et al in 2009. By considering the number of sheep enterprises/agricultural businesses in WD affected areas and considering the percentage of these landholders that are impacted by AWI 's activities towards mitigating the losses due to wild do attacks, it was possible to estimate the economic impact and stock loss reduction. Price and production data are sourced from the Australian Bureau of Agricultural and Resource Economics (ABARES).

Review of recent studies

Estimates of WD-related production losses vary from $41 million (McLeod 2004) across Australia to state estimates of $67 million in Queensland (Hewitt, 2009). The National WD Action Plan (2014) includes a range of estimates from $48 to $60 million annually. Gong et al (2009) estimated WD production losses were greatest for the beef industry, particularly in Queensland. Overall national economic costs for the beef industry were calculated to be $27 million, with Queensland bearing $20 million, or 73% of total national annual economic costs of $49 million for WD. Ecker et al (2017) (2017) estimated that losses to the Australian economy and the agricultural sector associated with WD attacks represent around $64- $111 million per year.

Overall, studies' results have determined that there are three most significant ways for which WD are considered a serious established pest:

- WD impact on agricultural production
- WD impact on natural environments
- WD impact on cultural and social stress.

Challenges

It is crucial to acknowledge the challenges inherent in accurately estimating the full economic impact of WD in Australia. The limitations in available data, coupled with the dynamic nature of factors influencing agricultural economics, pose significant hurdles. The lack of comprehensive and standardized reporting on WD attacks across regions makes it challenging to precisely quantify losses. Moreover, the complexity of variables such as varying sheep farming practices, geographic considerations, and the inherent unpredictability of WD behavior, complicates efforts to arrive at universally applicable figures. The findings presented here should be interpreted within the context of these challenges, emphasizing the need for ongoing research, data collection, and collaboration to refine our understanding of the economic implications of WD predation.

WD distribution and affected areas

In 2015 AWI commissioned ABARES to undertake a research project to examine the nature of groups undertaking WD management and the effectiveness these had on the mitigation of WD attacks. As part of the study 30 interviews were held across Australia with WD coordinator groups and 1,010 landholders were surveyed in all states except Tasmania and the Australian Capital Territory. 91% of the surveyed landholders had either a WD or fox problem on their property. The survey report prepared by Binks et

al (2015) estimated the areas that were exposed to WD attacks, which varied across states as shown in Table 1. Table 2 summarizes the number of sheep enterprises and total number of sheep per state 2017 – 2021, which were used for the calculations in this assessment.

Table 1: No. of sheep affected by WD attacks per state.

No. of sheep affected by WD attacks per state[4]						
FY 2021	NSW	QLD	SA	VIC	WA	Total
% sheep exposed – medium impact	15%	15%	15%	5%	18%	n/a
% sheep exposed – high impact	0	7%	0	0	4%	n/a

Table 2: Total number of sheep enterprises and total number of sheep per state 2017 – 2021 (ABARES)

Estimate no. of sheep	NSW	VIC	QLD	WA	SA
2017	26,928,532	15,203,491	2,108,045	14,221,759	11,506,038
2018	25,222,087	14,673,144	2,178,418	14,500,325	11,789,190
2019	22,366,416	13,948,270	2,100,695	14,305,148	10,649,696
2020	20,371,835	15,152,174	1,973,332	13,650,129	10,190,075
2021	24,711,534	15,360,673	2,079,829	12,714,684	10,777,694
Estimate no. of sheep enterprises	**NSW**	**VIC**	**QLD**	**WA**	**SA**
2017	11,805	7,901	1,203	4,559	5,342
2018	11,710	8,288	1,213	4,270	5,562
2019	11,880	8,216	1,344	4,422	5,241
2020	11,158	8,602	1,245	4,415	5,110
2021	11,726	8,486	1,301	4,305	4,987

Data source: ABARES

Participation and survey responses

Table 3 shows a summary of CWDCI participant survey responses in relation to losses to predation. Each column shows the number of participants per state and year that experienced WD issues before taking part in the program. These numbers were used to measure the effectiveness of AWI's funded programs to reduce the number of sheep lost to WD attacks. The total number of responses was then compared to the number of sheep enterprises per state. (Table 2)

[4] Binks, B, Kancans, R, & Stenekes, N, 2015, Wild dog management 2010 to 2014—National landholder survey results, ABARES report to client prepared for Australian Wool Innovation Ltd, Canberra, June. CC BY 3.0.

Table 3: Participant responses summary 2014 - 2021

Participant Responses	2014	2015	2016	2017	2018	2019	2020	2021	Total	% of Pop'n	Annual
NSW	43	28	20	47	41	150	94	0	423	24%	3%
QLD	34	46	31	7	18	53	0	6	195	68%	9%
SA	0	21	0	0	65	7	0	0	93	12%	2%
VIC	0	10	48	7	34	49	10	0	158	37%	5%
WA	19	11	9	6	23	21	0	0	89	9%	1%
Total	**96**	**116**	**108**	**67**	**181**	**280**	**104**	**6**	**958**	**23%**	**2.9%**

The long-term (2014-2022) average reduction in losses to predation due to AWI Community Wild Dog Initiative (CWDCI) and other "On-Ground" support, averaged 81%.[5] Variations between years are noticeable with the minimum occurring in 2014 at 76% and maximum in 2017 at 88% which includes results for the seven regions that used AWI Bushfire Recovery WD baiting support in 2021/22. These results continued to reflect the fact that participation in community based, broad scale WD baiting will reduce sheep losses to predation by around 80%.

Community Wild Dog Initiative (CWDCI) – III was the last of the three initiatives supported by the wool industry alone. This program has been successful in achieving the reduction of negative impacts of predation.

Table 4: Analysis of survey responses

Sheep lost before program	2014	2015	2016	2017	2018	2019	2020	2021	Total
NSW	5,104	3,042	15,041	5,594	3,633	12,433	12,820	0	57,667
QLD	17,129	10,076	9,970	700	7,920	20,720	0	4,800	71,315
SA	0	2,692	0	0	15,775	4,830	0	0	23,297
VIC	0	353	8,914	820	1,796	6,509	468	0	18,860
WA	500	14,095	2,605	141	3,655	1,828	0	0	22,824
Total	**22,733**	**30,258**	**36,530**	**7,255**	**32,779**	**46,320**	**13,288**	**4,800**	**193,963**

Sheep lost after program	2014	2015	2016	2017	2018	2019	2020	2021	Total
NSW	2,067	489	3,196	747	777	3,587	4,204	0	15,067
QLD	3,245	839	949	100	1,115	1,345	0	70	7,663
SA	0	258	0	0	1,730	2,050	0	0	4,038
VIC	0	74	566	27	757	210	243	0	1,877
WA	90	3,013	141	0	1,589	352	0	0	5,185
Total	**5,402**	**4,673**	**4,852**	**874**	**5,968**	**7,544**	**4,447**	**70**	**33,830**

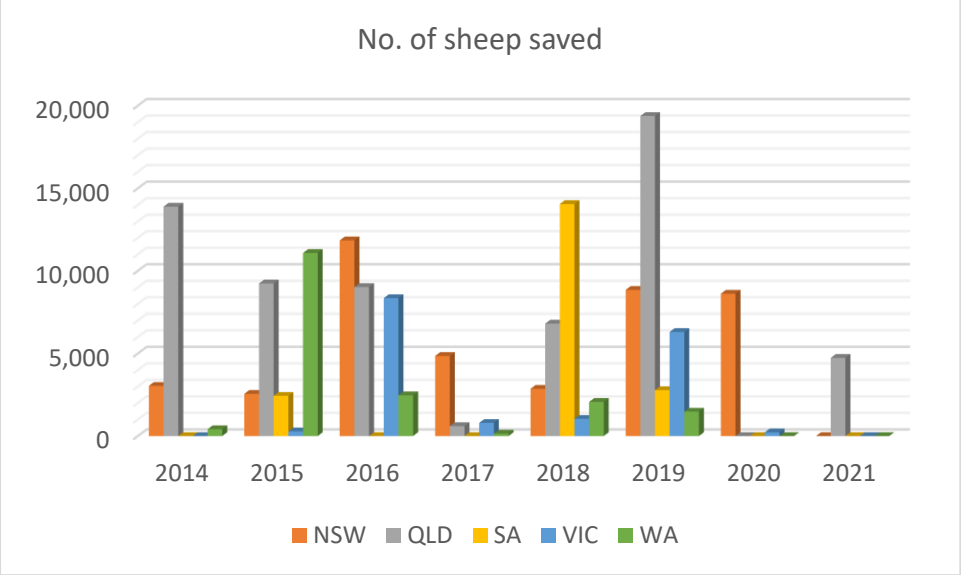
Sheep Saved	2014	2015	2016	2017	2018	2019	2020	2021	Total
NSW	3,037	2,553	11,845	4,847	2,856	8,846	8,616	0	42,600
QLD	13,884	9,237	9,021	600	6,805	19,375	0	4,730	63,652

[5] Average reduction in losses reported by the end-of-group-project survey respondents (the "7 Questions survey")

SA	0	2,434	0	0	14,045	2,780	0	0	19,259
VIC	0	279	8,348	793	1,039	6,299	225	0	16,983
WA	410	11,082	2,464	141	2,066	1,476	0	0	17,639
Total	17,331	25,585	31,678	6,381	26,811	38,776	8,841	4,730	160,133

Sheep Saved %	2014	2015	2016	2017	2018	2019	2020	2021	Total
NSW	60%	84%	79%	87%	79%	71%	67%	0%	74%
QLD	81%	92%	90%	86%	86%	94%	0%	99%	89%
SA	0%	90%	0%	0%	89%	58%	0%	0%	83%
VIC	0%	79%	94%	97%	58%	97%	48%	0%	90%
WA	82%	79%	95%	100%	57%	81%	0%	0%	77%
Total	76%	85%	87%	88%	82%	84%	67%	99%	83%

Figure 1: No. of sheep saved based on survey responses.



WD economic impact on agriculture

Livestock Predation

WD pose a significant threat to livestock farming. They are responsible for predation on sheep, goats, and other domestic animals, leading to direct economic losses for farmers.

Disruption of Agricultural Activities

The presence of WD can disrupt farming operations, causing delays and inefficiencies. This includes damage to fences, crops, and water sources.

Cost of Control Measures

Government-funded pest management programs aimed at controlling WD populations incur significant costs, including labor, materials, and monitoring expenses.

Economic benefits

Reduced losses

Part of AWI funding includes assisting woolgrowers/sheep farmers via WD management groups. Information can be obtained from the participants to try to measure the impact these groups have had on their business in terms of stock loss and costs. It is important to consider that this approach might understate the true impact of the project as there are different variables to consider, such as control undertaken and seasonal conditions: drought seasons usually see an increase in WD numbers.[6]

Investment by other agencies

Additional financial support from government agencies can supplement the resources available for WD control projects. This allows for larger-scale initiatives, potentially covering a broader geographic area and involving more stakeholders.

Figure 2: Investment by other agencies as a result of AWI's activities

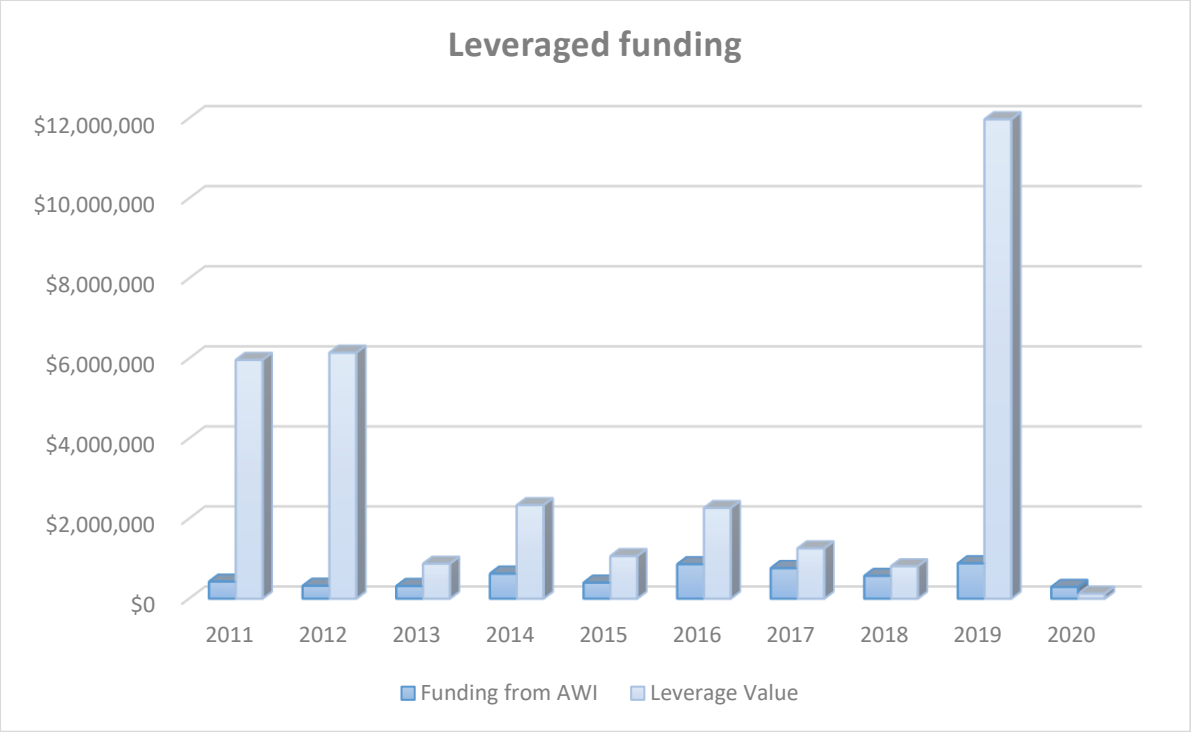


Table 5: Partner leveraged co-funding vs AW's investment ratio

FY	Funding from AWI	Leverage Value/Investment by other agencies	Average Leverage Ratio
2011	$425,400	$5,963,477	14.02
2012	$321,896	$6,143,765	19.09
2013	$315,813	$872,495	2.76
2014	$625,360	$2,336,067	3.74
2015	$399,918	$1,063,422	2.66

[6] BCA of AWI's Wild Dog Investment – BDA Group, 2014

2016	$860,675	$2,263,961	2.63
2017	$763,149	$1,255,736	1.65
2018	$569,309	$809,379	1.42
2019	$882,374	$11,974,565	13.57
2020	$291,600	$125,545	0.43

Figure 2 and Table 4 showcase the ratio between AWI's investment and leveraged funding by other organizations, which is an additional benefit generated for the landholders. Intervention has largely been in the form of subsidies provided for control activities (such as baiting, dog controllers, and providing training in control knowledge and skills for WD affected producers).

Benefit-Cost analysis.

In the AWI program "Vertebrate Pests" the metric is "to reduce the negative impacts of predation by 10%." The industry-wide cost of predation has been estimated enabling this metric to be converted to a direct financial impact on-farm.

As shown in Table 3, the annual uptake in participation was 2.9% p.a. with high variability by state, reflective of the varying degree of WD severity,[7] and an average annual uptake of 5% for the 2017-2021 period. As a result of the diverse investments of AWI in WD control, the following assumption was applied to estimate the economic benefit generated by the program:

It was estimated that AWI's activities impact 5% of the sheep enterprises located in WD affected areas, responsible for managing 5% of the total number of sheep and lambs per state. It is also estimated that this group sees at least a 70% reduction in WD attack related losses.

To estimate the economic impact resulting from AWI's investment in WD control programs, it was assumed that AWI's activities extended to 5% of the total number of sheep enterprises per state, responsible for managing 5% of the total number of sheep and lambs (Table 2). The survey results presented by Binks et al (2015) reflected variability in annual losses; sheep losses per WD affected property averaged 8%. Young sheep and cattle were found to be particularly vulnerable. Of the national loss of stock to WD predation, 66% of all sheep killed were aged less than 12 months.[8]

It is also assumed that properties impacted by AWI's activities will notice at least a 70% reduction in the number of sheep lost to WD attacks[9]. Considering these two scenarios, it is possible to estimate the reduction of losses related to WD attacks resulting from AWI's investment.

[7] 2.9% was calculated by dividing the average number of participants per year by the total number of sheep enterprises on wild dog affected areas (Table 2).
[8] Binks, B, Kancans, R, & Stenekes, N, 2015, Wild dog management 2010 to 2014—National landholder survey results
[9] Lower bound – even though survey result indicated an average 83% reduction on sheep lost due to wild dog predation, this analysis considered 70% to avoid the risk of overestimating.

Table 6: No. of sheep affected by WD attacks per state.

FY 2021	NSW	QLD	SA	VIC	WA	Total
% sheep exposed - medium impact	15%	15%	15%	5%	18%	n/a
% sheep exposed - high impact	0	7%	0	0	4%	n/a
Sheep and lambs total no.	25,886,692	2,196,028	11,138,358	16,361,691	13,040,616	68,623,385
Young sheep affected - medium impact	2,586,081	219,383	1,112,722	544,844	1,563,309	6,026,339
Young sheep affected - high impact	0	102,471	0	0	347,715	450,186
Adult sheep affected - medium impact	1,293,040	109,692	556,361	272,422	781,655	3,013,170
Adult sheep affected - high impact	0	61,489	0	0	208,650	270,139
Total no. of sheep in WD affected areas	**3,883,004**	**483,126**	**1,670,754**	**818,085**	**2,868,935**	**9,723,904**

Table 7 succinctly outlines the expected economic benefits in each state. To estimate the economic value of each sheep lost, two variables were considered: wool that would have been produced and its value per head. The calculations used data from the global datasets of Meat & Livestock Australia to ascertain the value associated with the reduction in sheep losses and the economic value attributed to the wool produced by each as well as the Farm Enterprises Budget series – 2022, published by NSW Department of Primary Industries.[10]

By considering the percentage of sheep and lambs exposed to WD attacks per state which allowed us to estimate the total number of sheep and lambs exposed to WD attacks per state by using historical data from ABARES (Table 2). Sheep losses were then estimated by using Binks et al (2015) survey results which showed that an average of 8% of the total number of sheep and lambs exposed to WD attacks were lost/killed. The "7 questions survey results" were then used to estimate the impact of AWI's activities by considering that the average wool grower/sheep farmer would see at least a 70% reduction in the total number of sheep lost to WD attacks.

The results show the effectiveness of AWI's activities in mitigating losses in each state's WD affected areas. The benefit-cost ratios reflect the average economic efficiency of AWI's initiatives over the 2017-2021 period. It was estimated that the average annual net benefit generated by AWI's activities against WD during the 2017-2021 period are $4,025,702.61 with a benefit cost ratio of 5.74 which means that for every $1 invested by AWI there is a $5.74 return on investment.

[10] Farm Enterprise Budget Series, 2022. https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/1297682/Merino-Ewes-1000-Ha-18micron.pdf

Table 7: Benefit-Cost Ratio estimations

	SA	VIC	WA	NSW	QLD
5% sheep exposed to WD attacks impacted by AWI's activities – No. of sheep	83,538	40,904	143,447	194,150	24,156
8% mortality rate – No. of sheep expected to die due to WD attacks	6,683	3,272	11,476	15,532	1,933
No. of young sheep affected - 2/3 (66%)[11]	4,455	2,182	7,650	10,355	1,288
No. of adult sheep affected - 1/3 (33%)	2,228	1,091	3,825	5,177	644
Value of young sheep affected	$540,898	$264,850	$928,804	$1,257,104	$156,410
Value of adult sheep affected[12]	$221,379	$108,398	$380,141	$514,508	$64,015
Value of wool loss - young sheep[13]	$120,456	$58,981	$206,842	$279,953	$34,832
Value of wool loss - adult sheep	$105,399	$51,609	$180,986	$244,959	$30,478
Total wool loss	$225,855.51	$110,590.14	$387,827.87	$524,911.47	$65,309.87
Total value of sheep affected	$762,277.58	$373,249.20	$1,308,945.24	$1,771,611.63	$220,425.22
70% reduction of losses due to AWI activities - sheep value per head	$533,594	261,274	916,262	1,240,128	154,298
70% reduction of losses due to AWI activities - wool value	$158,099	77,413	271,480	367,438	45,717
Total benefits deriving from AWI's activities	$691,693	$338,688	$1,187,741	$1,607,566	$200,015
Average AWI spending 2017-2021 period	$113,333	$44,975	$146,258	$276,875	$171,827
Benefit-Cost Ratio	$6.10	$7.53	$8.12	$5.81	$1.16
Overall BCR	5.74				

Table 8 summarizes the results of the sensitivity analysis: by adjusting estimated reduction in sheep losses, it is possible to estimate the changes in the benefit generated by AWI's activities against WD

[11] Estimation made for increased accuracy – studies reviewed during this evaluation found that younger sheep and cattle were more vulnerable to WD attacks.(PESTMART (2016) & Blinks et al (2015))

[12] Calculated using Meat & Livestock Australia global datasets. https://www.mla.com.au/globalassets/mla-corporate/prices--markets

[13] This was calculated by multiplying the EMI for the period by the average kilograms of wool produced by young and adult sheep.

attacks. The higher the reduction in sheep losses due to AWI's activities, the higher the benefit generated.

Table 8: Sensitivity Analysis

Sensitivity Analysis	
Lower bound - 50% reduction in sheep losses reduction due to AWI's activities	2,875,502
BCR	3.89
Estimated - 70% reduction in sheep losses reduction due to AWI's activities	**4,025,703**
BCR	**5.74**
Upper bound - 90% reduction in sheep losses reduction due to AWI's activities	5,175,903
BCR	7.01

Conclusion

The benefit-cost analysis (BCR) conducted for the Wild Dog Control Program funded by Australian Wool Innovation Ltd (AWI) reveals a highly favourable ratio of 5.74. This indicates that for every dollar invested in the program, $5.74 worth of benefits are generated. The program's efficacy lies in its multifaceted benefits, ranging from mitigating livestock predation to preserving native wildlife and safeguarding agricultural livelihoods. By curbing the population of wild dogs across Australia, the program not only reduces economic losses for farmers but also fosters ecological balance by minimizing the threats posed to vulnerable ground dwelling native species. Moreover, it contributes to the broader socio-economic well-being of rural communities by enhancing their resilience against the detrimental impacts of wild dog predation. Overall, the program stands as a pivotal intervention, yielding substantial returns on investment while concurrently addressing ecological conservation and agricultural sustainability concerns.

A considerable number of studies have been conducted throughout the last couple of decades to estimate the economic impact of WD in Australia. However, such estimations face challenges as data varies across states and relies on assumptions and estimations due to the unpredictable nature of WD's and a considerable number of attacks and losses not being reported, as found by Khairo (2018). In light of these challenges, the positive outcomes demonstrated in the benefits derived from AWI's activities are notable. It's endeavours in reducing losses, as reflected in the calculated benefit-cost ratio, underscore the potential for targeted interventions to yield favourable economic results.

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