

Landholder Typologies Used in the Development of Natural Resource Management Programs in Australia – A Review

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This article reviews the literature on the identification of landholder typologies that can be used to assist the design and delivery of natural resource management (NRM) programs. Australian researchers have developed typologies of landholders based on a variety of criteria. The rationale for developing landholder typologies is first discussed before reviewing the various approaches that have been used by Australian researchers and comparing their findings. The methods employed have differed according to the theories used to guide the research and the ‘clients’ or ‘sponsors’ of the research. The landholder types they describe, however, have a number of similarities. These similarities suggest that the studies have identified the same fundamental divisions in the rural community, and that it may be possible to integrate landholder typologies for a variety of NRM and non-NRM applications. It is concluded that further research could usefully investigate whether concepts of social class or sub-cultures may be appropriate to define and describe the variations in landholder types.



Rationale for developing landholder typologies

It is well recognised by those interested in natural resource management (NRM) that rural landholders vary considerably in their socio-economic characteristics, values and capacity (e.g. Cary *et al.* 2001, 2002; Barr 2003). Many researchers and rural development personnel have argued that decision-makers and service providers need to understand better the variety of socio-economic circumstances and value systems within the rural community, how this variation affects their land management attitudes and behaviour, and how the

differences lead to variation in the impacts of policies and programs across the community. The development of classification schemes to help understand the range of variation in a phenomenon and to assist in interpreting the reasons for, and effects of, the variety is characteristic of the development of any scientific discipline (Kostrowicki 1977).

A number of researchers have recommended the use of classification schemes and typologies of landholders to improve the effectiveness of rural development programs in relation to agriculture and forestry (Kostrowicki 1977; Chamala *et al.* 1980; Byron and Boutland 1987; Chamala 1987; Raintree 1991; van den Ban and Hawkins 1996; Howden *et al.* 1998; Landais 1998; Specht and Emtage 1998; Emtage and Specht 1998a, 1998b; Guerin 1999; Fulton and Race 2001; Howden and Vanclay 2000; Crase and Mayberry 2002; Kobrich *et al.* 2003; Emtage 2004a, 2004b). There is also considerable interest in being able to track effectively the impacts of financial assistance and economic development programs on landholders in varying circumstances and with differing life values (Johnson 2002; AAFC 2002). Anthropologists, marketing professionals and political analysts, whose task it is to track public opinions, have for a long time sought to identify homogeneous clusters or groups of people in the community.

This type of approach can be applied to identify groups (or types) of landholders in relation to NRM. Developing a landholder ‘typology’ is one way of avoiding a blanket approach to landholders, and at the same time recognising that it is impossible to have policies and programs tailored to each individual. One advantage of developing a landholder typology is that it provides a multi-dimensional profile of landholders and the inter-relationships between their values, attitudes, information-seeking behaviour, socio-economic characteristics and NRM practices. An intimate understanding of landholders’ circumstances, values and capacities is needed for successful engagement and development programs (see, for example, Aslin and Brown 2004). Studies that have investigated landholders’ capacity to adopt sustainable NRM practices have typically provided

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lists of landholders' psychological and socio-economic characteristics that are related to adoption of some NRM practice (e.g. Cary *et al.* 2001; Taylor *et al.* 2000), yet they fail to demonstrate how these factors are inter-related in a structured manner.

The term 'typology' can be used to describe the development of archetypal descriptions of various 'typical' landholders. Researchers from a varied range of disciplines, including social psychology and rural development, have used typologies to define and interpret patterns in NRM behaviour. This approach to NRM research has evolved from a variety of backgrounds, including market structure analysis, farming styles studies, innovation adoption studies, and sustainable livelihood analysis. Other terms have been used to describe similar approaches, including 'segmentation' (Chamala 1987; Vanclay 1995; Barr 1996), 'farming styles' (Vanclay *et al.* 1998; Howden *et al.* 1998) and 'target groups' (Chamala *et al.* 1980; Chamala 1987; Vanclay and Lawrence 1995). A typology is simply the 'study and interpretation of types' (Jary and Jary 1995, p. 347). The differences in the methods and terminology used by the various researchers who have attempted to devise typologies of Australian landholders reflect differences in their theoretical approaches. In the context of NRM, derivation of a typology typically involves identifying groups (or 'types') of landholders who share similar views, have similar socio-economic and enterprise characteristics, and make decisions in a similar manner.

Typologies of landholders and farming systems have been used to describe and analyse farming systems for centuries (Kostrowicki 1977). The popularity for developing and applying typologies of landholders and farming systems has waxed and waned over the years and seems, at present, to be undergoing a resurgence. The developing interest in landholder typologies appears to parallel the social phenomenon that has been variously described as population turnaround, counter-urbanisation (Newton and Bell 1996; Argent 2002; Barr 2003; Dwyer and Childs 2004) and the 'sea-change' movement (Burnley and Murphy 2004) that has occurred in developed countries since the 1970s.

The movement of urban-based people into rural landscapes has fundamentally altered the nature of the rural community by increasing the diversity of people that manage rural landholdings (Colman *et al.* 2002; Barr 2003; Bohnet 2004; Barr *et al.* 2005). The intermixing of people with varied social value systems and capacities to undertake sustainable land management practices poses a number of challenges to those seeking to promote

sustainable land management (Hollier *et al.* 2003; Aslin *et al.* 2004; Dwyer and Childs 2004), and has reinforced the need to develop understanding of the socio-economic variability within the rural community.

Landholder typologies are also seen as a useful means to interpret the diversity of farming systems and livelihoods in developing countries (Bourgeois 1999; Dorward 2002; Kobrich *et al.* 2003; Emtage 2004a). Another factor driving the increasing use of landholder typologies is the development of, and increased access to, sophisticated statistical software that enables application of multivariate analyses. This trend appears to have arisen partly as a spill-over from the development of increasingly sophisticated marketing practices in the commercial sphere.

The primary purpose of this article is to review the use of landholder typologies to assist NRM policies and programs in Australia. In the next section, an overview of the methods used to create the typologies is presented to provide the context for the following review. This is followed by a summary of the studies to date that have developed landholder typologies in relation to NRM in Australia. In the final section, the findings of the studies are compared, including their usefulness for development of NRM programs, and the potential to develop a generic national typology of landholders is discussed.

An overview of landholder typologies

The practice of developing landholder typologies has a varied, international background. Researchers that have developed landholder typologies in the field of natural resource management come from a variety of disciplines in the social and natural sciences, including anthropology, social psychology, economics, agronomy and forestry. Their disciplinary background, the characteristics and objectives of the funding agency, and the level of resources available for research, have all influenced the methods that have been applied. An overview of Australian and international typologies that have been devised to assist natural and rural resources management is presented in Table 1. The table is meant to illustrate the range of approaches that have been used rather than to be a comprehensive list of all studies that have been found in the review process.

Landholder types have been defined according physically identifiable characteristics; psychographic or attitudinal data; or a combination of both biophysical and social criteria collected in surveys. The use of experts to set threshold levels of the criteria for identification of types is common. Several Australian (e.g. Barr 1996) and

Table 1. A classification of typologies used to assist rural and natural resource management development programs.

| Basis of typology | Criteria used | Common techniques for collecting information and classifying respondents | Example authors |
|------------------------------|---|---|---|
| Anthropological | Socio-political and cultural structures and practices, land use practices | Participant observation, qualitative analyses | Conkin 1957; Ooi 1987; Jocano 1998 |
| Farming scale and occupation | Scale of operation, ownership, management intensity | Structured questionnaires, cluster analyses | Johnson 2002; AAFC 2002; Solutions 2003 |
| Wealth ranking | Socio-economic factors defined by community involved (participatory) | Focus group discussions, participatory methods, community immersion | Belsky 1984; Balbarino 2001 |
| Livelihood strategies | Factors affecting the livelihood of households | Focus group discussions, structured questionnaires, factor and cluster analyses | Bourgeois 1999; Dorward 2002 |
| Farming systems | Elements of production system used and management objectives | Structured questionnaires, expert interpretation | Kostrowicki 1977; Kaine and Lee 1994; Landais 1998; Caldwell <i>et al.</i> 2002 |
| Farming style | Farm management style | Focus group discussions, qualitative analyses | van der Ploeg 1993; Busck 2002; Howden <i>et al.</i> 1998 |
| Attitudinal | Attitudes to natural resources management issues | Structured questionnaires, cluster analyses | Barr 1996; Specht and Emtage 1998; Emtage <i>et al.</i> 2001; Boon <i>et al.</i> 2004; Emtage 2004b |

international studies (e.g. Rogers 2003) have sought to combine the insights concerning the characteristics of landholders developed over a number of studies to create their typologies. Researchers have devised their typologies based on their assumptions about the factors affecting the phenomena of interest. These assumptions are clearly articulated by some authors, including: Kaine and others (Kaine and Lee 1994; Kaine and Niall 1999; Kaine and Beswell 2002; Linehan and Kaine 2003), who cited the influence of ‘farming context’ theories¹; Howden *et al.* (1998) and Busck (2002), who looked to ‘farming styles’ theories²; and Landais (1998), who used theories of farms as ‘complex steered systems’. In other cases, the typologies have been developed from farming systems (Kobrich *et al.* 2003) and sustainable livelihoods analyses (Dorward 2002), or else have drawn on market structure analysis techniques (Emtage *et al.* 2001; Kaine and Beswell 2002) to guide the definition and interpretation of a series of types. The development of farmer typologies has been reviewed by Whatmore (1994 cited in Busck 2002), who defined three approaches to the development of typologies in rural sociology. The first is a taxonomic or ‘positivist’ approach, which defines types based on measurement of data. The second approach is a ‘relational’ approach, based on theoretical assumptions about the structural relations between the

biophysical environment, social institutions and individuals or households. The third approach is the ‘experiential’ approach, identifying groups by interpreting the ‘people’s reasoning about the meaningfulness of various practices’.

Following Whatmore (1994), the characteristic used to classify the studies in the typology presented in Table 1 is the criterion used to segment the population. As indicated in the table, the theoretical framework and focus of typologies varies considerably. As with all typologies, the classes of subject presented in Table 1 are ‘archetypes’, that is ‘typical specimens’, and the individual studies that are cited as examples do

not necessarily use isolated applications of the research methods associated with the type. In other words, the studies reviewed here frequently employed a number of methods to develop their typology.

There are a number of issues regarding the scale, scope and criteria used to construct landholder typologies that have a critical bearing on their utility to aid NRM programs. In brief, selection of the classifying criteria to define the types in a typology and the scope of the study (i.e. whether it is on single or multiple industries) is fundamental to its utility. The utility of a typology is dependent on the information available to support the interpretation of the types that are defined (Kostrowicki 1977; Landais 1998). Various approaches have been tried, and each has their advantages and disadvantages in differing applications. For example, although industry-specific studies provide the opportunity to generate sufficient detail about industry practices so as to better understand landholders’ willingness to adopt certain management practices (e.g. Kaine and Lee 1994, Kaine and Beswell 2002), they do not provide information that assists interpretation of the rural restructuring process. While a national scale typology may assist the design and implementation of national scale NRM programs, there is a need to refine such typologies and profiles at regional scales in conjunction with regionally based NRM

1. ‘Farming context’ is a concept developed by Crouch (1981), that refers to the stage of development of a farming enterprise, i.e. the degree to which the farming enterprise utilises ‘innovative’ or ‘best’ management practices, and the management objectives of the landholder.

2. ‘Farming style’ is a concept developed by van der Ploeg (1993 cited by Howden *et al.* 1998), Vanclay *et al.* (1998), and Howden and Vanclay (2000), referring to the strategy of farm management adopted by a landholder.

Table 2. Methods, applications and study areas of research using segmentation or typology methodologies to group rural landholders in Australia.

| Study authors | Area studied | Basis for segmentation | Application |
|--|---|--|--|
| Kaine and Lee 1994; Kaine and Beswell 2002; Linehan and Kaine 2003 | Victoria | 'Farming context' and industry specific practices | Facilitation of farm enterprise development |
| Emtage 1995 | Richmond River Catchment (north-east New South Wales) | Ratings of importance for various reasons for planting trees on private landholdings | Development of farm forestry extension and assistance programs and public policies |
| Rogers 2003 ^a | International | Propensity to adopt new practices | Development of any or all extension and assistance programs |
| Barr 1996 | Victoria | Pasture management attitudes and practices | Development of perennial pasture management extension and assistance programs |
| Howden <i>et al.</i> 1998 | North-east Victoria, south-west New South Wales | 'Farming style' | Development of rural extension and assistance programs |
| Specht and Emtage 1998 | Northern Rivers region (north-east New South Wales) | Ratings of importance for various reasons for planting trees on private landholdings | Development of farm forestry extension and assistance programs and public policies |
| Fulton and Race 2001 | Australia-wide | Type (size, location) of farm enterprise and landholder characteristics | Development of farm forestry extension and assistance programs and public policies |
| Emtage <i>et al.</i> 2001 | Far North Queensland | Ratings of importance for various reasons for, and restrictions to, plantation development on private landholdings | Development of farm forestry extension and assistance programs and public policies |
| Solutions 2003 | Australia-wide | Attitudes to commitment to the industry, willingness to seek new information and approaches to management, planning practices, and current family debt and reliance on off-farm income | Assessment of the impact of government rural industries policies and programs |
| Bohnet 2004 | Far North Queensland | Attitudes towards land use and land management | Development of future visions for agricultural landscapes in Far North Queensland to assist local government planning and policy development |

^a Although the description of landholder types by Rogers (2003) is not specific to Australia, the studies are included in this review because of the degree of influence they have had on Australian NRM and rural development programs.

'farming style' by Vanclay, Howden and others. Another technique has been to cluster landholders based on differences in their attitudes or behaviour in regard to one or two land management variables, and then to assess if these differences relate to other socio-economic differences. Barr (1996) described the market segments for perennial pastures based on landholders' attitudes to perennial pastures, while Emtage and others used attitudes to tree planting as the basis for defining types of landholder with differing interests in tree growing in eastern Australia (Emtage 1995; Specht and Emtage 1998; Emtage *et al.* 2001). Race (1999) and Fulton and Race (2001) described landholder types in relation to the development of regional timber industries. These authors discussed the various socio-economic factors affecting plantation development in regard to the characteristics that the timber processing industry should identify to efficiently target landholders for partnership programs, and described a broad typology of landholders matched to various potential regional timber industry structures.

personnel. A system of nested landholder profiles across national and regional scales could provide a useful means of summarising and implementing the data generated by nested survey methodology and an integrating framework to aid NRM programs being developed by the National Land and Water Resource Audit (Cody 2004; Webb *et al.* 2004; Nelson *et al.* 2005). These issues are explored in detail in another article by the authors (Emtage *et al.* in review).

Typologies of landholders in Australia

A wide range of techniques has been used to define typologies of landholders in Australia (Table 2), covering most of the techniques that have been trialled internationally, as presented in Table 1. Some researchers have asked farmers to describe themselves and other farmers in the community, such as the definition of

While not developed specifically in Australia, the work of innovation adoption theorists including Rogers (2003) and others (e.g. Scott 1991; Spence 1994) has been used to devise a landholder typology that has been widely applied in Australia. Like Barr (1996), innovation adoption theorists combine insights from a number of studies to define and describe their types. Kaine and others (including Kaine and Lee 1994; Kaine and Beswell 2002; Linehan and Kaine 2003) have examined whether it was possible to group farmers usefully according to specific farm management practices. Finally, Solutions (2003) defined a series of landholder types based on measures of their level of commitment to their rural enterprises and other factors listed in Table 2.

There are a number of similarities among the typologies that the researchers listed in Table 2 have developed, and

Table 3. Landholder types as described by innovation adoption theorists.

| Landholder type | Typical characteristics |
|-----------------|--|
| Innovators | People of this type are said to like experimentation and risk taking, and are termed 'venturesome'. They enjoy frequently trialling new ideas and practices. They are seen as eccentric by other landholders in terms of their ideas and behaviour. They are usually highly educated but not wealthy due to their constant changing of practices and lack of focus on wealth accumulation. They typically have a dispersed friendship network that extends beyond their local area, are keen information seekers, and have the most cosmopolitan worldview. |
| Early adopters | These types of landholders are often defined as the 'opinion leaders' in the community and are termed 'respectable'. They are typically relatively well educated and control landholdings of medium to large size that they may have inherited. They typically have sufficient resources to allow them to experiment with new practices. Because they have control over larger landholdings, don't deviate greatly from 'normal' practices, and have a strong history of land management, they have the respect of the 'majority' in the community, who look to them rather than the more eccentric 'innovators' for advice and ideas. |
| Early majority | Landholders of this type are interested in using the most productive practices on their landholdings but typically have less resources to trial new practices and a lower capacity to translate abstract research results to local farming conditions. This group watches the activities of the 'opinion leaders' and takes up practices they believe have been successful. They can be termed 'deliberate'. |
| Late majority | This type of landholder is typically more conservative than the above landholder types and can be termed 'sceptical'. They prefer to see widespread adoption of a practice in their area before they are confident to adopt it. They typically have less resources than the above types for experimentation and are unwilling to adopt practices until almost all risk associated with them has been removed. |
| Non-adopters | This type of landholder has been termed 'laggards' and 'traditional'. They are thought to be the most local in their worldview and poorly connected within the social system. They have a high degree of scepticism about change and change agents. Many are in tight financial circumstances and are unwilling to trial new practices until all uncertainty is removed. |

Source: adapted from Rogers (2003).

there would appear to be some potential for the development of a broad system of typologies that relate to general land management practices. The findings of the various Australian studies are summarised in the following sections.

Grouping landholders using innovation adoption theories

The theories describing the diffusion of innovations have been used as the basis for extension practices in Australia for the last three decades. These theories apply many of the concepts developed by social psychologists in an attempt to explain the process by which new ideas become known in a community and by which new practices are adopted (Scott 1991; Spence 1994; Rogers 2003). Innovation adoption theorists hold that there are a number of distinct types of people in a community in terms of the way they respond to new ideas and practices. Theories of innovation adoption describe a common process whereby new ideas are spread through the community. They state that new practices are initiated and tested first by the 'innovators', then they spread to 'early adopters' and 'opinion leaders', and finally to the 'early' and 'late' majorities (Spence 1994; Rogers 2003). Using hundreds of studies of the adoption of various innovative practices in many different countries, innovation adoption theorists have made a number of

generalisations about the socio-economic characteristics of each of these types of landholders (Rogers 2003). These generalisations are presented in Table 3.

Studies of landholders using farming style theory

Farming style theories were developed by van der Ploeg (1993) and others in Europe. These theories basically state that '...within a farming community there is a discrete set of styles (or strategies of farming) which farmers are acutely aware of, and from which they actively choose a specific strategy to guide their own management' (Vanclay *et al.* 1998, p. 86). Howden and Vanclay (2000, p. 297) cited van der Ploeg (1993, p. 241) as stating that:

farming styles refers to a cultural repertoire, a composite of normative and strategic ideas about how farming should be done. A style involves a specific way of organising the farming enterprise: farmer practice and development are shaped by cultural repertoire, which are in turn tested, affirmed and if necessary adjusted through practice.

Farming style theory has been proposed as an approach for conceiving and understanding diversity in agriculture. Howden *et al.* (1998) applied the concept of 'farming styles' to develop a comprehensive set of landholder types in the broadacre cropping areas of south-eastern Australia. One of the criticisms of the application of farming style theories by van der Ploeg (1993) in Europe is the use of market orientation as a primary basis for classifying farmers into distinct styles (Vanclay *et al.* 1998; Howden and Vanclay 2000). The European group used the extent of intensification and scale of operations as the basis from which to begin classifying various farming styles. Vanclay *et al.* (1998) argued that 'emic' approaches (where the farmers describe themselves in their own terms) should be used rather than presenting them with word 'portraits' of potential styles which they rate as being like or unlike themselves. Vanclay *et al.* (1998) attempted to modify the application of the farming styles methodologies to make them truly 'emic' or ethnographic rather than impose 'expert' interpretations of farming styles onto the landholders. As these researchers reported, their efforts

Table 4. Characteristics of different types of landholders in the broadacre cropping belt of south-eastern Australia developed using farming styles concepts.

| Category | Degree of contact with researchers and other change agents | Level of risk adopted | Key influences | Views of other landholders |
|-------------------------------|--|-----------------------------------|--|---|
| Innovative | High – used to trial new practices | High – like to try new ideas | Look to the ‘big picture’ | Forefront of change, take some unnecessary risks |
| Progressive | High | Medium – trial ‘proven’ practices | Strong economic/business orientation | Seen by many as the ‘best’ farmers |
| Middle of the road | Medium | Medium – low | Other landholders. Like the farming ‘way-of-life’, have inherited land | Seen as ‘average’, follow-on’ or ‘practical’ farmers |
| Lifestyler | Medium - low | High – low | Personal approaches; some new to land, others are retired farmers | Adopt ‘strange’ management. Annoying if they challenge neighbours’ practices or fail to control weeds |
| Resource limited - structural | Medium – low | Low | Small and often unviable farm size. Low financial and information capital limits practices | Some lack of business skills and ability to cope with new information |
| Traditional | Low | Low | Follow well-known practices, often those of their parents | Seen as ‘old-fashioned’, living in the past |

Source: based on Howden *et al.* (1998).

to avoid the need for expert interpretation were only partially successful.

The research undertaken by Howden *et al.* (1998) classified farmers into more than 20 distinct types, although it was concluded that more than 80 per cent of landholders fell into six main categories (Table 4). These researchers viewed the descriptions as ‘archetypes’ or ‘ideal’ representations rather than as discrete entities.

Howden and Vanclay (2000, p. 308) stated that ‘to some extent, the heuristic styles represent dimensions or continua on which farmers locate themselves (although subconsciously), and for which a mythologised style, or parable, is a characterisation of a polar extreme’. Thus they concluded that the styles they had described were in fact myths or stereotypical constructs in which

landholders saw elements of themselves and selected parts to emulate in devising their individual strategies, rather than the styles being descriptions of actual people or management strategies. They did not totally reject the concept of farming styles and the potential this has to understand better the sociology of Australian agriculture. They concluded that the current limitations of the concept are more of a methodological problem and that ‘focus groups are not an appropriate technique for identifying “real” tangible farming styles, which may or may not exist’ (Howden and Vanclay 2000, p. 309).

The farming styles classifications developed by Howden *et al.* (1998) were used as a basis for analysing the learning styles of farmers in a national study reported by Kilpatrick *et al.* (1999). Based on the respondents’ use of information sources to assist their land management, Kilpatrick *et al.* (1999) defined four learning styles, namely ‘locally focussed’, ‘people focussed’, ‘outward looking’, and ‘extensive networking’ styles (Table 5). They reported that the various farming styles are related to various learning styles, with an extensive networking learning style concentrated among the ‘innovative’ and ‘progressive’ types of farmers, a ‘locally focussed’ learning style concentrated among the ‘resource limited’ and ‘traditional’ types of farmers, and the other learning styles more evenly distributed across farming styles. Emtage (1995) identified similar relationships between landholders’ use of information sources and membership of organisations, and a set of landholder types in the Richmond River catchment of New South Wales. Again, the more innovative and progressive types of landholders were found to rate all sources of information as of greater importance in assisting their land management decisions than other landholder types.

Table 5. Landholder types and their associated learning styles.

| Landholder type ^a | Learning style ^b |
|------------------------------------|---|
| Innovative and progressive farmers | ‘Extensive networking’ (use at least four sources of information to support changes in practices) or ‘outward looking’ |
| Middle of the road | Spread between learning style but mostly ‘outward looking’ (use a number of information sources plus active observation of the practice before undertaking change) |
| Resource poor | People-focused (use one or two people and one other source of information to support change, learn through one-on-one interactions or farmer groups) or locally focused |
| Traditional | Locally focused (use only locally-based sources of information to support change, including local media and observation of local practices) |
| Lifestyle | Varied practices and learning styles. The learning style characteristics of this group were not described by Kilpatrick <i>et al.</i> (1999) |

^a The names for the landholder types are based on those of Howden *et al.* (1998).
^b Learning styles are those developed by Kilpatrick *et al.* (1999).

Market segmentation analysis

Previous research has identified the potential for the use of some of the techniques employed by market

Table 6. Typical landholder types in northern Victoria – south-western New South Wales.

| Landholder group | Level of risk | Key influences | Farm practices | Proportion of sample |
|-----------------------|----------------|--|---|--------------------------|
| The committed | Medium to high | Keen information gatherers and high awareness, able to translate into behavioural change. High interest in production and profit | Use perennial pastures and rotational and strategic grazing routinely. Good understanding of production agriculture | 5 – 15% |
| The pasture dabblers | Medium | Have off-farm work or business interests for financial security. Information and time poor | Only third or less of land under perennial pasture. Active cropping | 15% |
| The crop focussed | Medium to high | Intent on cropping | Use pasture to rest crop land. No perennial pastures | Only in mixed-crop zones |
| The belt tighteners | Low | Follow commodity trade closely Risk adverse. Translate awareness to action (trials) before attitude change | Mainly grazing, set stocking used. Overstate their level of perennial pastures | 30 – 40% |
| The sceptics | Low | Often have large landholding. Low trust in 'outside' information | Low set stocking rate, no perennial pastures | 10 – 20% |
| The comfortable group | Low | Older people with no beneficiaries, large holdings. Seek to reduce active management | Low energy management. Often in beef production | 20 – 40% |
| The retreatists | Low to high | Younger people with families. Very little time. High interest in aesthetics. Some interest in capital gains. Near urban areas | Little interest in pasture improvement. Greater than average interest in tree planting | Little available data |

Source: Adapted from Barr (1996).

segmentation research to assist those designing and administering rural development programs (Chamala 1987; Vanclay *et al.* 1998). Some work has now been published about this approach in Australia (Emtage 1995; Barr 1996; Emtage and Specht 1996, 1998a; Emtage *et al.* 2001; Kaine and Beswell 2002; Solutions 2003). Market segmentation is an analysis technique used by commercial firms to guide their resource allocation and marketing strategies between products and markets (Dillon *et al.* 1990; Assael 1998).

Market segmentation methods were used by Barr (1996) to examine the potential adoption of perennial pastures. Barr (1996) examined landholders' reactions to perennial pastures as a 'product'. The perceived benefits of, and constraints to, the various uses for trees on private lands were used as the basis for clustering respondents by Emtage (1995), Specht and Emtage (1998) and Emtage *et al.* (2001). Analysis of variance and chi-square tests were then used to assess differences in the tree-planting attitudes and the socio-economic characteristics of each group. Kaine and others (Kaine and Lee 1994; Kaine and Niall 1999; Kaine and Beswell 2002; Linehan and Kaine 2003) have used consumer behaviour theory to help understand the particular types of benefits sought from specific innovations. In the study reported by Solutions (2003), landholders were grouped using cluster analysis of their responses to a series of attitudinal statements in relation to their commitment to the industry, willingness to seek new information and new approaches to management, planning practices, and current family debt

and reliance on off-farm income. The study by Solutions (2003) is the only one that has used a series of national surveys of representative samples of Australian landholders to develop a landholder typology.

Landholder typologies defined according to strategies for management of perennial pasture

Barr (1996) described a typology of landholders derived from an examination of 22 studies (including five segmentation studies) of landholders' pasture management attitudes and practices in northern Victoria and southern New South Wales. Barr examined how various types of landholders have used perennial pastures and predicted how they

might respond to different extension messages in the future. The studies that did not use segmentation were employed to supplement the information gleaned from the segmentation studies. Barr (1996) searched for consistencies among the findings of the segmentation studies and identified seven distinct groups of landholders with different socio-economic characteristics and different attitudes and approaches to land management (Table 6).

Barr (1996) concentrated on the implications of using the understanding of various landholder types to anticipate the likely adoption of low-input pastures. He did not explicitly address the rationale for using such an approach or discuss the implications for rural extension in general terms. He argued that the various levels of enthusiasm for, and adoption of, perennial pastures by landholders in various 'groups' are rational given their social and economic circumstances. He noted differences in groups with regard to stage of life-cycle and in terms of the area of land owned and extent of reliance on the farm for income. For example, the 'comfortable group' are those who have reasonably large farms and are becoming older with no prospects of inter-generational transfer of the farm and thus they are seeking to minimise the labour demands of farm management. Their situation contrasts with the 'retreatists', who live near urban areas, have a heavy reliance on off-farm income and tend to be at a stage in their life cycle where they have young families so that they also have limited opportunities to carry out management activities. This group also has

Table 7. Selected characteristics of landholder types in north Queensland.

| Group | Land size (ha) | Cropping (% of holding) | Native forest (% of holding) | Time managed land (yrs) | Income (% from farming) | Family work (hrs per week) |
|-------------------------------------|----------------|-------------------------|------------------------------|-------------------------|-------------------------|----------------------------|
| High intensity | 58 | 47 | 9 | 16.5 | 45 | 60.1 |
| Retired professionals and hobbyists | 54 | 16 | 31 | 14.4 | 36 | 44.8 |
| Progressive second generation | 81 | 37 | 11 | 18.4 | 54 | 64.4 |
| Traditional | 100 | 45 | 25 | 27.0 | 71 | 99.1 |
| Experienced/ comfortable | 74 | 38 | 27 | 21.5 | 62 | 54.5 |
| Mean | 69 | 35 | 25 | 19.3 | 53 | 56.9 |

Source: Emtage *et al.* (2001).

different management objectives, being more interested in activities such as tree planting which have the prospect of capital gain through improvement of amenity values as well as timber production.

Several authors have described the variation in learning patterns between the landholder types in Australian studies. Barr (1996) reported that some of the studies he reviewed revealed differences in the decision-making process used by the various landholder groups and differences in their information-seeking behaviour. For example, the 'committed' landholders were thought to have a confident and information-rich decision-making style. Barr (1996) noted that, for these landholders, awareness of an advantageous innovation in land management practices leads to attitude change, which then leads to behavioural change. This he contrasted with the process followed by 'belt-tighteners', whose adoption of innovations is characterised by awareness leading to behavioural change (i.e. testing new ideas), followed by changes in attitudes. Another factor Barr (1996) emphasised as differing between landholder types was their attitude to risk. Again, the committed group were reported to be the best equipped to manage risk through the gathering of information as well as through ownership of reasonably large farms. The 'sceptics', on the other hand, are reported to be highly risk adverse, and because of their control of large properties, use conservative farming methods that do not necessarily maximise economic returns on a per hectare basis.

Landholder types in relation to tree planting and management

Following the recommendations of Raintree (1987, 1991), Emtage and others (Emtage 1995; Specht and Emtage 1998; Emtage and Specht 1998a, 1998b; Emtage *et al.* 2001; Herbohn *et al.* 2005) have grouped landholders with similar attitudes to farm forestry. The clustering was based on ratings of the importance of various reasons for and restrictions to tree planting and management obtained by surveys in the Northern Rivers

of New South Wales and Far North Queensland. The landholder groups defined according to their attitudes were then tested to assess whether they differed in terms of their average socio-economic characteristics and tree management behaviour. In these studies, five types of landholders were identified which differ in their attitudes to farm forestry and in some socio-economic characteristics.

The landholder types were found to range from landholders on relatively large properties with a long history of land management and low interest in tree growing, to those on smaller properties with shorter periods of land management and high interest in tree growing (Table 7). The 'retired professionals and hobby farmers' groups and the 'traditional' group appear to represent the extreme positions of landholder types. They have the smallest and the largest landholdings respectively, and are at the extremes of the range in the proportion of income from the landholding and the length of time over which they have managed the landholding. Furthermore, 'retired professionals and hobby farmers' have the lowest proportion of their land used for cropping, the highest proportion under native forest, and the lowest average hours per week labour input from the family (Emtage *et al.* 2001). As well, this type has the highest level of past tree planting activity, and the highest proportion who intend to plant trees for mixed purposes including timber production, aesthetic and environmental reasons in the future (Emtage *et al.* 2001). The typologies of landholders have been validated through the use of case studies (Emtage and Specht 1998b) and expert interpretation (Emtage *et al.* 2001). The types were used as the basis for making recommendations for improving policies and programs relating to vegetation management (Emtage and Specht 1998b; Emtage *et al.* 2001).

In their study of landholders in relation to farm forestry development in tropical north Queensland, Emtage *et al.* (2001) used a workshop with locally based farm forestry research and extension personnel to develop a series of support programs that were targeted to various landholder types; the objectives being to develop the 'ownership' of the research by the extension personnel as well as to make use of their expert knowledge (Table 8). Central to the capacity to recommend strategies to motivate change in landholders is an understanding of landholders' land management motivations or values. As noted by Landais (1998, p. 520),

Table 8. Recommended programs to support various types of landholders in developing farm forestry in North Queensland.

| Landholder type | Recommended farm forestry support measures |
|---|--|
| High intensity | Provide information about multiple purpose plantings. Provide tax breaks/incentives and rate reductions. |
| Retired professionals and hobby farmers | Continued CRRP ^a program, develop networks. |
| Progressive second generation | Provide advice about planting. Provide tax breaks/incentives and rate reductions. Develop networks. |
| Traditional | Develop options for short-rotation plantations and annuity schemes through joint-ventures |
| Experienced/comfortable | Develop options for short-rotation plantations and annuity schemes through joint-ventures |

Source: Emtage *et al.* (2001).
^a The Community Rainforest Reafforestation Program (CRRP) operated over 1992-1998, and involved financial subsidies and information services to assist landholders to establish trees on private land in Far North Queensland.

(a) associating the local actors in typology construction and using their knowledge plays a significant role in their receptiveness to the method based on local expert knowledge, and thus in their readiness to eventually appropriate the typological models produced.

Fulton and Race (2001) recommended using defined groups of landholders to assist the development of strategies to increase participation in farm forestry activities. They sought to assist government and industry to identify which types of landholders are most likely to adopt farm forestry. The advantage of this approach, they argued, is that it can make the extension programs more efficient by targeting specific types of landholders (Fulton and Race 2001). Fulton and Race (2001) developed a guide typology of landholders that matches types with various sectors in the timber industry, alternative plantation designs and various potential marketing arrangements. The typology is intended as a guide only, and Fulton and Race (2001) stated that regional studies are required to identify local variations. The landholders they refer to include all those who could potentially be involved in the development of timber plantations on private and public land including urban investors and municipal governments.

Grouping landholders by farm enterprise structures

Kaine and Lee (1994) sought to improve understanding of how differences between farm business enterprises affected landholders' ability to adopt innovations in the cattle raising industry. In subsequent work, Kaine and others (Kaine and Niall 1999; Kaine and Beswell 2002; Linehan and Kaine 2003) have explicitly discussed the insights that consumer behaviour theory has for developing effective means to promote sustainable rural land management practices. Kaine and Beswell (2002, p. 174) argue that

...producers derive purchase criteria for assessing innovations based on relevant elements of the existing mix

of agricultural practices, techniques, and resources available to them. These elements define the farm context for the innovation - usage context in consumer theory parlance.

The theories underlying their work include the concepts of an agricultural knowledge and information system (AKIS) and that of farming contexts. The concept of 'farming contexts' is drawn from the work of Crouch (1981). It is taken to mean the 'resources, practices and technologies currently used by a farmer in production and the key attributes of the farmer such as his or her business and farming aspirations and objectives' (Kaine and Lee 1994, p. 2). Thus, if an innovation in farming

practices will only lead to an increase in production when used in conjunction with other specific practices, then the innovation will be more valuable to those already using those other practices than those who are not. Therefore, Kaine and Lee (1994) hypothesised that the range of farming 'contexts' suitable for innovations will become more restricted as the innovations become progressively more advanced, that is, that the adoption of innovations becomes an increasingly ordered and structured process.

Kaine and Beswell (2002) have argued that extension circles fail to understand the context in which management practices occur and the relationship between these contexts and the attributes of the innovation; a line of reasoning supported by Vanclay and Lawrence (1995), Cary *et al.* (2002) and Rogers (2003). In other words, Kaine and Beswell (2002) argue that an important reason that innovations are not adopted is because they are not appropriate or advantageous for many farmers. The typologies of farmers developed by Kaine *et al.* (2002) differ from the other typologies reviewed for this article in that those of Kaine *et al.* are enterprise and innovation specific. By concentrating on a specific enterprise (e.g. fruit growing) and a particular innovation (e.g. the use of micro irrigation schemes), these authors have been able to address the problems associated with the assumptions that innovations are universally applicable and therefore those who fail to adopt them are 'laggards'. The process followed by the studies of Kaine *et al.* (2002) involves first interviewing a small number of producers to determine the situations in which the adoption of a practice is beneficial. Next, a questionnaire is developed to survey a broad range of producers carrying out a certain enterprise. The questionnaire is used to categorise the producers, using cluster analysis, according to whether they are in situations where the adoption of a particular innovation is beneficial to some extent, on what proportion of the various categories have actually

Table 9. Group names and proportions of the Australian landholder population.

| Group | Segment name | Benchmark % (1998) | Track 1 % (2000) | Track 2 % (2002) |
|-------|---------------------------|-----------------------|---------------------|---------------------|
| 1 | Committed/ doing it tough | 26 | 17 | 25 |
| 2 | Preparing to leave | 21 | 27 | 15 |
| 3 | Questioning involvement | 18 | 21 | 20 |
| 4 | Confident/ established | 13 | 16 | 16 |
| 5 | Business person | 19 | 19 | 24 |

Source: Solutions (2003).

adopted the innovation, and to develop understanding of the pathways of development that may improve the sustainability of the enterprise.

Landholder typology based on enterprise orientation and commitment

Solutions (2003) reported a six-year evaluation project they conducted in collaboration with the Commonwealth Department of Agriculture, Fisheries and Forestry. The project was designed to identify performance indicators that could be used to track the impact of an Australian Government agricultural industries development program, the *Agriculture – Advancing Australia* (AAA) package. Three sets of questionnaires were administered by telephone to a representative sample of over 2500 Australian landholders, at two-year intervals commencing in 1998. Cluster analysis was used to group landholders based on their responses to attitudinal statements. These statements reflected on the landholders’ commitment to the industry, willingness to seek new information and new approaches to management, planning practices, and current family debt and reliance on off-farm income (Solutions 2003). The types of farmers they described included:

- farmers with a ‘business’ attitude to farming
- farmers who are confident and established in their industry
- those committed to the industry but ‘doing it tough’
- those who are questioning their long-term involvement in farming
- farmers preparing to leave.

Changes in the relative proportion of landholders in each of the types over the four years were used to indicate changes in the profile of Australian rural landholders (Table 9). The relative proportion of ‘business’ type landholders increased over the six years, while the number ‘preparing to leave’ declined, and the proportion of ‘committed but doing it tough’ landholders fell and climbed over the time of the study.

These groups differed in terms of a number of socio-economic characteristics, including the worth of their net assets, their reliance on off-farm income, hours spent working off the farm and farm size (Table 10). They also differed in terms of their use of various programs associated with the AAA program, including FarmBiz and the Farm Management Deposit Scheme. It is difficult to review fully the publication as only graphic illustration of the values measuring the socio-economic characteristics of the groups is provided, with no details about the statistical testing method. The Solutions AAA survey was expanded in 2002 to better assess landholders’ NRM attitudes and behaviour. There may be opportunities for the researchers to incorporate some of the measures of landholders’ NRM attitudes as part of the criteria used to classify the typology and thereby gain further insight into the landholders’ NRM behaviour. The Solutions (2003) study did include an analysis of the socio-economic, attitudinal and demographic differences between two groups of landholders, differentiated according to whether they had or had not adopted an innovation in the previous two years. While such an analysis is interesting, with only two categories, the range of inter-relationships between landholders’ socio-economic characteristics and their NRM behaviour is not adequately captured. The report concluded that ‘(t)hese profiles have demonstrated the value of segmenting industry participants to better understand their needs and capacities, as a basis for targeting and refining policy design and delivery’ (Solutions 2003, p. 6).

Comparing landholder typologies

Researchers from different institutions reporting the studies reviewed in this article, looking at different aspects of land management, and using different theoretical bases, developed their typologies separately (i.e. they were initially unaware of each others research). Despite the perceived limitations with innovation adoption theories, examination of the findings of these studies shows remarkable consistency across regions and the application of differing methods. The typologies described by Barr (1996), Howden *et al.* (1998), Specht and Emtage (1998), and Emtage *et al.* (2001) all include a traditional or conservative type, a smallholder or hobby farmer type, a progressive type, a resource-limited type and a comfortable type, as presented in Table 11. The socio-economic characteristics of these typologies appear to be similar to the ideal types described by innovation adoption theorists. This suggests that landholder types

Table 10. Selected characteristics of the Australian landholder types defined according to their attitudes to farm management.

| Type name | Total Net Assets | Percentage lacking off-farm income | Farm size | Use of AAA government programs |
|---------------------------|----------------------------|------------------------------------|-----------|--------------------------------|
| Committed/ doing it tough | Approx. 50% assets <M\$1 | 32 | Average | High |
| Preparing to leave | More than 50% assets <M\$1 | 67 | Smallest | Moderate to low |
| Questioning involvement | Approx. 50% assets <M\$1.5 | 55 | Average | Moderate to low |
| Confident/ established | Approx. 50% assets <M\$2 | 44 | Average | Low |
| Business person | 30% assets >M\$2 | 43 | Largest | High |

Source: Solutions (2003).

identified by the aforementioned studies and the theories of innovation adoption have a similar basis in that they are all picking up similar patterns of similarities and differences between landholders.

There are several socio-economic factors that have been consistently reported to differentiate between the landholder types in these studies. These factors include the economic characteristics of the landholding, such as size and productivity and the degree of dependence of the landholder on the property for income; social characteristics, such as the history of family ownership of a landholding and the family size, structure and time in life-cycle; and personal characteristics, such as the level of formal education. Landholders' attitudes to land management issues, such as the legitimate role of governments and the relative importance of biodiversity conservation, are also similar between the similar landholder types described by different authors.

The similarities of the landholder types described in the studies raises the question of whether these 'ideal types'

are representative of fundamental social units in the rural community. Are they best conceived of as self-perpetuating 'cultures' or 'subcultures' with shared belief systems, characteristic behaviour patterns and identifiable icons, or alternatively, are they representative of 'social classes'?

While there are some differences in the average age of members of the various types in some studies, the similarities in land management attitudes and practices across age groups reinforces theories holding that landholders learn their practices from their families and those in their social group, with their core values changing only slowly over time.

This review highlights that, while it is recognised that there is a great deal of variation in the 'small farm' sector, there is a lack of understanding of this sector which includes the 'lifestylers', 'retreatists', hobby farmers and retiree groups described above. The research reported by Ford (1999), Colman *et al.* (2002), Barr (2003), Fisher (2003), Hollier *et al.* (2003, 2004), Hodges *et al.* (2004), and Barr *et al.* (2005) does provide some insight into the patterns of socio-economic variation within this sector. The research of Fisher (2003) appears closest to providing a set of profiles of these landholders, yet a comprehensive typology of these landholders is yet to be developed.

There are many other questions surrounding the issue of how best to combine studies of the socio-economic characteristics of Australian landholders to assist NRM policy and program development, implementation and monitoring. These issues are taken up in a forthcoming article (Emtage *et al.* in review).

Table 11. Names of groups from previous studies of farming styles, innovation adoption and market segments.

| Group: Barr (1996) | Style: Howden <i>et al.</i> (1998) | Group name: Emtage <i>et al.</i> (2001) | Group name: Solutions (2001) | Innovation adoption categories |
|-----------------------|---|--|---|--------------------------------|
| The committed | Progressives/ innovators | Progressive second generation | Business oriented | Early adopters |
| The pasture dabblers | Lifestylers | Retired professionals, hobby farmers, absentee farmers | | Early majority |
| The crop focussed | Diesel burners | High intensity | Committed/ doing it tough | |
| The belt tighteners | Resource limited – structural; middle of the road | Marginal | Committed/ doing it tough; questioning involvement? Preparing to leave? | Late majority |
| The comfortable group | Middle of the road | Experienced/ comfortable | Confident/ established | |
| The sceptics | Traditional | Traditional | Confident/ established | Late or non-adopters |
| The retreatists | Lifestyler | Retired professionals, hobby farmers, absentee farmers | | Varied |

Conclusions

It is clear that many Australian researchers interested in NRM and rural development recognise a role for landholder typologies to assist in the design, delivery and monitoring of publicly funded policies and programs. As outlined in this article, various criteria for classifying and procedures can be used to construct landholder typologies. These methods vary according to the theoretical approach

used by the researcher and the purpose of the research. The definition of landholder types can be imposed according to one or more identifiable characteristics, including characteristics of the landholding, psychographic or attitudinal data collected using surveys, or by combining elements of both.

The main function of these typologies is to improve the understanding and description of the diversity of landholders' values, attitudes, behaviour and socioeconomic circumstances in rural communities. One of the most useful outcomes of applying segmentation techniques is the insight that they provide into the way that personal, social and economic characteristics combine to produce distinct land management objectives and strategies. The application of typologies offers the opportunity to improve the efficiency of extension programs through greater understanding of the circumstances in which landholders are operating, and the potential to thus tailor the program's communications about them to specific needs and learning styles of various landholder types. For private industries seeking partnerships with specific types of landholders, typologies can assist in both identifying the landholders most likely to be compatible with the requirements of the industry and ways to design the programs to stimulate these landholders' interest in collaboration. In the public sphere, the application of typologies offers the chance to improve the equity of NRM programs by explicitly describing variation in the landholder population and designing engagement and capacity building strategies to suit.

It can be argued that typologies are artificial in that identification of specific examples of various types can be difficult, as reported by Howden *et al.* (1998). In response it can be argued that the similarities in the landholder typologies, which were developed independently of each other using a variety of methods and approaches, suggests that they reflect fundamental variations between landholders throughout rural Australia. Given the desirability of having a comprehensive set of information with which to define and describe landholder types, a major challenge is to find a system or methodology that can be replicated between regions at a reasonable cost. Possible means of achieving this goal are discussed briefly below and by Emtage *et al.* (in review.).

This review of landholder types identified in Australia raises a number of issues. First, a number of issues surround the choice of the theoretical position to guide the research. These theoretical issues have implications for the choice of methods used to create, analyse and

describe typologies of landholders and their landholdings. For example, there is considerable debate about the legitimacy and the relative utility of studies centred on analysis of the adoption of innovations as the basis for generating landholder typologies. Second, the consistency in the characteristics of the types described by various authors suggests the possibility of synthesising the results to create a broad typology of Australian landholders. Issues related to the theoretical underpinning of the research and the methods used to create and describe the typologies are discussed in a following article (Emtage *et al.* in review.).

Besides the consistency in the socio-economic characteristics of the landholder types reviewed in this article, another issue is that a landholder typology that is derived from a comprehensive data set has the potential to assist regional development strategies and farming systems analyses. The National Land and Water Audit is currently examining possible integrating frameworks to guide the collection and reporting of socio-economic data to support NRM programs (Cody 2004; Webb *et al.* 2004; Nelson *et al.* 2005). While their study was not related to NRM practices specifically, Kaine and Lee (1994) recognised the potential utility of their approach for other rural development issues. The relationship between the various landholder typologies was discussed by Landais (1998), who argued that it is possible to develop a 'master' typology of rural landholders based on an analysis of a comprehensive range of social, economic and biophysical information. Landais (1998) argues that this 'master typology' can then be adapted for a range of applications by a range of people involved in NRM for NRM purposes, and by people involved in social services and economic development programs for their purposes. A conceptual diagram outlining this idea is presented in Figure 1. The concept is based on a series of multi-dimensional landholder profiles. These could act as functional management units, providing a framework for the integration of indicators of capacity to inform management and policy decisions at multiple scales. Given that typologies and the surveys on which they are based provide only a snapshot of landholders' socio-economic circumstances and values, the work needs to be undertaken at regular intervals in time to provide understanding of the process of change and restructuring in rural areas. The potential to do this in Australia is discussed in Emtage *et al.* (in review.).

The limitations of typologies should be recognised and landholder types should not be expected to represent every variation of landholders in a community. Typologies can potentially assist in the design of

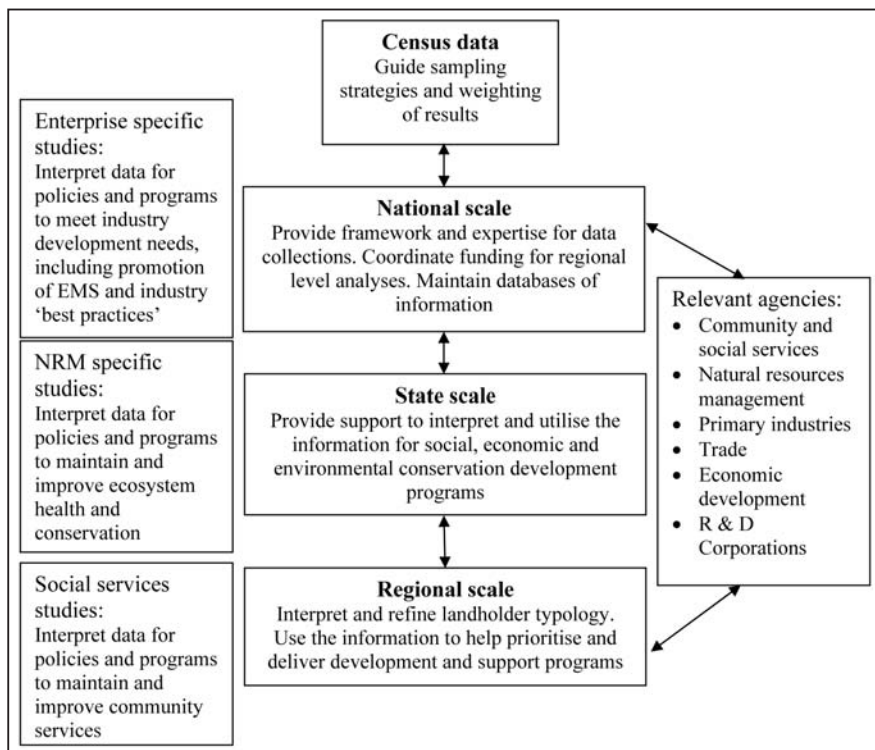


Figure 1. Conceptual framework for a nested system of landholder typologies.

extension programs at regional and possibly at national levels where their application offers distinct advantages over the use of univariate averages to describe the characteristics of rural landholders and their holdings. While typologies can assist industries based on rural enterprises to target specific landholders and can assist the development of suites of programs to address common issues, they cannot replace the need for those offering advice to landholders to develop an understanding of the landholders' individual circumstances. In other words, the landholder typologies provide a broad indication of the variations in the characteristics of landholders that is suitable for NRM policy and program formation, however, the final decision about which program is best suited to a particular landholder is likely to be complex and unique. It can only be hoped that the use of typologies will lead to the development of suites of public and private extension programs that are tailored to the variety of objectives and values as well as the variety of socio-economic circumstances of landholders. Once suites of programs are available, or variation in programs is enabled to account for variations in needs and circumstances, it will then be up to the landholders and their advisors to select appropriate NRM programs for their own needs.

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References

- Agriculture and Agri-Food Canada (AAFC). 2002. *Characteristics of Canada's Diverse Farm Sector*. Publication number 2109/B. AAFC, Ottawa, Ontario.
- Argent, N. 2002. From pillar to post? In search of the post-productivist countryside in Australia. *Australian Geographer*, 33(1): 97-114.
- Aslin, H.J. and Brown, V.A. 2004. *Towards Whole of Community Engagement: A Practical Toolkit*. Murray-Darling Basin Commission, Canberra.
- Aslin, H., Kelson, S., Smith, J. and Lesslie, R. 2004. *Peri-urban Landholders and Bio-security Issues – A Scoping Study*. Bureau of Rural Sciences, Canberra.
- Assael, H. 1998. *Consumer Behaviour and Marketing Action*. South West, Cincinnati, Ohio.
- Balbarino, E.A. 2001. *Participatory Rural Appraisal in Land-use Planning for Forestry*. Paper presented to the ACIAR/ViSCA Smallholder Forestry Planning Workshop, FARM Institute, Visayas State College of Agriculture (now Leyte State University), Baybay, Leyte, The Philippines, July 2001. Department of Forestry, Leyte State University, Leyte, The Philippines.
- Barr, N. 1996. Conventional and low-input pasture improvement – a review of recent market research. *New Zealand Journal of Agricultural Research*, 39: 559-567.
- Barr, N. 2003. Future agricultural landscapes. *Australian Planner*, 40(2): 123-127.
- Barr, N., Karunaratne, K. and Wilkinson, R. 2005. *Australia's Farmers: Past, Present and Future*. Land and Water Australia, Canberra.
- Belsky, J.M. 1984. *Stratification among Hillside Farmers and some Implications for Agroforestry Programs: A Case Study in Leyte, The Philippines*. Master of Science thesis, the Faculty of the Graduate School, Cornell University, New York.
- Bohnet, I. 2004a. *Agricultural Landscapes in the Wet Tropics – Future Visions Balancing Environmental, Social and Economic Needs*. Summary report prepared for the participants of the qualitative interviews. CSIRO Sustainable Ecosystems, Atherton, Queensland.
- Boon, T.E., Meilby, H. and Thorsen, B.J. 2004. Forest owner typology to improve policy-practice communication.

Scandinavian Journal of Forest Research, 19, Supplement 4: 45-55.

Bourgeois, R. 1999. *The Impact of the Crisis on Javanese Irrigated Rice Farmers*. Australian Centre for International Agricultural Research, Canberra.

Burnley, I. and Murphy, P. 2004. *Seachange: Movement from Metropolitan to Arcadian Australia*. University of New South Wales Press, Sydney.

Busck, A.G. 2002. Farmers' landscape decisions: Relationships between farmers' values and landscape practices. *Sociologia Ruralis*, 42(3): 233-249.

Byron, N. and Boutland, A. 1987. Rethinking private forestry in Australia. *Australian Forestry*, 50(4): 236-252.

Caldwell, J.S., Berthé, A., Doumbia, M., Kanno, H., Ozawa, K., Yorote, A., Sasaki, K. and Sakurai, T. 2002. *Incorporation of Farmer-Based Climate and Risk Indicators into Research Design and Farmer Typologies in Southern Mali for Decision Support*. Japan International Research Center for Agricultural Sciences (JIRCAS), Tsukuba, Ibaragi, Japan. Online at <http://conference.ifas.ufl.edu/ifsa/papers/c/a3.doc> (accessed 1 April 2004).

Cary, J.W., Webb, T. and Barr, N.F. 2001. *The Adoption of Sustainable Practices: Some New Insights and Analysis of Drivers and Constraints for the Adoption of Sustainable Practices Derived from Research*. Land & Water Australia, Canberra.

Cary, J.W., Webb, T.J. and Barr, N.F. 2002. *Understanding Landholders' Capacity to Change to Sustainable Practices: Insights about Practice Adoption and Social Capacity for Change*. Bureau of Rural Sciences, Canberra.

Chamala, S. 1987. Strategies to overcome communication deficiencies in achieving sustainable farming systems. *The Journal of the Australian Institute for Agricultural Science*, 53(3): 164-169.

Chamala, S., van den Ban, A.W. and Roling, N. 1980. A new look at adopter categories and an alternative proposal for target grouping of farming community. *Indian Journal of Extension Education*, 16(1&2): 1-18.

Cody, K. 2004. *National Land and Water Audit Socio-economic Workplan*. National Land and Water Audit, Canberra.

Colman, D., Coster, M. and Avery A. (eds). 2002. *Future Family Farms*. Proceedings/notes of a national workshop held at Daylesford, Victoria, July 2002. Department of Natural Resources and Environment, Melbourne.

Commonwealth of Australia. 1990. Ecologically sustainable development, A Commonwealth Discussion Paper. Australian Government Publishing Service, Canberra.

Conkin, H.C. 1957. *A Report on the Integral System of Shifting Cultivation in the Philippines*. Food and Agriculture Organization of the United Nations, Rome.

Cruse, L. and Mayberry, D. 2002. Personality and landholders' management of remnant bush and revegetation in the Murray Catchment. *Australian Journal of Environmental Management*, 11(1): 21-33.

Crouch, B. 1981. Innovation and farm development: A multidimensional model. In: Crouch, B. and Chamala, S. (eds) *Extension Education and Rural Development. Volume 1: International Experience in Communication and Innovation*, pp. 119 – 134. John Wiley and Sons, Brisbane.

Dillon, W.R., Madden, T.J. and Firtle, N.H. 1990. *Marketing Research in a Marketing Environment*. Irwin, Boston, Massachusetts.

Dorward, A. 2002. *A Typology of Malawian Rural Households*. Imperial College, Wye, UK. Online at <http://www.wye.ic.ac.uk/AgEcon/ADU/research/projects/ppag/malclust.doc> (accessed 2 April 2004).

Dwyer, J.F. and Childs, G.M. 2004. Movement of people across the landscape: A blurring of distinctions between areas, interests, and issues affecting natural resource management. *Landscape and Urban Planning*, 69(2004): 153-164.

Emtage, N. 1995. *Landholders' Perceptions of Planting and Managing Trees*. B.App.Sci. Hons. Thesis, the Faculty of Resource Science and Management, Southern Cross University, Lismore, New South Wales.

Emtage, N.F. 2004a. Typologies of landholders in Leyte, The Philippines, and the implications for development of policies for small-holder and community forestry. In: Baumgartner, D.M. (ed.) *Proceedings of Human Dimensions of Family, Farm, and Community Forestry*, international symposium, 29 March - 1 April 2004, pp. 81-88. Washington State University, Pullman, Washington.

Emtage, N. 2004b. *An Investigation of the Social and Economic Factors Affecting the Development of Small-scale Forestry by Rural Households in Leyte, The Philippines*. Doctoral thesis, the School of Natural and Rural Systems Management, The University of Queensland, Gatton, Queensland.

Emtage, N., Herbohn, J. and Harrison, S. 2001. Landholders' attitudes to and participation in farm forestry activities in subtropical and tropical eastern Australia. Chapter 15. In: Harrison, S.R. and Herbohn, J.L. (eds) *Sustainable Farm Forestry in the Tropics*, pp. 195-210. Edward Elgar, Cheltenham, United Kingdom.

Emtage, N., Herbohn, J. and Harrison, S. In review. Landholder profiling and typologies for natural resource management policy and program support: Potential and constraints.

Emtage, N.F. and Specht, A. 1996. Revegetation programs: A case for niche marketing. Paper presented to the conference *Conference Outside the Reserve System*. Centre for Conservation Biology, University of Queensland, Brisbane.

Emtage, N.F. and Specht, A. 1998a. Landholders' perceptions of farm forestry in the northern rivers region of New South Wales. In: Dyason, R., Dyason, L. and Garsden, R. (eds) *Plantations and Regrowth Forestry: A Diversity of Opportunities*, Proceedings of the Biennial Conference of the Australian Forest Growers, pp. 345-369. Southern Cross University, Lismore, New South Wales.

Emtage, N.F. and Specht, A. 1998b. *Landholders' Perceptions of Farm Forestry in the Northern Rivers Region of New South*

- Wales: Overview Report*. Report to the Northern Rivers Regional Plantation Committee, Ballina, New South Wales.
- Fisher, T. 2003. Differentiation of growth processes in the peri-urban region: An Australian case study. *Urban Studies*, 40(3): 551-565.
- Ford, T. 1999. Understanding population growth in the peri-urban region. *International Journal of Population Geography*, 5: 297-311.
- Fulton, A. and Race, D. 2001. Farm forestry in Australia: Why do landholders get involved? In: Herbohn, J.L., Harrison, S., Herbohn, K. and Smorfitt, D. (eds) *Developing Policies to Encourage Small-Scale Forestry*, Proceedings of the Kuranda IUFRO group 3.08 Small-scale Forestry conference. School of Natural and Rural Systems Management, The University of Queensland, Brisbane.
- Guerin, T.F. 1999. An Australian perspective on the constraints to the transfer and adoption of innovations in land management. *Environmental Conservation*, 26(4): 289-304.
- Herbohn, J.L., Emtage, N.F., Harrison, S.R. and Smorfitt, D.B. 2005. Attitudes of landholders to farm forestry in tropical eastern Australia. *Australian Forestry*, 68(1): 50-58.
- Hollier, C., Francis, J. and Reid, M. 2003. Shrinking extension to fit a growing small farm sector. APEN 2003 National Forum 26-28 November 2003, Hobart. Online at <http://www.regional.org.au/au/apen/2003/2/096hollierc.htm> (accessed 25 November 2005).
- Hollier, C., Reid, M. and Francis, J. 2004. *Understanding Drivers of Land Use Change Associated with Life Style Farms*. Department of Sustainability and Environment, Melbourne.
- Hodges, A., Shafron, W. and Mues, C. 2004. *Small Farms and Other Industries Survey*. ABARE Briefing Report to the Natural Resource Management Business Unit, Canberra.
- Howden, P. and Vanclay, F. 2000. The mythologisation of farming styles in Australian broadacre cropping. *Rural Sociology*, 65(2): 295-310.
- Howden, P., Vanclay, F. Lemerie, D. and Kent, J. 1998. Working with the grain: Farming styles amongst Australian broadacre croppers. *Rural Society*, 8(2): 109-127.
- Jary D., and Jary, J. 1995. *A Dictionary of Sociology*. Harper Collins, Glasgow.
- Jocano, F.L. 1998. *Filipino Indigenous Ethniccommunities: Patterns, Variations and Typologies*. Punlad Pubs., Manila.
- Johnson, J. 2002. A typology for U.S. farms from national survey data. Paper presented to the *Workshop on the Farm Household - Firm Unit: Its Importance in Agriculture and Implications for Statistics*, held 12-13 April, 2002, Wye College, London. Pennsylvania State University, Pennsylvania.
- Kaine, G. and Beswell, D. 2002. Are marketing research and extension complementary? A paper presented to the Association for International Agriculture and Extension Education (AIAEE) *Approaches and Partnerships for Sustainable Extension and Rural Development*, 26-30 May, 2002, Durban, South Africa. Online at <http://www.aiaee.org> (accessed 26 July 2005).
- Kaine, G. and Lee, J.W. 1994. *Patterns in Innovation: An Analysis of the Adoption of Practices in the Cattle Breeding Industry*. The Rural Development Centre, University of New England, Armidale, New South Wales.
- Kaine, G. and Niall, E. 1999. *Market Segmentation for Wet Soil Management*. Report to the Department of Natural Resources and Environment, Melbourne. School of Marketing and Management, University of New England, Armidale, New South Wales.
- Kilpatrick, S., Johns, S., Murray-Prior, R. and Hart, D. 1999. *Managing Farming: How Farmers Learn*. Publication No. 99/74. Rural Industries Research and Development Corporation, Canberra.
- Kobrich, C. Rehman, T. and Khan, M. 2003. Typification of farming systems for constructing representative farm models: Two illustrations of the application of multi-variate analyses in Chile and Pakistan. *Agricultural Systems*, 76: 141-157.
- Kostrowicki, J. 1977. Agricultural typology concept and method. *Agricultural Systems*, 2: 33-45.
- Landais, E. 1998. Modelling farm diversity: New approaches to typology building in France. *Agricultural Systems*, 58(4): 505-527.
- Linehan, C.J. and Kaine, G. 2003. The key to reducing the gap between research and application. Paper presented to the National Landcare Conference, 28 April – 1 May 2003, Darwin. Online at <http://www.landcareconference.nt.gov.au> (accessed 25 July 2005).
- Nelson, R., Webb, T. and Byron, I. 2005. *Integrating Conceptual Frameworks to Coordinate Information for Natural Resource Management Decision Makers*. NLWRA socio-economic workplan project B0. Report to the National Land and Water Resources Audit (NLWRA), Canberra.
- Newton, P.W. and Bell, M. (eds) 1996. *Population Shift: Mobility and Change in Australia*. Australian Government Printing Service, Canberra.
- Ooi, J.B. 1987. *Depletion of Forestry Resources in The Philippines*. Institute of Southeast Asian Studies, University of Singapore, Singapore.
- Race, D. 1999. Regional farm forestry industries: Potential dimensions and possible outcomes. *Australian Forestry*, 62(2): 182-192.
- Raintree, J.B. 1987. The state of the art of agroforestry diagnosis and design. *Agroforestry Systems*, 5: 219-250.
- Raintree, J.B. 1991. *Socioeconomic Attributes of Trees and Tree Planting Practices*. Food and Agriculture Organisation of the United Nations, Rome.
- Rogers, E.M. 1988. *Social Change in Rural Societies: An Introduction to Rural Sociology*. Prentice-Hall, New Jersey.
- Rogers, E.M. 2003. *Diffusion of Innovations*. The Free Press, New York.
- Scott, J. 1991. *Social Network Analysis: A Handbook*. Sage, London.

Solutions 2003. *AAA/AFFA Program Evaluation Rural Producer Survey: Final Report*. Solutions Marketing and Research Pty Ltd, Sydney.

Specht, A. and Emtage, N.F. 1998. *Landholders' Perceptions of Farm Forestry in the Northern Rivers Region of New South Wales*. Report to the Northern Rivers Regional Plantation Committee, Ballina, New South Wales.

Spence, W.R. 1994. *Innovation: The Communication of Change in Ideas, Practices and Products*. Chapman and Hall, Melbourne.

Taylor, B., Lockie, S., Dale, A., Bischof, R., Lawrence, G., Fenton, M. and Coakes, S. 2000. *Capacity of Farmers and other Land Managers to Implement Change*. Technical report, Theme 6 – Fitzroy Implementation Project. National Land and Water Resources Audit, Canberra.

van den Ban, A.W. and Hawkins, H.S. 1996. *Agricultural Extension*. Blackwell Science, London.

van der Ploeg, J.D. 1993. Rural sociology and the new agrarian question: A perspective from the Netherlands. *Sociologia Ruralis*, 33(2): 240-260.

Vanclay F. 1995. Actors and structures in Agriculture: Reflections of an Australian in Wageningen. In: Vanclay, F. (ed.) *With a Rural Focus: TASA '94 Conference proceedings*, pp. 89-128. Centre for Rural Social Research, Charles Stuart University, Wagga Wagga, New South Wales.

Vanclay, F.M. and Lawrence, G. 1995. *The Environmental Imperative: Eco-social Concerns for Australian Agriculture*. Central Queensland University Press, Rockhampton, Queensland.

Vanclay, F., Mesiti, L. and Howden, P. 1998. Styles of farming and farming sub-cultures: Appropriate concepts for Australian rural sociology? *Rural Society*, 8(2): 85-108.

Webb, T., Cody, K., Harrison, B., Sincock, A., and Mues, C. 2004. *Social and Economic Information for NRM: An Initial Discussion Paper*. National Land and Water Resources Audit, Canberra.

Whatmore, S. 1994. Farm household strategies and styles of farming: Assessing the utility of farm typologies. In: Van De Ploeg, J.D. and Long, A. (eds) *Born From Within: Practice and Perspectives of Endogenous Rural Development*, pp. 31-37. Van Gorcum, Assen, Netherlands.