

Retired Farmers' Perceptions regarding the Riparian Forests in the Great Barrier Reef Lagoon Catchment

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In Far North Queensland, Australia, riparian (streamside) forests are of great importance in preserving good water quality in the waterways that drain into the Great Barrier Reef Lagoon. This paper presents the findings of an open-ended semi-structured face-to-face interview with 11 retired farmers about their ideas, opinions, beliefs, and their experience with riparian forest, and with government agencies. It included an intervention in the form of an information fact sheet on the biophysical functions and environmental importance of riparian forests. The interviewees' general attitudes, appraised from evaluative statements were mainly positive but most of them, 73% (n=8) did not believe or accept the scientific information, and 55% (n=6) felt the Great Barrier Reef was not influenced by farmers' actions. All expressed mistrust in the government and only considered financial support helpful. Landcare agencies were known to very few of the retired farmers.

Long-term environmental conservation is dependent on the concerted effort of large numbers of people. Only in rare cases can a small group be seen to have the potential capability of bringing about significant outcomes. One such group is the landowners of riparian lands in the water catchment of the Great Barrier Reef Lagoon in far north Queensland, Australia. The Great Barrier Reef is a World Heritage site since 1981 (World Heritage List, 2009). In addition to this protected marine zone, the study area is surrounded by the World Heritage of the Wet Tropics of Queensland one of the few World Heritage areas that were declared on the merit of their natural importance based on flora and fauna.

Riparian forests, that is, those areas bounding the waterways and wetlands need to be intact to adequately perform their biophysical functions: bank stabilisation, retention of sediment and agricultural chemicals, uptake of excess nutrients, minimisation of water energy during floods, and the provision of habitat for land and water fauna (Bjornsson, et al., 2002; Brodie, 2002; FNQ NRM Ltd & Rainforest CRC, 2004; Land and Water Australia, 1995; Lovett & Price, 2007; McKergow, Prosser, Grayson, & Heiner, 2004; Suszkiw, Lee, Lyons-Johnson, & Adams, 1998; Webb & Erskine, 2003). The term riparian forest is often used to include the waterways as well.

The impact of European agricultural practices and landowners' ignorance about or disregard for the ecological importance of maintaining intact riparian zones have been shown to be contributing significantly to the deterioration of the health of the Great Barrier Reef (Bjornsson, et al., 2002; Brodie, 2002; Great Barrier Reef Marine Park Authority, 2001, 2001a; Rasiah, et al., 2003). The ensuing human-made pollution of the

water courses with agricultural chemicals is a major “threatening process” to the Great Barrier Reef. This has become a concern to the researchers and managers of the Great Barrier Reef Marine Park (FNQ NRM Ltd & Rainforest CRC, 2004; Great Barrier Reef Marine Park Authority, 2001a; Productivity Commission, 2003; Queensland Department of Primary Industry, 1993).

Maintenance of natural vegetation in riparian zones has been recognised as a sensitive indicator of appropriate land use and land management practices in rural areas in Australia (Armour, Cogle, Rasiah, & Russell, 2004; Werren & Arthington, 2002). There is a considerable amount of information and practical help regarding riparian areas available to the landowners that can be obtained from brochures and websites such as Land and Water Australia (Land and Water Australia, 1995) and through Land care groups and workshops. Despite these efforts to inform, educate and to facilitate revegetation programs, the chances of improving the health and survival of riparian forests are declining (FNQ NRM Ltd & Rainforest CRC, 2004; Lawson, Gillieson, & Goosem, 2007; Queensland Department of Primary Industry, 1993). This can be seen to have devastating effects on the natural marine environments such as the Great Barrier Reef.

Research studies conducted in Australia (Burston & Mathison, 1997; Cotching & Sims, 2000; Fielding, McDonald, & Louis, 2008; Wilson, Jansen, Curtis, & Robertson, 2003) and overseas (Corbett, 2002; Dutcher, 2000; Dutcher, Finley, Luloff, & Johnson, 2004) with the aim of elucidating the factors that impede adoption of good land management practices, have repeatedly found that landowners believe they are responsible stewards of their land including riparian areas, despite evidence to the contrary. Landowners seem to have a generalised inability to recognise and acknowledge riparian conservation needs (Corbett, 2002; Kraack, 2000; Thomson & Pepperdine, 2003) or, if they do recognise the need they do not translate it into action (Wilson, et al., 2003). It was also found that while extensive information abounded, farmers did not objectively assess the state of their own riparian forest according to the new information, but rather dismissed conservation criteria as not specifically applicable to their geographical and climatic area, or flatly pronounced it to be incorrect (Kraack, 2000; Vanclay, 1992). Instead, the farmers more often relied on their own or other farmers’ observations.

General education background and understanding of scientific information have been identified as unreliable factors in predicting positive environmental attitudes or environmentally sound agricultural land care practices (Ingram, 2008; Klapproth & Johnson, 2001; Thomson & Pepperdine, 2003; Vogel, 1996). But the strong tendency to disbelieve scientific findings is often driven by economic concerns, insistence on property “rights”, and grievances that have to do with feelings of not being listened to. These personal issues can become the main force in cognitive decision making in regard to land preservation and restoration as has been reported by Kraak (2000), Thomson and Pepperdine (2003), and Fenton (2004). In Fenton’s investigation, prepared for the Far North Queensland Natural Resource Management, he specifically identified the stakeholders’ dissatisfaction. Their experiences and local knowledge were not perceived to be given due consideration in the preparation of education and information material for the public. The stakeholders expressed strong scepticism and disbelief in scientists’ objectivity and in the applicability of scientific findings. The strength and saliency of their accessible memories together with their embedded core beliefs biased their

attitudes (Eagley & Chaiken, 1993; Teel, Bright, Manfreda, & Brooks, 2006). In a study in England about sustainable soil management, the farmers' knowledge of their own situation needed to be combined with enough scientific knowledge to lead to adoption of beneficial practices (Ingram, 2008).

The recommendations coming out of investigative reports stress that the stakeholders' understanding of and experiences with natural resources have to be seriously considered and included in the drafting process of future land management policies as well as in information publications (Clarke, 2008; Fenton, 2004, 2007; Hermans, Erickson, Noordewier, Sheldon, & Kline, 2007; Kraack, 2000; Larson & Lach, 2008; Lee & Roth, 2006; Qureshi & Harrison, 2002; Steel, List, Lach, & Shindler, 2004; Wilson, et al., 2003). Predicting the level of stakeholders' willingness to participate has been found to be difficult (Napier, Thraen, & Camboni, 1988). In reports about collaboration in land management practices the importance of overcoming distrust in government involvement has been pointed out (Brown & Harris, 2004; McNaughton & Ziegler, 1999).

This study aims at gathering information and assessing the attitudes of retired farmers toward their riparian land and its management through an interview process. Their general attitudes will be appraised from evaluative answers given on the affective, behavioural, and cognitive level, and expressing egocentric or biospheric values (Kellert, 1996; Stern, Dietz, & Guagnano, 1998). The interviewees' beliefs and understanding of riparian environmental (biophysical) functioning and their role as stewards of their riparian forests will be analysed before and after viewing and reading an illustrated scientifically-based fact sheet. The interviewees' perceptions of the veracity of the scientific information, and their understanding of their own role as significant agents in the protection of water quality in their creeks and the Great Barrier Reef Lagoon will be explored, as well as their expectations of help from the community and the government.

Retired farmers were selected for this study because it was surmised that they would hold more conservative and extreme opinions in regard to riparian forest issues than the average landowners. This was based on the assumption that retired farmers have more embedded and salient ideas concerning their land and riparian areas because of the many years of managing both, and also because of their conservatism in matters concerning farming.

The study reports the investigative phase of a survey of landowners' attitudes toward riparian forest in the area. The present study was aimed at eliciting ideas, beliefs and opinions about riparian forests.

METHOD

Study Design:

A semi-structured questionnaire in an open-ended format was used for the face-to-face interviews so that the retired farmers could freely express general attitudes and beliefs about riparian land and government involvement as well as to recount their experiences with the land.

Participants:

The eleven retired farmers (ten males, one female) had all owned and managed farmland that included a creek or river in the geographical area of interest between the South Johnstone and the Mossman Rivers in North Queensland, Australia. The location constitutes part of the northern lowland catchment basin for the Great Barrier Reef Lagoon. They were aged between 43 and 74 years (average age 66.5 years) and had been predominantly sugarcane farmers.

Materials and Procedure:

The retired farmers were recruited by word of mouth by other interviewees. They contacted the principal researcher (B.F.) who conducted all interviews and arranged an interview at their own home. The interview was tape recorded, with the permission of the participant and notes were taken at the same time. The interview was composed of three parts. Part 1 and 3 consisted of 22 and 27 questions respectively, and part 2 consisted of the presentation and perusal of an information fact sheet intended as an intervention.

Part 1 contained 22 questions about former living and farming activities, their memories and observations of changes of the creek and adjacent riparian land. Their understanding of the importance of the connection between water quality and the health of the Great Barrier Reef was explored, as well as their experience with land management and government agencies, and what they knew of their neighbours' and friends' views on the subject.

Part 2, the information fact sheet (see Figure 1), consisted of a pamphlet 21x9.8cm folded in the middle with colour photos of streamside forest on the outside. On the inside it showed photos of an intact and a degraded streamside forest separated by a diagram and text explaining the role and functions of these areas that include the waterway and the adjacent land.

The information was based on several published studies, reports, and websites (Great Barrier Reef Marine Park Authority, 2001a; Johnstone River Catchment Management Committee, undated; Klapproth & Johnson, 2001; Price & Lovett, 2002; Reich, 1998; Werren & Arthington, 2002). While the interviewee looked at the fact sheet the researcher read the text aloud and got assurances that it was understood.

Part 3 contained 27 questions that aimed at finding out how much the interviewee agreed with the information in the fact sheet, as well as their belief in the efficacy of such fact sheets to provide information, and their suggestions of other sources and methods of providing information on the subject of riparian forests. The final questions requested demographic data about the interviewee and about their level of ownership of and involvement in their former farms.

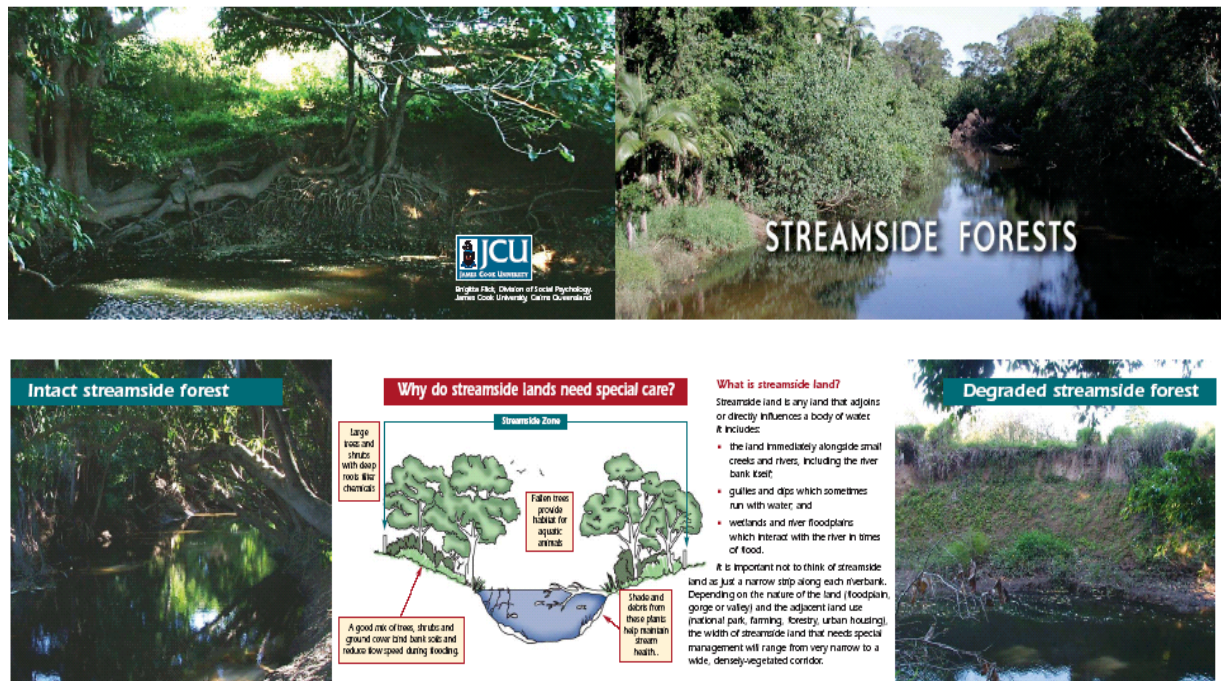


Figure 1. The fact sheet on the functions of streamside forest used in the interview.

RESULTS AND DISCUSSION

When responding to questions about their former farmland none of the interviewees mentioned the riparian forest as part of it. Only when specifically asked did they elaborate on the stream sides and the waterways of their land. Their narratives mainly concentrated on the creek rather than the banks which was the case throughout the interview unless their attention was specifically drawn to the vegetation and use of the banks. To gain a meaningful overview of the interview the responses were categorised into four overarching components consisting of the elements of “general attitudes”, “beliefs and understanding of scientific facts”, “protection of water quality”, and “government and land care”. The summary of each is presented in this section.

1. Attitudes toward riparian forest and its management based on evaluation on the affective and cognitive level and expressing egocentric or biospheric values.

The concept of ‘attitudes’ in this study is understood in the social psychological sense as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour” (Eagley & Chaiken, 1993, p.1).

To extract the general attitudes from the interview, the transcripts were analysed for the number and valence (that is, whether negative or positive) of the evaluative expressions and words used by the interviewees in connection with riparian forests. Responses expressing positive concepts (44) outweighed negative ones (25). The answers showed processing on the cognitive, affective and behavioural level, and signifying aesthetic, egocentric and biospheric values (Kellert, 1996; Stern, et al., 1998).

Positive examples were given on the cognitive and affective level of aesthetic appreciation and mainly concentrated on the creek rather than on the entire riparian forest:

[It is] beautiful and peaceful...

... and [provides] tranquillity.

[At times I] sit down and observe the flowing water.

[It is a] beautiful little creek...most people are attracted to flowing water, [has] aesthetic value...

...natural, serene beauty, privacy, not much cleared on the banks.

[I like] the pristine state of it, - always pure, clear... nice to go down there, used to perch in the creek.

All but two interviewees said they enjoyed the riparian environment. The creek changing course or widening, and erosion due to tree fall were experiences mentioned. Many of the negative examples were based on valid memories of problems and “hardship” with the areas.

...got wider, is a curse, diverting it does not help... creeks are such hardship...cannot clean it out, is a place for rats and vermin...

...changed course by eroding banks and building up others.

All interviewees agreed that the creeks were “an asset as well as a nuisance”. Egocentric and biospheric value statements were given in equal numbers.

Examples of egocentric value statements were:

If drained it would be good, cannot use the area ...for farmers it [riparian forest] is a nuisance.

[The creek is] an asset and a nuisance.

Trees are a problem, fall in and dam the creek [and cause] erosion, roots also cause erosion in floods...

Biospheric value statements examples were:

See it as something natural and very nice to have.

...for the whole ecosystem it is the bloodline.

I have 5 creeks, valuable for the catchment, natural.

I don't want it to wash away and I planted trees, paspalum grass, don't see it [riparian forest] as a problem, is there for a purpose.

It is important, we need all the original creeks on the land, also to grow vegetation and trees for maintenance of creek and as wildlife habitat, it is no problem, extra work but part of the value of the land not in a commercial sense...

As found in other surveys in Australia (e.g. Institute for Rural Futures, 2009) the natural environment such of flora and fauna are valued highly by farmers. In this study all but two interviewees repeatedly mentioned the aesthetic values of their riparian forests. All could list some native animals that they have seen in their riparian forest, and all liked having those animals there. They also assumed that their neighbors and friends felt the same way.

The overwhelmingly positive attitudes about riparian forests based on evaluation on the affective and cognitive level were not reflected in the interviewees' appropriate land management practices as reported by them, or in an understanding of the need for it. This is further illustrated in the next section. The same incongruity was found by other researchers such as Vanclay (1992) with farmers in the Darling Downs region of New South Wales: Strongly positive conservation attitudes and a highly positive evaluation of stewardship ethic were not necessarily associated with farmers who followed good management practices. He concluded that direct efforts to improve those attitudes are not what is needed but a different approach in the presentation of information material which often uses dramatic images of land degradation to make a point. Instead it should educate the farmers to recognise "early warning signs of land degradation" (p. 47) on their land.

To find out what the interviewees in this study know about riparian forest function and importance their responses to several questions were considered. Their belief in and acceptance of scientific findings were assessed from statements before and after the presentation of a fact sheet.

2. Beliefs in and understanding of riparian environmental function before and after being shown an illustrated scientifically based fact sheet.

Before seeing the fact sheet 10 interviewees (90%) had made up to five incorrect statements regarding the function of riparian forests, and after reading a fact sheet on riparian forest these interviewees declared that the fact sheet held no new information for them. Additionally, questioning revealed that eight interviewees did not believe or accept all the scientific findings or did not see their importance, and only three believed all the information to be correct. The recommended riparian vegetation was questioned,

Trees don't hold banks together, they shade out the grass which is what holds it together during a flood, ripples and erosions is nothing new, it is all connected.

...concerned with roots of trees absorbing chemicals, they would die and that is not happening, there may be no threatening amount of chemical, trees alive and developing, growing profusely.

and the need for a certain width of riparian vegetation to act as a buffer and retain its functioning was not accepted by all interviewees either, nor were cattle considered a problem:

...use 4m [of the riparian area] for the tractor to turn around...

...it is nothing new, cattle not as bad as pigs, there is natural destruction...

Several interviewees stressed the need to remove any natural debris from the banks and the creek even after the benefits of debris had been pointed out in the information fact sheet. The importance of fast flowing streams was considered common sense because it implied a cleaning function. This same observation has also been reported by Dutcher (2000). Examples of comments are:

Basically knew it all, strengthened my beliefs, but cannot agree with the debris in the creek.

Rubbish falls in, branches, leaves, grass, [needs to be] remove[d]...clean and it will flow quicker, looks like common sense...

...natural flushing means quality is good, self cleaning, no poisonous build-up evident.

The responses indicate that the retired farmers' belief and overall acceptance of scientific findings is not strong which would not give them a sufficient level of competence to critically assess the state of their own riparian forests. But believing in the benefits and the efficacy of the functions of riparian forests would be a prerequisite for the intent to adopt recommended riparian management practices based on scientific facts.

The retired farmers feel that they have the knowledge to decide if there is a need for improvement in their situation and that they will not blindly follow recommendations. Responses that illustrate the point are:

Cane farming is done all the way to the river where the land is best, - has not done a lot of harm.

... long time farmers have their own ideas, have practical experience...

...all farmers would know value of a stream...

[A] successful farmer must have an open mind, not blind to all, we are responsible.

For this group of retired farmers acceptance of scientific information or agreement with scientific findings cannot be expected to occur through the agency of a small intervention in the form of an information fact sheet. Only if it addressed conditions or questions the interviewees had been pondering, and if it did not compromise their core or embedded beliefs could the information be absorbed and applied. The memories of hardships of natural or self-made disasters concerning the riparian forest are much

more salient and not easily influenced by facts that do not fit with strong beliefs and formed attitudes. They did believe in the good state of their land and their riparian forest as exemplified by the comments such as,

... nobody sees anybody degrade their land.

All in good order by my observations.

... it is just nature; use land right up to the bank ... a bit of vegetation is okay, it is all experience.

Nevertheless, most interviewees may also have experienced some cognitive dissonance when they claimed to know all the facts after viewing the information sheet while they had exhibited ignorance of those facts before. This would explain the interviewees' use of moderating statements, such as "[true] but not for farmers; reserve agreement; cannot agree", and the expressions of disbelief and denial of the veracity of the information, "trees don't hold banks together; concerned with roots of trees absorbing chemicals; no debris in the creek". These are consonant elements that were qualifying previous responses and helped to resolve the possible cognitive dissonance (see Festinger, 1957, as cited in Eagley & Chaiken, 1993).

There was also an indication that group dynamics played a role in resolving the cognitive dissonance. Social identity theory (Tajfel & Turner, 1986) explains that self-concept is very much based on our perceived group membership. The interviewees perceived their social identity in terms of being farmers and regarded their in-group as consisting of farmers in the region. This was expressed with regard to the farmers' competence in land management as:

... long time farmers have their own ideas, have practical experience...

...natural to good farmer.

...all farmers would know value of a stream.

...people are receptive to findings and recommendation, attitude that has been put out is wrongly based, generally not the case, not remiss in taking care of the land, occasionally exception to the rule...

This group identification would increase the saliency of the message that responsibility and experience equals good management according to social identity concepts, and scientific information about riparian management would not be a strong influence. Thus the disbelief in scientific findings is not a prerequisite of belonging to the farmers' in-group, because their behaviour is driven by experience in farming and following established practices rather than by belief in scientific findings. Individual scrutiny of scientific finding is more acceptable than scrutiny of established beliefs. Of course the economic benefit seen in using land as close to the creek as possible is a rational behaviour that is acceptable in the farming culture and based on cognitive evaluation. The positive attitudes of the same group toward riparian forest are not a contradiction because they are based mainly on affective evaluation.

The salient out-groups identified were represented by a combination of city-dwellers, government agencies and scientists. These are closely linked to the feelings of self-competency that the in-group values highly and that are threatened by the out-groups:

City-dwellers and do-gooders:

...do-gooders blame farmers.

...agriculture blamed when urban areas contribute.

...no city dweller knows that...

Government as owner of riparian forest:

...would ruin the farm, and cannot trust them.

...they do not do a good job; World Heritage is taken over by pigs which are coming to the farms now.

[They] take over and after 6 months do nothing to maintain it anymore... they want 20m either side of the creek as a gift but then would not maintain it.

Scientists also represent the out-group which makes recommendations about appropriate environmentally beneficial practices and which is potentially very powerful in implementing regulations. In such a situation intergroup perception was found to be a very important predictor of management of riparian zones by farmers (Fielding, Terry, Masser, & Hogg, 2008). The interviewees in this present study expressed their distrust of the scientific information on the premise that scientists do not have the practical experience which counts more in the farmers mind than empirical studies. This is exemplified in the following remarks:

...nobody tells you the negatives, the reason they [creek banks] were originally cleared by my forefathers was to stop erosion, they burned them, you have to be prepared to loose agricultural land because of shading and the roots take nutrients...

...long time farmers have their own ideas, have practical experience, all depends on the size of the stream, in gullies and dips [points to leaflet], grasses and trees work very well...

The distrust in scientific information was also found in Fenton's (2004) investigation. The presentation of appropriate factual scientific information is not enough to convince people when there are embedded beliefs present (Teel, et al., 2006), and when the source of information comes from somebody who is perceived of having no hands-on experience (Kraack, 2000).

In this study one of the characteristics of the in-group of farmers appears to be the distrust and almost disregard of scientific findings. From that perspective the retired

farmers did not experience any inconsistencies between their thoughts and personal knowledge and their farming practices. In short, the interviewees never had any doubts about the healthy state of their riparian forest, and especially the water quality in their creeks (as discussed in the next section). These strong beliefs were not shaken by new information about the state and maintenance of proper riparian forests. The cognitive elements are consonant in the mind of the interviewees: The water quality of their creek is deemed pristine even though no attention was ever paid to the recommended riparian management practices as described in the fact sheet. They did the right thing after all as they had just assured the interviewer. Because they were convinced that there are no signs of bad riparian management such as erosion, weeds, compaction of the soil, the state of their riparian land shows that farmers know how to manage it. Their feelings of group belonging have been vindicated and verified. The farmer's social identity has been confirmed. No cognitive changes were necessary for these interviewees in this situation to align their beliefs about riparian forests with the information in the fact sheet, and cognitive dissonance did not actually occur.

An overall interpretation of the observed resistance to scientific information is also that the responses of the retired farmers are not irrational or contradictory to them when considering that they based their trusted agricultural practices on tradition, experience, and the (probably self-serving and profit-seeking) recommendations of fertiliser companies and sugar cane associations, which were believed to be appropriate. After all their farming practices sustained them and their families well, and the land does not appear to them to show signs of decline in condition and profitability.

3. Understanding their role as significant agents in the protection of water quality in their creeks and the Great Barrier Reef Lagoon.

Factual knowledge about function and importance of riparian forests, in connection with the marine environment i.e. the Great Barrier Reef was extracted from nine questionnaire items. The interviewees' reaction to the information fact sheet also targeted the knowledge and tested the strength of personally held beliefs about the role of farmers in riparian forest management.

The majority of answers, 55% (n=6) indicated that these cane farmers felt that as a group they have no need to change the environment since they have "always done their best" and are not responsible for pollution:

Heard about that [water pollution from creeks affect the Great Barrier Reef] but clean water now, 100 years ago the same.

Follow best farming practices available indefinitely, all common sense, yes, all known we are aware of it.

The consistently positive answers obtained to questions addressing the feeling of responsibility for the land were linked to expressions of obligation to the family and also of affection for the land. This feeling for the land was considered a necessary prerequisite for a good farmer. The notion for responsibility to the land and the creek also surfaced in answers to non-direct questions.

...ownership means to keep the land, provide a living and give to son.

[It is] necessary for a farmer.

[Responsibility is the] background of farming.

I liked the farm, sorry to give it up.

If I didn't love the land I would not be here.

Maintenance of creeks is very important, few people would find it not important, generally in farming community they are considered important.

...look[ed] after it [the creek] as well as we could...

[The creek] is part and parcel of having the land...

The conviction of being 'responsible for the land and being a good custodian' has been found to be strong in farmers and landowners in other studies in Australia and overseas (Atari, Yridoe, Smale, & Duinker, 2009; Cotching & Sims, 2000; Dutcher, 2000; Dutcher, et al., 2004; Institute for Rural Futures, 2009; Reeve & Black, 1993; Vanclay, 1992).

The interviewees always spoke in the inclusive plural ("we") or as a group member ("farmer") when expressing feelings of responsibility. This may be interpreted as group solidarity or simply as a social convention of politeness that stresses that they are not to be praised for something that every farmer feels.

The water quality in their own and the neighbors' creek was universally judged as very good or "pristine" and unchanged or improved due to green harvesting methods and less chemicals.

Very good, always trashed cane, we do the best we can, can drink the water.

Pristine, perfect, no agriculture upstream, good to drink.

Probably got better because fewer farmers now farm cane formerly banana farmers used lots of chemicals, no more misters and planes now.

But pollution of the creek was not unknown to the interviewees who mentioned silt pollution by loggers and by wild pigs, and chemical runoff from other than sugarcane farms especially banana farms. Later in the interview two interviewees admitted that pollution was happening caused by farmers known to them but they did not want to talk about it:

... if you turn the tape recorder off I tell you. Don't ask this question.

The other interviewee said bluntly:

In all honesty, most cane farmers wanted the land up to the creek banks, stuffed it up and had bad erosion, lost land and learned from their mistake.

Not all interviewees acknowledged having possibly contributed to marine pollution. Only four interviewees agreed that everybody's stream including their own can be responsible for polluting the marine environment when its waters reach the sea:

Connection with the GBR okay...

Yes, it has got to have some effect.

Yes, connected to the Great Barrier Reef, it is included in the natural cycle...

Three interviewees could not see the connection and felt wrongly accused of pollution,

Yes heard of it, we test the water, Cairns and Townsville water is bad and farmers are blamed for it, do-gooders blame farmers."

Farming could go on indefinitely without impact on the creek, creek not affected in time I farm [30 years], no life disturbed in the river ever.

while five were convinced that it would not be their creek:

Yes, from Babinda to the sea there may be pollution but not here. There was pollution at some time from the Mill. There were good fish here before.

Not from the little creek, because of green harvest farming there is not much wash off, keeps the silt, but they say that big floods mean a natural flow of silt.

The belief that the state of their riparian forests and the water in their creeks had no direct impact on the health of the Great Barrier Reef was held by 8 of the 11 retired farmers (70%). Similarly, Fenton (2004) reported this disbelief in groups of stakeholders in the same area:

...one of the important components of the belief systems is the attributions that are made in relation to any changes in the natural resource condition. This issue is particularly important in relation to issues associated with water quality and its potential impact on the Great Barrier Reef (p. 69).

Scepticism and disbelief in scientists' objectivity and also in the applicability of scientific findings was clearly voiced. The personal experiences, misunderstandings, and needs of the landowners were instead given credence and put on par with scientific findings, and some interviewees just denied scientific findings:

No, again there is no substantial evidence, heard of the accusations, unsubstantiated, the Great Barrier Reef is as healthy as ever, not blinded by my attitudes when I form my opinion.

... long time farmers have their own ideas, have practical experience...

Yes, if they [recommendations] are good and practical, so far they have not been good by the agencies, wrong varieties of trees...

Biased processing of new information by people with strong attitudes about natural resources has been documented with students (Teel, et al., 2006). They also validated the idea that just providing factual information is not sufficient when a change of attitude is the goal, and that other strategies are needed.

4. The expectations of help from the government and land care in riparian land management.

On this topic the interviewees openly defended their core beliefs vigorously, and also repeatedly offered unsolicited opinions in response to questions that did not particularly target this issue.

Government agencies' involvement was seen most favourable in the role of provider of technical and financial assistance. Financial assistance was universally applauded and seen as the best thing the government could do ("farmers would jump at the chance"). Some also believed that farmers would be willing to provide their equipment for use and donate time for the establishment and maintenance of streamside forests ("need assistance and expertise; farmers...provide the equipment").

Mistrust in the government agencies' ability and willingness to stick to their promises and perceived obligations was expressed strongly. This is presumably based on experience and deep seated negative feelings which result in the often repeated reasons given to demean the good intentions of government involvement:

They...would ruin the farm, and cannot trust them.

They do not do a good job. World Heritage is taken over by pigs which are coming to the farms now.

...cannot maintain public streamside forests now.

What I can see is that DPI (Department of Primary Industries) or DNR (Department of Natural Resources) and EPA (Environmental Protection Agency) take over and after 6 months do nothing to maintain it anymore..."

These comments echo the stakeholders' grievances with government interventions and regulations, and the opportunity and capacity of the community to participate in decision making found in other studies and reports (Fenton, 2004, 2007; Kraack, 2000; Reeve & Black, 1993; Thomson & Pepperdine, 2003). Similar observations have also been reported by Corbett (2002) from an interview study into motivations to participate in riparian improvement programs where the negative beliefs of rural landowners about government control seemed to be one of the reasons for not participating.

CONCLUSIONS

While the methodology in this interview study can provide a rich source of information it could also be skewed by elaborate responses of a few talkative interviewees who felt especially strongly about the subject matter. The researcher (main author) who conducted the interviews did not observe any outstandingly talkative interviewees and felt that the information collected was evenly distributed among them. It should also be noted that none of the interviewees had ever been asked about their riparian forests. They could therefore be considered to be a homogenous group on this level.

The findings of evaluative expressions as part of attitudes about riparian forest show that they were overwhelmingly positive. Nevertheless, the reported effort in appropriate riparian management was not of the same high standard. This reflects the findings of other researchers such as Vanclay (1992) and points out that the attitude component is not what needs to be targeted in education campaigns. The results also point to the problem of information capacity as outlined by Fenton (2004) in connection with the rational and effective use of resources to promote environmentally friendly land management practices. In other words how much information and in what form can it reasonably be assumed to be assimilated and put into action.

The strong positive attitude basis from which to proceed to good riparian land is augmented by the interviewees' professed role as custodian of their land. This acceptance of responsibility and appreciation of the land and the riparian forest has been found in other studies with farmers and landowners (Cotching & Sims, 2000; Dutcher, 2000; Dutcher, et al., 2004; Reeve & Black, 1993; Vanclay, 1992). In contrast acceptance and apparent understanding of scientific information about the functions and importance of riparian forest was low.

The knowledge status about the role of riparian forest was appraised from all responses given on the subject throughout the interview, especially from those after the presentation of the fact sheet. It was not surprising that persuasion to espouse the functions and the dependence of the Great Barrier Reef on intact riparian forests did not take place after viewing the fact sheet but the overwhelming disbelief of the scientific message by the majority of the interviewees was unexpected. Only one interviewee believed that at least some information was unknown to them. The rest of the interviewees insisted that they knew it all despite their comments to the contrary during the entire interview.

This should have resulted in cognitive dissonance that needed consonant elements to resolve. The use of moderating and qualifying statements is one such element that was found in the narratives. Another was identified as the interviewees' strong feelings of group identity. Their perceived social identity as farmers strongly supports the in-group's characteristic reliance on their personal experience in riparian management. At the same time scientific information would lose its saliency as it is coming from an out-group which is not perceived to have practical experience. Additionally, the interviewees believed that their riparian forests had been managed well and therefore the scientific information would be considered redundant or not justified.

In contrast to observations made by Dutcher et al. (2004), the interviewees in this study did not show any particular interest in the way their creek would impact on the waters downstream and on the marine environment. They rather elaborated on their own or their fellow farmers' group experience and knowledge than wondered where the scientific findings came from. This lack of understanding was also reflected in the comments of disbelief by the majority of interviewees about the impact of farming practices on the health of the Great Barrier Reef.

On the subject of government agencies and their involvement in riparian management the interviewees expressed mainly disparaging beliefs presumably based on experience. Only financial and technical assistance to support farmers in preserving and maintaining riparian forest was considered in a favourable light, and further environmental guidelines or rules were seen as being unnecessary. Financial incentives in the form of rate rebates in exchange for long-term conservation efforts have been used in Western Australia (Gunningham, 2007), and could be successfully applied in all areas of North Queensland.

Even though the small sample size of this study is a limitation, it still has provided some valuable insights into retired farmers' attitudes towards riparian forest, and their beliefs about riparian forest management. Future work focussing on alternate approaches to engaging farmers has to address the misconceptions, lack of knowledge and the distrust of scientific information and government involvement that has surfaced in these interviews. Nevertheless, these negative factors should not detract from the fact the overwhelmingly positive attitudes and strong feelings of stewardship found in this sample of interviewees need to be given equal consideration.

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