



Attitudes and aspirations of farmers on wind erosion in the Northern Agricultural Region

An exploratory KASAP study



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Acronyms used in this report¹

NACC	The Northern Agricultural Catchments Council
NRM	Natural Resource Management
C4OC	The Australian Government Caring for Our Country Program
NAR	The Northern Agricultural Region
KASAP	Knowledge, Attitudes, Skills, Aspirations and Practices
SSRO	Social Science Research Officer

¹ Disclaimer: While all responsibility has been taken to ensure that the contents of this publication are factually correct, no responsibility is accepted for the accuracy or completeness of the contents. No liability is accepted for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this publication.



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About the NACC

The NACC is a non-profit organisation owned and directed by the people of the Northern Agricultural Region (NAR) of Western Australia. The NAR covers an area of more than 7.5 million hectares, from Kalbarri in the north to Gingin in the south to the edge of farming country in the east. The NACC is the coordinating body for natural resource management (NRM) in the NAR in Western Australia. The NACC works in partnership with community, farmer groups and with the three tiers of government to provide leadership, advice and on-ground support for NRM issues and projects in the NAR. The NACC is governed by a skill-based board which currently holds seven directors. The NACC Board provides leadership on environment issues affecting the Northern Agricultural Region, bringing together State and Commonwealth Government policy to match with local community aspirations. Through local and regional NRM officers, NACC is working with:

- Farmers, land managers and local agricultural catchment groups
- State and Commonwealth agencies
- Fishing and aquaculture interests
- Indigenous bodies
- Local government authorities
- Industry
- Special interest groups and the wider community

In promoting sustainable resource use in the region the NACC aspires to participate in the growth and maintenance of vibrant and prosperous communities living and working in a diversified economy with a healthy environment. See also www.nacc.com.au for more information.



Introduction

The main focus of this study was to get an understanding of how farmers in the NAR experienced, defined and coped with wind erosion in order to identify their KASAP, in particular attitudes and aspirations.

The 'Attitudes and aspirations of farmers on wind erosion in the Northern Agricultural Region' social science study² was undertaken as part of the NACC's C4OC Wind Erosion Project³ and flowed from the NACC's Wind Erosion Project Program Logic⁴. The study served several aims. The first aim was to provide qualitative data that could serve as grounding for the NACC's wind erosion incentive survey and reporting requirements for the NACC C4OC wind erosion project. The second aim of the study was to explore KASAP⁵ of farmers and land managers in the NAR in relation to wind erosion, in particular attitudes and aspirations. Attitudes (Greiner et al. 2009) as well as aspirations (Byron et al. 2004, 2006a, 2006b in: Australian Government 2008: 6 and 7) can be a big indicator of future conservation behaviour and adoption of conservation practices of farmers and land managers. The third aim of the study was to get an understanding of the language farmers used in relation to wind erosion and to use the same sort of language in the NACC's wind erosion (incentive and extension) surveys.

Background

Wind erosion, *the initiation of movement, transport and deposition of soil by wind*, is part of the natural Australian environment. Large parts of Australia have been shaped by wind erosion in the last two million years, making a large proportion of the landscape Aeolian in origin. Since the arrival of European settlement, many authors have identified that the magnitude and intensity of wind erosion have increased due to the adoption of European agricultural practices (Wasson 1989, Ratcliffe 1938, Harrington et al. 1984, Noble & Bradstock 1989, McTainsh & Leys 1993 in: Stott, Mohtar & Steinhardt

² This qualitative study falls under the banner of social science studies in NRM. For more information on social science in NRM see Fenton (2008), Australian Government (2002) and Roughley & Salt (2005). For more information about social science at NACC see: <http://www.nacc.com.au/getdoc/a5a593d7-8452-415a-89e0-8290dfea93b1/Social-Science.aspx>.

³ See also <http://www.nacc.com.au/Programs/Current-programs/Caring-for-our-Country/Wind-erosion.aspx>.

⁴ See Appendix 1 for the NACC's Wind erosion project program logic.

⁵ KASAP stands for Knowledge, Attitudes, Skills, Aspirations and Practices (Bennett 1975, Bennett & Rockwell 1995). I would like to thank Bill Currans, Tim Wiley and Peter Newman for referring me to the KASAP concept and Bennett's articles.



2001: 940). This increase in land degradation has raised concerns with land managers, farmers and the Australian Government ever since. Since 2009, the Australian Government (2009) C4OC program has set out target areas for wind erosion in the Business Plan of which the NAR is one.

Methodology

Study Participants (N=20) were randomly selected from high risk (70-100%) wind erosion areas in the NAR⁶ from the NACC database and White Pages. Data was gathered between June and November 2009. A qualitative approach was used in the study.⁷ Instead of assuming categories beforehand, the SSRO has paid attention to categories farmers themselves construct when talking about wind erosion (see also Latour 2005: 23 and 27-42). This is a comparable approach taken in the past by the former social scientist at the NACC, Dr. Howard, in the NACC's (2007) NRM Literacy Study and Good Farmer Study.⁸

Participants were asked semi-structured, open-ended questions during in-depth interviews, related to wind erosion and wind erosion-concepts used by the Australian Government (2009). Confidentiality as well as anonymity was emphasized before interviews started. Interview questions were prepared in liaison with management at the NACC and the former social scientist at the NACC, Dr. Howard. Bennett's (1975), Bennett & Rockwell's (1995) and Pannell's et al. (2006) definitions of subparts of KASAP were also used to structure questions, whereby definitions were used as sensitizing concepts instead of definitive concepts (Blumer 1969 in Clarke 2005: 28).

Interviews were transcribed and content analysis⁹ was undertaken. Grounded theory (Strauss & Corbin 1990 and Clarke 2005) and another qualitative method (Taylor-Powell & Renner 2003) were used for analysing the data. The open source software program Weft QDA was used for coding for content and theme and basic statistical analysis of the data. Coding, briefly described, *is the process of defining, in*

⁶ See appendix 2 for a map of high risk wind erosion areas in the NAR. Thanks go to Marieke Jansen, GIS officer at NACC, and the Department of Agriculture and Food (Geraldton) for providing the map.

⁷ As Yin (1994) states, qualitative researchers are not primarily interested in generalizations towards a numerical universe, e.g. a population, but a theoretical universe: a class of phenomena.

⁸ See <http://www.nacc.com.au/Programs/Current-programs/Social-Science.aspx> for the NRM literacy study conducted in the NAR for the NACC (2007) by Dr. Howard.

⁹ Content analysis is the systematic study of messages and the meaning those messages convey (Maxfield & Babbie 2009: 244 and 245).



terms of categories and properties, what the data are about (Clarke 2005: xxxi-xxxii and Charmaz 2006: 186). In this study coding was not exclusive or “open” (Clarke 2005: xxvi and 7-9), that is, there was no limit to the number of categories a single interview could be coded against and coding in one category did not preclude coding under another.

The main aim of qualitative analysis is seeking differences in the data instead of generalisations (Clarke 2005: xxxiv, 9-10 and Taylor-Powell 2003: 9). In this study the SSRO has tried to balance the need for generalisations with the distinctiveness of local situations and practices; an issue other social scientists face too (see also Solomon, Katz & Lovel 2007: 3-7). The SSRO has also followed Clarke (2005: 3, 127 and 128) in trying to stay as close as possible to perspectives of participants.

Demographics and general data

In this study, participants were asked about the location and size of their farms. They were also asked about their gender and age. The results show that all participants farm in the NAR and 19 of the 20 participants were male. The average age of participants was 52, the youngest being 29 and the oldest 72. Participants report they have spent on average 40 years in their area; shortest time spent was 9 years, longest 72 years.

Mean property size was 2903 ha; the smallest 202 ha and the largest 6900 ha. On average, participants have worked their properties for 29 years; the longest being 50, the shortest 7 years. Most participants reported having a mixed farming enterprise, growing crop and keeping livestock, although the emphasis for most was on cropping. In terms of total income of all participants, roughly 80% came from cropping. Just one farmer held only livestock. The other 19 all practised cropping with minimum till cultivation techniques (knife points) and some also held livestock.

At the time interviews for this study were conducted most participants indicated that a very small number of areas on their property, and a very small part of their property was prone to wind erosion. The average area that was prone to wind erosion was 23ha. The smallest being 0 ha and the largest 200 ha. However, many (N=13) emphasized that with bad management or an unexpected weather event (e.g. prefrontal winter winds or strong summer rains) a significantly larger part of their property could be prone to wind erosion.



Analysis

As mentioned in the preceding section participants were asked a number of questions in relation to wind erosion. Data was coded and sub coded in categories in the tables provided below. If participants mentioned a certain category, e.g. “overgrazing”, multiple times then this was only coded once per participant. In the coding process I’ve tried to stay as close as possible to categories participants themselves constructed.

Question: “What is wind erosion according to you?”

Coding category	Frequency	%
Sand/dust visibly moving through the air	12	30.1
Top soil blowing away	10	25.6
Combination bare soil and strong winds	10	25.6
Land degradation	6	15.4
Strong winds/any earth movements/water erosion	1	2.6
Total	39	≈ 100

Answers to the question “What is wind erosion according to you?” circled around a number of coding categories described in the table above. This question was asked to see how participants defined wind erosion. Interesting to note is that a combination of bare soils and strong winds was mentioned by only half of the participants (N=10).

This question was further analysed using the method Dr. Howard (2007) put forward in the NACC NRM Literacy Study. A model definition of wind erosion¹⁰ was used (Houghton & Charman 1986 in Australian Government 2007: 9) to score responses of participants against on a scale from 1 to 5. The rating process in this analysis was “generous”, to use the words of Dr. Howard about his rating process in the NACC NRM Literacy study. For example, on the next page, the following answer to the question: “What is wind erosion according to you?” was coded as a 4:

¹⁰ Houghton & Charman (1986 in Australian Government 2007: 9) use the following definition of wind erosion: “‘Wind erosion’ is the process by which soil is detached and transported from the land surface by the action of wind. Transport occurs by creep, saltation or in suspension.”



Wind erosion to my mind is quite simply most obviously as blowing dust and depending on the speed of the wind as to the size of the particle it will carry.

The following response was coded as a 1:

Any earth movement or pretty strong winds or water erosion, I guess.

Mean scores for closeness to the model definition of wind erosion

Number of participants (N)	Mean	Standard Deviation
20	3.15	0.96

If we follow the outcome of this method then it could be argued that an average score of 3.15 for participants indicates a moderate level of knowledge about wind erosion. If we assume that this method is an adequate way of testing knowledge levels then this in turn could fuel the idea that there exists a lack of understanding of wind erosion among participants. However, as every participant revealed experience and coping mechanisms with wind erosion, I have no reasons to believe that participants had moderate understandings of wind erosion (risks) and its effect on the landscape, even though their definition of wind erosion might not align perfectly with the official (model) definition.¹¹

Question: “What causes wind erosion according to you?”

Coding category	Frequency	%
Overgrazing/overstocking	16	20.5
Lack of ground cover	8	10.4
Usage of (disc) ploughs	7	9.0
Lack of rainfall	6	7.7
Strong winds	6	7.7
Wind erosion especially on light soil/sand plain	5	6.4

¹¹ A similar outcome was observed in the NACC (2010: ii) City of Geraldton-Greenough Coastal Communities Study. In this study some participants were not able to define an “ecosystem service”, but they could describe the values they attribute to the coastal zone and its valuable contribution to their sense of place and lifestyle.



Losing ground cover due to heavy summer rain	4	5.1
Burning stubbles	4	5.1
Sheep camping on blowouts	4	5.1
High/multiple cultivation	4	5.1
Ploughing whole property in the past	3	3.8
Cultivated fallow	2	2.6
Land clearing in the past	2	2.6
Bad management of cropping practices	2	2.6
Bad management all-over	2	2.6
Chemicals	1	1.3
No tree barriers	1	1.3
Lack of options to combat wind erosion	1	1.3
Total	78	≈ 100

This question was coded under the categories described in the table above. Although only a few participants (N=6) mentioned strong winds as causing wind erosion in answering this question, in all interviews it was implicit and mentioned in response to other questions. In the same way, overgrazing/overstocking (N=16) and usage of disc ploughs (N=7), might consequently imply lack of ground cover (N=8). However, I've only coded under this category when participants mentioned lack of ground cover. In answering this question some participants (N=5) also mentioned that their sand plain, or sandy soil country, was especially vulnerable to wind erosion. Lack of rainfall was also mentioned a number of times (N=6) and mentioning the 06/07 drought was coded under this category too.¹² What's clear from this is that participants see the cause of wind erosion mainly as *anthropogenic* (i.e. derived from human activities).

¹² The outcomes of this question and the question on the next page: "What would you consider some bad or worst practices in managing wind erosion?" are in line with the answers given by participants in the R&D meeting of the Liebe Group, held on the 19th of October 2009. I would like to thank the Liebe Group management, in particular Chris O'Callaghan, for inviting me to this event.

At the moment the Liebe Group is conducting an innovative wind erosion project, funded under C4OC, which aims to provide growers with "innovative and improved management strategies to overcome wind erosion in the Dalwallinu, Coorow, Perenjori and Wongan-Ballidu shires". See: <http://www.liebegrup.asn.au/caring.html> for more info.



Question: “What would you consider some bad or worst practices in managing wind erosion?”

Coding category	Frequency	%
Overgrazing/overstocking	13	30.2
Burning stubbles	11	25.6
High/multiple cultivation	8	18.6
Usage of (disc) ploughs	7	16.3
Taking root matter away/ground cover off	2	4.7
Spraying	1	2.3
Cultivated fallow	1	2.3
Total	43	≈ 100

This question was coded under the above mentioned categories. It resembles the previous questions “What causes wind erosion to you?” and was asked to consolidate this previous question. As Dr. Angela Wardell-Johnson mentions, sometimes we have to ask multiple questions to combat social desirability bias (i.e. giving answers to the interviewer that might be viewed favourably, by the interviewer or others).¹³ Interesting to note from this table, in comparison with the previous, is that there is agreement among participants about overgrazing/overstocking (N=13 vs. N=16) as a worst practice, but that burning stubbles is mentioned a lot more often (N=11 vs. N=4) as well as high/multiple cultivation (N=8 vs. N=4).

Question: “When does wind erosion occur most according to you?”

Coding category	Frequency	%
March	12	18.8
April	10	15.6
February	9	14.1

¹³ I would like to thank Dr. Angela Wardell-Johnson for reminding me of this fact. Dr. Wardell-Johnson spoke about the role of meso level social capital in cross-scale engagement in landscape management at the NACC’s social science forum at the state NRM Changing Environments Conference. Her presentation can be found here: <http://www.nacc.com.au/State-NRM-Conference/Social-Science-Forum/Presenter-powerpoints.aspx>.



May	9	14.1
June	9	14.1
January	7	10.9
December	4	6.3
July	2	3.1
November	1	1.6
August	1	1.6
Total	64	≈ 100

This question was coded under the above mentioned categories. I chose to code for individual months as this made it easier to sort the data. For instance, if a participant mentioned all months from November to March, I coded this for separate months. In a similar way when participants mentioned autumn, I coded for the months of March, April and May. Most participants mentioned having problems with wind erosion at the end of the summer months as well as in autumn. Many also mentioned having problems during seeding, before the first winter rains set in. There was little consensus about which winds caused the greatest erosion. Most mentioned north-westerlies (6), some easterlies (4), a couple southerlies (2), a couple south-westerlies (2), a couple westerlies (2), one south-easterly, one north-easterly and one participant mentioned “all directions”.

Question: “What do you do (and have you done) about wind erosion?”

Coding category	Frequency	%
Manage stock to prevent overgrazing/bare soil	11	14.1
Using minimum tillage	11	14.1
Tree planting	10	12.8
Stubble retention/leaving some ground cover after harvest	9	11.5
Wind row burning	6	7.6
Planted cover crop (e.g. blue lupins, barley, oats, cereal rye, tagasaste)	5	6.4
Mixing sandy soil with clay/gravel	5	6.4
Chisel plough in clay and gravel soils	3	3.8



Reduced stock numbers	3	3.8
Fenced off wind erosion prone areas	3	3.8
Planted perennial grasses	2	2.6
Fenced off native vegetation	2	2.6
Cover up blowholes (with straw, rocks, hay, etc.)	2	2.6
Fenced according to soil types	1	1.3
Planted saltbush	1	1.3
Put gravel around watering points	1	1.3
Started using new type of chemicals	1	1.3
Started using new crop varieties	1	1.3
Start seeding earlier	1	1.3
Total	78	≈ 100

Answers to the question “What do you do (and have you done) about wind erosion?” circled around a number of coding categories described in the table above. Many participants (N=11) mentioned managing their stock in ways that did not negatively affect ground cover in order to minimize wind erosion. Many (N=11) also mentioned adopting no-till farming with knife points.¹⁴ Half of the participants (N=10) brought up tree planting as their way of minimizing the risk of wind erosion. Leaving stubble after harvest was also common (N=9). Participants also mentioned a decline in burning their paddocks after harvest, but some (N=6) still burn windrows to manage stubble or cope with weed issues. Putting clay or gravel on sandy soils to reduce the risk of wind erosion was done by some (N=5). One participant noted that using chisel ploughs could lead to wind erosion. However, a small amount of participants (N=3) were optimistic about using this technology and reported positive results.

¹⁴ This number signifies the answers to this particular question. At the beginning of this study I mentioned that all farmers (N=19) who cropped cultivated with minimum till methods.



Question: “What do you consider best practices in minimizing the risk of wind erosion?”

Coding category	Frequency	%
Manage stock to prevent overgrazing/bare soil	8	23.5
Stubble retention/leaving some ground cover after harvest	7	20.6
Minimum tillage	7	20.6
No stock at all on degraded soil	4	11.8
Tree planting	2	5.9
Cover up blowholes (with straw, rocks, hay, etc.)	1	2.9
No dry seeding/ploughing	1	2.9
Planting of saltbush	1	2.9
Planting of perennial grasses	1	2.9
If fallowing, only chemical fallow	1	2.9
Using new crop varieties	1	2.9
Total	34	≈ 100

This question was coded under the above mentioned categories. During the interview process, which was semi-structured and conversation-like, I noticed that a lot of participants did not elaborate as much on this question. This could be due to the fact that the previous question: “What do you do (and have you done) about wind erosion?” was asked before and participants felt they had answered it already. Therefore I think the answers to this questions should be seen a clarifier to the previous questions and not as stand-alone. However, it is clear that the main coding categories resemble those of the previous question: managing stock (N=8 vs. N=11), stubble retention (N=7 vs. N=9) and minimum tillage (N=7 vs. N=11).¹⁵

¹⁵ According to Farm Weekly “it is a given now that the majority of Australian farmers now embrace minimum tillage and stubble retention methods to inhibit wind erosion and cut moisture retention. See “Breaking the cropping mould at Arrino”, in: *Farm Weekly*, 8th of October 2009, p. 8.



Question: “Which other practices do you think are effective in minimizing the risk of wind erosion?”

Coding category	Frequency	%
Tree planting	10	12.7
Planting of perennial grasses	10	12.7
Stubble retention/leaving some ground cover after harvest	10	12.7
Mixing sandy soil with clay/gravel	6	7.6
Reducing stock numbers	5	6.3
Using minimum tillage	5	6.3
Fencing off wind erosion prone areas	4	5.1
Planted cover crop (blue lupins, barley, oats, cereal rye, tagasaste)	4	5.1
Manage stock to prevent overgrazing/bare soil	4	5.1
No burning at all	3	3.8
(Tree) Alley farming	3	3.8
Getting rid of non-wetting sands	2	2.5
Chisel plough in clay and gravel soil	2	2.5
More vegetation	2	2.5
Using zero till (discs)	1	1.3
Increase organic carbon level of soils	1	1.3
Mixing loam, straw, mulch and fertilizer on blowouts	1	1.3
Cover up blowholes (with straw, rocks, hay, etc.)	1	1.3
No dry seeding/ploughing	1	1.3
Stop farming	1	1.3
Gravel around watering points	1	1.3
Wind row burning	1	1.3
Rotational grazing	1	1.3
Total	79	≈ 100

Answers to the question “Which other practices do you think are effective in minimizing the risk of wind erosion?” circled around a number of coding categories described in the table above. This



question was asked in order to be able to report upon a complete picture of the practise side in KASAP of wind erosion. There is a lot of overlap with the two previous questions. However, in considering the top three categories only stubble retention (N=10) is a 'stayer'. Interesting to note is that participants see planting of perennial grasses (N=10) and planting of trees (N=10) as useful ways of minimizing the risk of wind erosion. Claying (N=6) was also mentioned some times as a way of minimizing wind erosion. Managing stock to prevent overgrazing (N=4) was mentioned a lot less than in previous questions. The same also goes for minimum tillage (N=5).



Attitudes

Attitudes focus on individuals' beliefs, opinions, feelings or perspectives (Bennett 1975).¹⁶ It could be argued that attitudes are only a part of (planned) behaviour. This is concurrent with Ajzen's (1991) theory of planned behaviour where, besides attitude, behavioural control, norms, intention and perceived behavioural control all play a role in final behaviour. Attitudes seem more temporal than aspirations. Attitudes can for instance be highly influenced by "being in a bad mood" (Haddock, Zanna & Esses 1992 in: Zanna & Olsen 1994: 98). However, Greiner et al. (2009) clearly show that strong conservation and lifestyle motivation (attitudes) translate into intrinsic motivation for adoption of conservation practices.¹⁷ In other words, attitudes as well as aspiration can play a key role in the adoption of new conservation practices. In this study attitudes on wind erosion were coded in the table below.

Coding category	Frequency	%
Don't want it happening/horrible thing to look at/last thing you want to happen	15	23.4
We are aware of wind erosion and constantly trying to find ways to help prevent wind erosion	13	20.3
Confession/Guilt - We were slow to catch on (land clearing/traditional cultivation/overstocking in the past)	8	12.5
Land management practices have changed significantly over the last generations	7	10.9
Future-ness - wind eroded land takes long time to recover	6	9.4
It is not 100% preventable - a cause of what we do	4	6.3
There is no stopping it until it rains	4	6.3

¹⁶ As currently used in psychology, the term *attitude* refers to a hypothetical construct, namely a predisposition to evaluate some object in favourable or unfavourable manner (Eagly & Chaiken 1993 in: Crano & Prislis 2008: 261).

¹⁷ Dr. Greiner has stated her point again at her presentation at the Rural Practice Change Conference in Perth on the 8th of July. I would like to thank Dr. Greiner for sending me her article and powerpoint presentation.



Social acceptability - sand blowing over neighbours fence	3	4.7
Feeling empathy for someone who has wind erosion	3	4.7
Last thing on the agenda/blowouts not economically viable	1	1.6
Total	64	≈ 100

As it is not deemed feasible to ask participants directly about their attitudes one has to analyse and search through the interviews with the above mentioned methods (e.g. Bennet 1975) in mind. A general thread through the interviews was that the majority of participants expressed an absolute dislike of wind erosion (N=15).¹⁸ Participants (N=13) also had a clear desire to find new, effective ways to minimise wind erosion or to prevent it from happening in the first place. What struck me was the open and honest attitudes of participants (N=8) about their “learning curve” in their experience of sometimes (indirectly) causing wind erosion in the past and their ways of coping with it. Besides mentioning changed land management practices over time (N=7), some participants (N=6) also mentioned an element of future-ness, i.e. that degraded land takes a long time to regenerate and that the cost-effectiveness of effort vs. output decreased in using degraded land for farming.

To find out more on prevailing attitudes on wind erosion, participants were asked about attitudes of other farmers.

Question: “What would the attitude of other farmers be towards wind erosion?”

Coding category	Frequency	%
Other farmers don't like to see their paddocks blow/don't want it happening	12	32.4
A minority of other farmers manages lets/makes their properties blow	6	16.2
Attitudes of other farmers are all right, they have done things (tree planting, stubble retention, etc.) to minimize wind erosion	5	13.5
Attitudes of other farmers have changed tremendously/hardly any farmers left who practice land degrading form of farming	4	10.8

¹⁸ Although I suspect that all participants disliked wind erosion, I could not trace any more statement pointing towards this in the analysis of the text of the interviews.



Land management practices have changed significantly over the last generations	3	8.1
Social acceptability - sand blowing over neighbours fence	3	8.1
Farmers have to sometimes carry out land degrading practices (e.g. to cope with weeds/stubble)	1	2.7
Majority of farmers farms unfortunately in a land degrading way (cultivation, burning, overstocking, etc.)	1	2.7
Some other farmers take blowing paddocks for granted	1	2.7
Other farmers are aware of wind erosion, but not doing anything	1	2.7
Total	37	≈ 100

Answer to the question: "What would the attitude of other farmers be towards wind erosion?" circled around a number of coding categories described above. Most participants (N=12) expressed that other farmers disliked wind erosion. Some (N=6) expressed their concerns about other farmers making their properties susceptible to wind erosion. Some participants expressed optimism about changed attitudes (N=4) and what has been done by farmers (N=5) to minimize wind erosion on their properties. Confidence in changed land management practices (N=3) and a decrease in social acceptability (i.e. 'not done' to let paddocks blow) (N=3) was mentioned a few times.

Participants were asked how many farmers still practiced land degrading/wind erosion promoting ways of farming (e.g. with overstocking, burning, excessive cultivation, etc.). An average mean percentage of 5-10% was the result of this analysis, with the highest mentioned percentage being 50% and the lowest 2%. In other words, most participants believed that around 5 to 10% of (other) farmers still use land management practices that increase the risk of wind erosion.

Question: "Do you feel you are effective in managing the risk of wind erosion?"

When asked if participants felt effective in minimizing the risk of wind erosion all (N=20) of them expressed an opinion that showed optimism. Most participants answered "yes" or "most of it, yes". Most attitudes were very much in line with the following citations on the next page:



We have been quite effective but not without some painful lessons.

Like I said the way you farm these days is totally different. You know we don't burn anymore, all that sort of stuff and I reckon that's half the problem and if we do have sheep or you get sheep in over the summer [...] just make sure you don't leave them on there [the paddock] for too long.

Wind erosion in this area now is not the issue that it used to be [...] Most people would say it's very important but it's not the highest priority because they know what to do about it.

Participants say that due to new farming methods, better management of stock, less stock and less burning, wind erosion is no longer the issue that it used to be in the NAR. Most participants expressed confidence in their own management efforts and a couple mentioned the unpredictability of major weather events that could cause wind erosion.

Throughout the interviews a number (N=7) of participants mentioned financial constraints to cope with wind erosion effectively. As one participant puts it:

It comes down to sometimes a lack of funds, you know things that you want to do but you're limited by your funds. So at the moment we are undertaking the claying project to stop wind erosion [...]. It's still a cost but it's not a huge cost.



Aspirations

Besides attitudes, participants were also asked about their aspirations. According to Byron et al. (2004, 2006a, 2006b in: Australian Government 2008: 6 and 7) aspirations are a good indication of future conservation behaviour. Below is a table with aspirations that participants mentioned to manage wind erosion in the long-term.

Question: “How would you like to see wind erosion managed on your property in 25 years?”

Coding category	Frequency	%
(There should be) no wind erosion at all	11	21.6
Putting trees around blow outs and wind erosion prone paddocks	7	13.7
To continue current management	5	9.8
Hard to say/can't control nature (e.g. amount and reliability of rainfall)	4	7.8
Planting of perennials	4	7.8
Less/minimum wind erosion and less blowouts	4	7.8
Managing stock/ no overstocking	4	7.8
Stubble retention/managing	4	7.8
Claying	2	3.9
Fencing of wind eroded spots	1	2.0
If wind erosion got bad I'd plant Lucerne trees in lines	1	2.0
Increasing organic carbon levels in sand plain	1	2.0
Getting rid of non-wetting soils	1	2.0
Whole property mulched	1	2.0
Planting of shrubs	1	2.0
Total	51	≈ 100

All participants were quite satisfied with the way they were handling wind erosion at the time the study was conducted. This was reflected in a number of things. Firstly, mentioned before in ‘General Data’ in this report was that none of the participants had problems with wind erosion or perceived that big areas of their properties were prone to wind erosion. Secondly, in terms of aspirations, a



majority of participants (N=11) expressed a desire to have no wind erosion at all on the properties in 25 years. Thirdly, some (N=5) mentioned continuing current management practices (which varied) and were considered by participants as minimizing the risk of wind erosion already. Fourthly, a few (N=4) participants mentioned wishing for less wind erosion and fewer blowouts.

Participants also mentioned the desire to plant trees (N=7) and perennials (N=4) in the future to combat the risk of wind erosion. A few participants (N=4) mentioned the inability to control nature and varying rainfall amounts. Management of stubble (N=4) and stock (N=4) was also seen as adequate to manage wind erosion risks by some, as well as claying (N=2).

Participants were also asked how they would like to see their properties in 25 years (provided they were still alive to see it). All participants mentioned that they wanted their properties to be in a better shape in the future.¹⁹ The degree to which they wanted improvement varied. Most aspirations were a variance on the following statements made by three participants:

I suppose the aim of what I would like to do when I leave in 30 years is [...] if I hand it over to my son or sons or whatever, is that it is actually in better shape than when I got it.

I just like to think that this property will be equally or better condition than it is now. [...] I don't think there'd be any farmer out there that I can think of who wouldn't think similarly. They'd like to see their farm in better condition, but what constitutes better condition, everyone's idea of what is better condition [varies].

Well I'd like to see it as it is now with that little spot down there recovered because now [that] we don't have any livestock or very few, the farm's not in anywhere near as bad a shape as what it was when I took it over.

¹⁹ These findings are in line with the research of Prof. Vanclay (2004: 214 and 215) who writes that: "Most farmers want to pass the farm on to their children in a better condition than they themselves received it. This motivation exceeds any rational economic decision about the level of care to invest in improving the farm because it makes any investment of labor, effort, money worthwhile." I would like to thank Prof. Vanclay for his helpful comments and articles.



In line with the definition of aspirations and the NRM literacy study participants were asked about stewardship and how they understood it. *Stewardship* according to Stanley et al. (2005: 30-32) refers to the concept of *responsible care-taking of natural resource, so as to pass healthy ecosystems to future generations*. Vanclay (2004: 214 and 215) simply describes stewardship as “environmental management” and “looking after the land”. Below is a table in which answers of participants to the question were coded.

Question: “Are you familiar with the term stewardship? How do you understand it?”

Coding category	Frequency	%
Looking after the land - treating it with respect	10	35.7
Don't know what it means	7	25.0
Preserving and improving the land for next generations	7	25.0
Being a leader	1	3.6
A consultant that comes along and tells us what we should be doing	1	3.6
Making sure you follow a particular program/set procedure	1	3.6
Don't know what it means - have heard of it	1	3.6
Total	28	≈ 100

Most participants (N=10) mentioned something in the line of “looking after the land” when asked how they understood stewardship.²⁰ Quite a number of participants (N=7) did not know of the term or what it meant, although one had heard of it. An element of future-ness, preserving and improving the land for future generations, was also mentioned by quite a number of participants (N=7). One participant was quite fond of the term stewardship and elaborated on it in the following citation on the next page:

²⁰ As I mentioned above on page 9, even though some participants can’t describe or define an official definition, in this case stewardship, this might not imply that they don’t know what it means.



So what you do with [the land] has consequences for the next generation and the generation after that. [...] Failing your stewardship has an enormous influence on what happens in the future. I think it's a great term, it's not an imposing term, it really means that you understand the influences about what you do and you understand the consequences of making mistakes and you are also answerable to a wider community and I think that's also very important.

Concluding remarks

In this study I've explored the KASAP of 20 farmers in relation to wind erosion. Although it is difficult to generalize from such a small study, as it lacks statistical significance, it is possible to say that the participants in this study are 'on the ball' in terms of risks of wind erosion. This is expressed by participants in their awareness of wind erosion risks, their amount of experience and coping mechanisms with wind erosion and their attitudes and aspirations.

The analysis of knowledge levels used in this study in defining wind erosion revealed moderate knowledge levels of wind erosion (although the method used in the analysis can be debated). Definitions of wind erosion as well as management practices differed somewhat, but there was a general thread throughout the interviews that emphasized management of stock and stubble and using minimum tillage and tree planting as effective ways of minimizing the risk of wind erosion. These answers also conveyed that most participants saw the causes of wind erosion as anthropogenic (i.e. derived from human activities).

In terms of best practice, most participants indicated expectations from perennials, tree planting and claying as further ways to minimize wind erosion. Participants seem also well informed about most of the concepts use by the Australian government (2009: 77) C4OC Business Plan to minimize the risk of wind erosion, namely: keeping ground cover, reducing tillage, stubble retention and timing or avoidance of long cultivated fallow (although none of the participants in this study mentioned conducting long cultivated fallow on their properties).

Clarke (2005: 145-179) suggests to supplement qualitative analysis using discourse analysis. In essence a discourse claims *to properly and adequately describe how X* (for instance management of wind erosion) *is (or should be) in the world* (Clarke 2005: 148-151). Although there were varying definitions of wind erosion in this study, and different constructions of it, all participants in this study indicated



that wind erosion *should* be managed. This was clearly expressed in their attitudes of wind erosion: a clear dislike of it and its effects and a strong sense of trying to find new ways of minimizing wind erosion. In other words, there existed in this study a discourse of a management imperative of wind erosion and implicit in this an awareness of the anthropogenic causes of wind erosion.²¹

A sense of guilt for mistakes made in the past in land management was expressed by some, as well as an acknowledgement that land management practices had changed significantly in past decades. Asking participants about the attitudes of others solidified these results and brought to the forefront that few expected others to manage their land in degrading ways. Most participants were also under the impression that attitudes of other farmers were towards sustainability in NRM.

Coding and analysing aspirations revealed a desire by participants to have no wind erosion at all in the future. About a third of participants planned to use trees as useful options of minimizing the risk of wind erosion in the future. Several others simply plan to continue their current management of wind erosion in the future.

Asking about stewardship exposed that some participants were unfamiliar with the term; a result in line with the NACC (2007) NRM Literacy study. The participants that did express understanding mentioned caretaking of the land and preserving it for future generations.

After reading and analysing the interviews on wind erosion I think it is safe to conclude that wind erosion in the NAR is not what it used to be. Land management practices have improved considerably and attitudes seem to have evolved along similar lines. I would like to reiterate that in terms of their KASAP of wind erosion, farmers and land managers in the NAR seem to be 'on the ball'. With the help of the NACC C4OC wind erosion project extension and incentive activities it is my expectation that management of wind erosion risks will further evolve towards sustainability and stewardship in the NAR.

²¹ See Fleming & Vanclay (2010) for a more elaborate use of discourse analysis in understanding behavior and behavioral change of farmers in response to climate change and sustainable agriculture.



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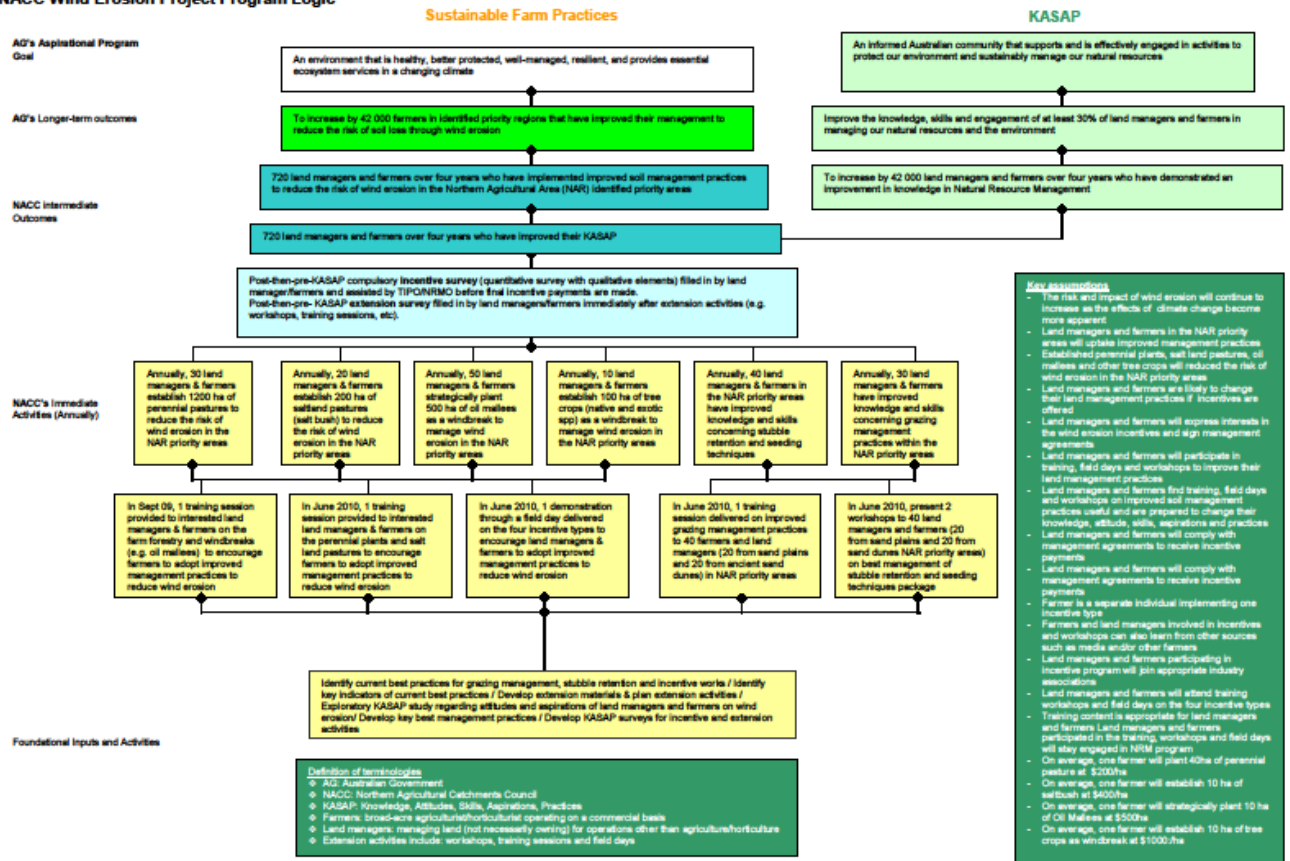
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Appendix 1: NACC Wind erosion project program logic

NACC Wind Erosion Project Program Logic





Appendix 2: High Risk wind erosion areas in the NAR

