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Title

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Abstract

Voluntary incentive programs are widely used to generate conservation actions on private land. Although there is a growing body of research about factors that influence landholder participation in incentive programs, studies generally conceptualise landholders in agricultural landscapes as owner-occupier, farming individuals or families. Few studies have considered participation by absentee landholders and fewer still have recognised group landholders (e.g. non-government organisations or community groups) as potential incentive program participants. We examined participation in a conservation stewardship tender (reverse auction) in South Australia to identify the diversity within participants, and particularly to evaluate the extent of participation by absentee landholders and groups. A diverse set of landholders participated, where nearly a quarter of participants were absentee landholders, and a small component were groups. Although small in number, groups were shown to be important because they were likely to offer larger land areas in the stewardship tender. With very little known about how absentee and group landholders may differ from their counterparts, further research is recommended to inform incentive program design. We recommend that incentive programs consider landholder diversity in order to achieve effective conservation in agricultural landscapes.

Keywords: stewardship; covenant; auction; native vegetation; Bayesian Model Averaging

1. Introduction

At the global scale, publicly governed protected areas are not sufficient to meet environmental targets on their own (UNEP-WCMC and IUCN, 2016), leaving a significant contribution required from private landholders (Figgis, 2004; Knight, 1999; Norton, 2000). Consequently, private landholders have an important role to play in biodiversity conservation and the sustainable provision of other ecosystem services. The public good quality of biodiversity conservation and the implementation and opportunity costs of changing management mean that there are often cost barriers to optimal production of conservation benefits on private land (Kinzig et al., 2011). Offering payments to private landholders for environmental services through voluntary incentive programs is one approach widely employed to generate conservation action on private land (Doremus, 2003; Kamal et al., 2015). However the drivers of participation can be complex and in many cases remain insufficiently known (Lastra-Bravo et al., 2015; Sorice and Donlan, 2015).

When participation in incentive programs is voluntary, the environmental outcomes of the program rely on appropriate levels of participation (Mettepenningen et al., 2013; Rolfe et al., 2017; Selinske et al., 2015; Zanella et al., 2014). Positive environmental outcomes are dependent on sufficient participation from landholders responsible for the assets of interest. However, high participation is not always desirable. In programs with a finite budget where participants compete for funds, interest in participation may extend far beyond the available budget, resulting in avoidable transaction costs and inefficiencies for the program and participants (Whitten et al., 2013). Knowledge of the target audience, and the factors that influence their participation, is therefore required to inform the design of effective incentive programs (Mettepenningen et al., 2013; Morrison et al., 2012; Rolfe et al., 2017; Whitten et al., 2013).

While the level of incentives offered is a key factor, there are many other factors that influence participation in incentive programs. These include characteristics of the potential participants themselves, their landholdings, their attitudes and behaviour and the social context (Lastra-Bravo et al., 2015; Morrison et al., 2012). Research in this area commonly examines factors such as participant age, education level and experience (e.g. Comerford, 2014; Pavlis et al., 2016) and dependence on the land or associated resources (e.g. Lindhjem and Mitani, 2012; Petrzelka et al., 2012). Social factors such as trust, connectedness and access to information (e.g. Moon, 2013; Morrison et al., 2012; Zanella et al., 2014) and attitudes and behaviour including personal satisfaction from participation, agreement with the incentive program goals, business orientation and information seeking behaviour (e.g. Comerford, 2014; Morrison et al., 2012; Pavlis et al., 2016; Reimer and Prokopy, 2014) are also frequently addressed. However, as Burton (2014) highlights, findings about the presence and direction of relationships between these factors and participation can be inconsistent or contradictory because the cause of the relationships often remain poorly understood. Another limitation of this area of research is that studies of environmental behaviour in agricultural landscapes almost always conceptualise landholders as owner-occupier farming individuals or families, in empirical studies and reviews (e.g. Burton, 2014; Defrancesco et al., 2008; Hill et al., 2011; Perkins et al., 2013) and in economic choice experiments (e.g. Boxall et al., 2017; Wichmann et al., 2016). Exceptions to this prevailing view are a small number of studies that have considered absentee landholders (e.g.Lindhjem and Mitani, 2012; Petrzelka and Armstrong, 2015; Petrzelka et al., 2013; Petrzelka et al., 2012; Ulrich-Schad et al., 2016).

In many places, rural land ownership is becoming increasingly diverse, with growing numbers of non-primary producer “amenity migrants” (Cooke and Lane, 2015; Gosnell and Abrams, 2011) and absentee landholders (Mendham and Curtis, 2010; Petrzelka et al., 2013). While the influence of land use on participation has been addressed by many studies, only a

small number of these have examined participation by absentee landholders. Studies of absentee landholder participation indicate that absentee landholders may be less concerned with financial incentives for land management change (Farmer et al., 2015), or accept lower incentives compared with resident owners (Lindhjem and Mitani, 2012), and that access to information can be a key barrier to participation (Petrzelka et al., 2012; Ulrich-Schad et al., 2016). Another contribution to the diversity of participants in conservation on private land is made by group landholders such as community groups, not-for-profit conservation organisations, and corporations (Fitzsimons, 2015; Gosnell and Travis, 2005; Selinske et al., 2015). To our knowledge, information about group landholders as participants in conservation incentive programs has not been directly examined in the literature.

This study aims to investigate the diversity in incentive program participants, and in particular, to identify the role of absentee landholders and groups. We took a novel approach to the characterisation of participants in a conservation stewardship program in South Australia where incentives were allocated by tender (a reverse, single-sealed-bid auction). We examined a range of participant characteristics including their involvement in primary production, whether they are resident or absentee and whether they participated as an individual/family or group. Statistical models were used to test the relationships between these factors and the size of the area offered in the tender. Results are discussed in the context of incentive program design to promote conservation on private land.

2. Materials and methods

To investigate the question of which landholders participate in conservation incentive programs we used the BushBids conservation stewardship program as a case study. This program had 163 unique participants and spanned a large geographic area (more than 30,000 km^2) in the agricultural regions to the east of Adelaide, South Australia. Average annual rainfall in the program area ranged from approximately 880 mm in the wettest part of the Mt Lofty Ranges to approximately 210 mm in the arid plains to the north of the River Murray (BOM, 2014). Agricultural activities in the program area included broad-acre cropping (cereals, pulses, oilseed), hay and silage production, horticulture, viticulture, livestock grazing, and intensive livestock production (ABS, 2016). The program area's native vegetation was diverse, primarily including eucalypt dominated forests, woodlands, and mallee, as well as grasslands, wetlands, and chenopod shrublands (DEWNR, 2011).

2.1. BushBids conservation stewardship program

The work presented here is based on the BushBids program (Australian Government, 2006). The aim of this program was to support private landholders to maintain or restore the ecological function of remnant native vegetation on their property. Briefly, private landholders were invited to tender (bid) for 5 or 10 year contracts to manage and restore native vegetation. Over the period from 2006 to 2013, there were five BushBids projects with a total of eight tender rounds (Table 1). The projects were advertised through a variety of channels: local newspapers and newsletters; local radio and television; agricultural field days; and government and non-government organisation natural resources management networks. Participation was voluntary and landholders were not obliged to bid in the tender, or accept the contract if their bid was successful. After the landholder made an expression of interest, an on-site assessment of the location, size and condition of the native vegetation on their

property was made by BushBids, and a native vegetation management plan was prepared for the landholder (O'Connor et al., 2014). Management plans mapped the area of native vegetation offered in the project and outlined management actions designed to maintain or improve the condition or ecological function of the native vegetation. Management of grazing pressure from stock and retaining fallen timber were mandatory, and always included in the management plan, while weed control and feral animal control were usually included and revegetation was occasionally included.

At a broad level, management plans were consistent throughout all five BushBids projects, however, the extent to which management actions differed from existing practices depended on participant circumstances. Management of stock grazing pressure under a BushBids management plan required complete stock exclusion from the site in most cases, but a conservative stock grazing regime was allowed in grassy ecosystems where it was used as a management tool to maintain or restore ecological function. For some participants this represented a change in management with associated forgone resources, while for participants who had already excluded stock or were already using conservative grazing practices in grassy ecosystems, there was no or minimal change required. Weed species and feral animal species targeted for control also differed between project locations and to a lesser extent, within project locations according to variation in climate and other environmental conditions. The management actions were intended to maintain or restore ecological function in remnant vegetation in order to address past and continuing declines identified by Duncan and Dorrough (2009) and Perring et al. (2015) for example. However, the ecological outcomes of these restoration actions have not yet been documented in research literature.

2.2. BushBids project locations

The five BushBids projects were located in the Mt Lofty Ranges, Murray-Darling Basin and South East regions of South Australia, where much of the original native vegetation has been cleared to provide land for agriculture (Fig. 1). Native vegetation cover in the project locations ranged from 8 % in the Eastern Mt Lofty Ranges (EMLR) project to 61 % in the Woodland (WLND) and River Bend (RBND) projects (Table 2). In addition to having the smallest proportion of remaining native vegetation, the EMLR project location had one of the smallest proportions of native vegetation protected in public protected areas (4 %) and the highest proportion of residential land (21 %). The WLND project location had the next largest proportion of residential land (7 %) and although it had a large proportion of remnant vegetation, only 7 % was protected by covenants (similar to conservation easements) on private land and only 3 % was in public protected areas. The RBND location, also with a large proportion of remnant native vegetation, had similar levels of protected vegetation to the WLND location, but a smaller proportion of residential land (3 %) and a larger proportion of land used for primary production (87 %). The Southern Mallee (SMLE) project location had the largest proportion of land used for primary production (96 %) and small proportions of remnant native vegetation (9 %) and residential land (1 %). Like the SMLE location, the South Eastern (SEAST) project location had a very small proportion of residential land, however this location had a moderate proportion of remnant native vegetation (22 %), much of which was protected by covenants (16 %) and in public protected areas (59 %).

2.3. Data

Data about participants and their native vegetation were collected by the BushBids program through the expression of interest and site assessment processes. A subset of these data was made available for this study, including the size of the area offered for management

at the draft management plan stage (referred to here as management plan size), the presence of proposed and existing covenants (similar to conservation easements), gender of the primary contact person/people, town of postal address and nearest town to the property, entity type, and information about the participant's involvement in primary production. This information was used to generate a set of eight categorical variables and one numerical variable characterising participants. The categorical variables were selected to provide information about the diversity of participants. Entity type, absentee status and primary production status were selected to evaluate the extent to which participants diverged from owner occupier, farming individuals or families. Gender of primary contact was included firstly to identify the extent of gender diversity in participants and secondly to evaluate how the other variables related to this fundamental demographic diversity measure. Although it's been shown that in developed economies women are more likely than men to engage in pro environmental behaviour (Hunter et al., 2004; Raymond and Brown, 2011), in this study, this trend is likely to be hidden by the gender imbalance in management and ownership of rural land noted by Raymond and Brown (2011). Three covenant (conservation easement) status variables were included to allow evaluation of how permanent covenants may interact with participation in the stewardship tender. Finally, the project location variable was included to allow evaluation of how the other participant characteristics varied with location.

Entity type includes two categories: individual/family and group. The individual/family category includes individuals or family groups where all members were connected by a familial relationship. All remaining participants shared a common characteristic in that they were groups where not all group members shared a familial relationship. This group category comprises a broad spectrum of participants including community groups, non-government organisations and corporations (other than family

business structures), and also extends to include local government and informal groups where two or more group members were co-owners or co-managers with no familial relationship.

The absentee or resident variable was generated using information about the nearest town to the land offered for management and the town of the participant's postal address. Where the town nearest the land offered for management and the town of the postal address of the participant matched or were proximate, the participant was classified as resident. If the town nearest to the land offered for management and the town of the participant's postal address were spatially distant then the participant was classified as absentee. For example, these cases included participants who resided in Adelaide (or a major regional centre) but offered management services on a rural property. Some of the absentee participants resided on rural properties but offered management services on rural property in a different location. Where a participant offered land for management from two or more properties and met the criteria for being resident at one property the participant was classified as resident.

The gender of the primary contact was derived from the contact names participants gave when expressing interest in BushBids, and for the site assessment and development of the management plan. A number of participants provided contact names for more than one person and where male and female contact names were given this was classified as "both" rather than male or female.

The primary production status was assessed using a range of information collected by BushBids. This information included direct observations made by BushBids personnel, satellite imagery of the areas adjacent to the native vegetation and participant reported land use. If there was any primary production activity undertaken by the participant or by another party on the participant's property, then the participant was classified as a primary producer. Primary production activity included livestock, cropping, orchards and vineyards. Keeping horses for recreation and small scale, domestic gardening or poultry keeping were not

211 classified as primary production activity. A small number of participants (six) could not be
212 classified using the available information.
213 The project location was also included as a categorical variable. As some participants
214 were involved in more than one BushBids project, participants were classified according to
215 the BushBids project where their bid was successful, or if they did not make a successful bid,
216 they were allocated to the first BushBids project they participated in.
217 The covenant variables categorise participants according to the presence or absence of
218 existing and proposed covenants in their BushBids management plan. The covenants referred
219 to in this study are similar to conservation easements in the USA (e.g. Fishburn et al., 2009),
220 in that they are binding agreements established to conserve environmental values on private
221 land. This study exclusively deals with Native Vegetation Heritage Agreements, a form of
222 covenant in South Australia (Adams and Moon, 2013). Native Vegetation Heritage
223 Agreements establish legally prescribed, usually permanent land use restrictions on a piece of
224 land, with the agreement registered on the land title (Native Vegetation Act, 1991). Land use
225 restrictions under Native Vegetation Heritage Agreements include restrictions on clearance or
226 removal of native flora and fauna, introduction of non-native organisms and fertiliser, and
227 removal or disturbance of soil and rock (Native Vegetation Council, 2017). They are
228 generally consistent regardless of location and ecosystem type, with some relatively rare
229 exceptions for stock grazing in grassy ecosystems (where it is used as a tool for conservation)
230 and in the Monarto area where a specific type of Heritage Agreement was historically
231 established with lower level restrictions. These variations in restrictions are unlikely to affect
232 many of the participants and therefore have not been addressed in the analysis. The three
233 covenant variables used in this study; existing covenant, proposed covenant and existing
234 and/or proposed covenant were created from information about the presence of existing and
235 proposed Native Vegetation Heritage Agreements within the management plans negotiated

with participants. Where a Native Vegetation Heritage Agreement application had been submitted prior to participation in BushBids but the agreement had not yet been established, this was treated as an existing covenant.

The numerical variable management plan size was the total size of the area offered by the landholder for BushBids at the draft management plan stage, regardless of whether or not the landholder submitted a bid. Where the landholder participated in multiple BushBids projects and/or tender rounds, the total area offered by that landholder across all projects and rounds was used.

2.4. Data analysis

The Pearson's Chi-square test of independence with Yates' Continuity Correction was used to test whether absentee landholders and covenants were associated with primary production status. Observations from the unclassified category for primary production status were excluded from this analysis due to the small number of observations in this category. All expected frequencies were greater than five.

Ward's hierarchical cluster analysis was undertaken to identify groups within the participants. This method provided a relatively high cophenetic correlation coefficient (0.63) compared with other hierarchical cluster analysis methods and provided an interpretable solution with four groups, each containing a sufficient number of observations. A dissimilarity matrix was created for the cluster analysis using Gower's metric due to this metric's suitability for categorical variables. The dissimilarity matrix used a subset of the data: entity, gender of primary contact, primary production status, resident/absentee status and status for new and existing covenants separately. Observations in the "unclassified" category for primary production status were excluded due to the small number of observations in this category.

Linear modelling was used to test the relationship between management plan size and the predictor variables entity type, primary production status, absentee status, covenant status and gender of primary contact. The management plan size variable was natural log transformed to meet assumptions of normality, and observations with "unclassified" primary production status were removed from the dataset. A linear model of the main effects was fitted and tested with ANOVA both by adding terms to the model and dropping terms from the model. These two approaches yielded slightly different results, however, we selected the more conservative results from the additive approach for presentation here.

Generalized Linear Modelling with Bayesian Model Averaging (BMA) (Hoeting et al., 1999) was then used to confirm the results from the linear model and examine the relationship of management plan size to predictor variables within each of the four largest projects. BMA calculates an average of multiple model predictions, weighted by the posterior model probabilities. When a predictor variable had a 0.75 or greater probability of inclusion in the model, it was considered to be an important predictor (Thomson et al., 2007; Viallefont et al., 2001).

All statistical analyses were performed using R 3.2.4. The Gower's dissimilarity matrix was created using the package cluster 2.0.5 (Maechler et al., 2016), while the package BMA 3.18.6 (Raftery et al., 2015) was used for Bayesian Model Averaging.

3. Results

3.1. Participants

Of the 163 participants, a large majority were individuals or families (92 %) with the remainder consisting of groups (8 %). The gender of the primary contact person was most frequently male (60 %), although a considerable proportion of primary contacts were female (20 %) or included at least one person of each gender (20 %).

A little over half the participants were involved in some kind of primary production (55 %), while approximately 41 % were not involved in primary production and a small number (4 %) could not be classified (Fig. 2(a-d)). At the time of expressing interest in the program, most participants were resident on their property (77 %), however, a considerable proportion were not (23 %) (Fig. 2(a)). Thirty four per cent of participants had an existing covenant (similar to a conservation easement) over part or all of the land offered in BushBids (Fig. 2(c)) and 25 % of participants indicated they would like to apply for a covenant (Fig. 2(d)). Almost half of the participants (44 %) did not have a covenant over the land offered in the project and were not proposing to apply for one as part of their offered management services (Fig. 2(b)).

The Chi-squared independence test revealed that resident/absentee status was dependent on primary production status (Chi-square independence test $X^2=23.4$, df=1, $P<0.0001$) with a larger proportion of absentee landholders within those not involved in primary production, compared with those landholders who were involved in primary production (Fig. 2(a)). However, no significant relationship was found between covenants and primary production status ($X^2=1.6$, df=1, P=0.2) (Fig. 2(b)).

Four groups of participants were identified through hierarchical cluster analysis and are here after referred to as clusters (Fig. 3(a-d)). Cluster 1 was the largest and included 45 % of all participants. It mainly comprised participants who were classed as individuals or

304 families (94 % of Cluster 1) (Fig. 3(a)), resident (85 % of Cluster 1) (Fig. 3(b)), and involved
305 in primary production (65 % of Cluster 1) (Fig. 3(c)). Nearly all participants in this cluster
306 did not have an existing covenant (97 % of Cluster 1) (Fig. 3(d)) and did not have a proposed
307 covenant (99 % of Cluster 1) (Fig. 3(f)). The next largest cluster, Cluster 2, included 23 % of
308 total participants and was comprised entirely of individuals or families (Fig. 3(a)) with a
309 proposed covenant (Fig. 3(f)). This cluster had relatively similar proportions of primary
310 producers (56 % of Cluster 2) and non-primary producers (44 % of Cluster 2) (Fig. 3(c)), a
311 relatively large proportion of absentee landholders (25 % of Cluster 2) (Fig. 3(b)) and the
312 largest proportion of female primary contacts (42 % of Cluster 2) (Fig. 3(e)) compared with
313 the other clusters. Cluster 3 included 17 % of all participants and was comprised exclusively
314 of participants who were not involved in primary production (Fig. 3(c)) and also had a large
315 component of absentee landholders (65 % of Cluster 3) (Fig. 3(b)), groups (31 % of Cluster
316 3) (Fig. 3(c)) and participants with an existing covenant (92 % of Cluster 3) (Fig. 3(d)).
317 Finally, Cluster 4 was the smallest cluster and included 15 % of all participants. Similar to
318 cluster 1, cluster 4 was comprised entirely of participants who were resident (Fig. 3(a)),
319 involved in primary production (Fig. 3(c)) and not proposing a new covenant (Fig. 3(f)).
320 However unlike cluster 1, all members of the cluster 4 had an existing covenant (Fig. 3(d)).
321
322 3.1.1. Absentee landholders
323 A majority of participating absentee landholders were non-primary producers (76 %
324 of 38 absentee participants) compared with 21 % who were primary producers (Fig. 2(a)).
325 Likewise, more absentee participants were individuals/families (82 % of absentee
326 participants) than were groups (18 % of absentee participants). The WLND project location
327 had the highest percentage of absentee participants (34 % of participants in that project)
328 followed by the EMLR project where 29 % of participants were absentee and the RBND

project where 26 % of participants were absentee (Fig. 4(a)). The SMLE and SEAST projects both had lower rates of absentee participants with 11 % and 9 % respectively.

3.1.2. Groups

Following a similar pattern as the absentee participants, most participating groups were non-primary producers (77 % of 13 participating groups), with the remaining 23 % being classified as primary producers. There was a roughly even division between absentee (seven) and resident (six) participants within those classified as groups. Project locations with the highest proportions of participating groups were the RBND project where 13 % of participants were groups, and both the EMLR and WLND projects where 9 % of participants were groups (Fig. 4(b)). The SMLE project had no participating groups, while 5 % of participants in the SEAST project were groups.

3.2. Management plan size

The size of the area offered by participants in the tenders (referred to here as management plan size) differed by four orders of magnitude ranging from 0.5 ha to 4 792.6 ha, with a median of 45.7 ha and interquartile range of 19.0 ha to 179.6 ha. Linear modelling showed a significant relationship between management plan size and both project location and entity type (see Table 3 and Sup. 1). Other participant characteristics (primary production status, covenant status, gender of primary contact and resident/absentee status) were not significantly related to management plan size.

Generalised linear modelling with Bayesian model averaging confirmed the relationship between management plan size and project location and entity type with these factors identified as the strongest predictors of management plan size, and the only predictors with greater than 75 % chance of inclusion in the model for all project locations combined

(Table 4). Entities classified as individuals or families were likely to have smaller management plans (coefficient of -1.14) than entities classified as groups. Compared with EMLR, participants in all other project locations were likely to have larger management plans (coefficients ranging from 0.97 to 2.00). The SEAST project location was the only individual location where predictors with a greater than 75 % chance of inclusion were identified (Table 4). These predictors were entity type, gender of primary contact, primary production status and covenant status. Again, participants classified as individuals or families were likely to have smaller management plans than group participants. In the SEAST location, participants with female-only primary contacts were likely to have smaller management plans than participants with primary contacts that included both genders. Non-primary producers were likely to have smaller management plans than primary producers and participants with neither existing nor proposed covenants were likely to have smaller management plans than those with covenants or proposed covenants.

4. Discussion

In this study we characterised participants in a conservation stewardship tender (reverse auction) and examined how these characteristics related to the size of the area offered in the tender. The range of landholders interested in participating was diverse, including a considerable proportion of absentee landholders, a small but important constituent of groups and relatively equal proportions of primary producers and non-primary producers. Project location was the best predictor of the size of the area offered in the tender followed by entity type, with groups likely to offer larger areas compared with individuals and families. The diversity of landholders participating in the tender is consistent with the increasing diversity within agricultural landscapes highlighted by Mendham and Curtis (2010). Both absentee landholders and groups were found to be important participants, absentee landholders because they made up a considerable proportion of total participants and groups because of the larger areas they offered in the tender. Programs seeking to incentivise conservation actions on private land must understand these ownership structures, particularly where they result in participant behavioural differences compared with traditional, production oriented, family ownership models.

4.1. Absentee landholders

Absentee landholders made up nearly a quarter of all participants and came from all project locations. This large component of absentee landholders confirms their relevance within the community of private land managers in agricultural landscapes and aligns with studies showing increasing absentee ownership in various parts of the world (Petrzelka et al., 2013) including Australia (Klepeis et al., 2009; Mendham and Curtis, 2010). Further, these results provide empirical evidence of absentee landholders' interest in participating in a conservation stewardship tender, which to our knowledge has not previously been

documented. Project locations with the highest rates of absentee landholder participation were the EMLR project location where much of the area is within 50 km of Adelaide (the nearest city) and the WLND and RBND project locations where the majority of the area is within 150 km of Adelaide and there is a relatively large proportion of native vegetation remaining in the landscape. Travel distance from cities is likely to influence the rates of absentee land ownership, at least for non-primary producing landholders, however other interrelated factors may also play a role such as amenity values, land productivity and value, and land use planning and policy. Although there is a substantial body of research relating to amenity migrants (Gosnell and Abrams, 2011), relatively little is known about absentee landholders. More research is needed to better understand the patterns and drivers of absentee ownership and how rates of absentee landholder participation in incentive programs compare with rates of absentee land ownership in agricultural landscapes.

Participating absentee landholders included both primary producers and non-primary producers, with most classed as non-primary producers. Absentee primary producers may have included landholders who own two or more spatially separated rural properties to take advantage of resources available in different environments (e.g. seasonal grazing for stock while crops are grown on the primary property), or landholders who reside in an urban area and manage the property remotely. Non-primary producer absentee participants are likely to have included “weekenders” who reside in urban areas and periodically visit their rural properties for recreation and/or other purposes, or groups who jointly use and manage the land for a variety purposes (such as recreation, conservation and/or non-primary production businesses). Recreation has been found to be a widespread purpose for land ownership among absentee landholders and intersection of multiple land uses is also common (Petrzelka and Armstrong, 2015; Petrzelka et al., 2009). To facilitate participation by absentee landholders,

private land conservation policy makers are advised to recognise that absenteeism may coincide with a variety of often co-existing land use objectives.

Although they are a diverse group, absentee landholders may face some particular challenges for land management and incentive program participation that set them apart from resident landholders. Absentee landholders may not access the same information sources as resident landholders, therefore presenting a challenge for incentive program recruitment. Time constraints may also be a major barrier for absentee landholders, including at the time of recruitment to a program (Mendham et al., 2012), having insufficient time available to implement management actions (Kendra and Hull, 2005; Klepeis et al., 2009) or experiencing difficulties with the timing or frequency of visits required for management, such as implementing weed control at a critical weed lifecycle stage. The cost of implementing management actions may also be influenced by absentee status (Mendham et al., 2012). For example, there may be additional costs associated with travel and transport to the property and/or hired labour and equipment. However, absentee landholders' possible willingness to accept lower incentive rates (Lindhjem and Mitani, 2012) may offset additional management costs. Another management challenge potentially exacerbated by absenteeism is impacts from unauthorised access to the property (O'Connor, 2016) for activities such as off road vehicle use, camping, hunting (Kendall et al., 2013) and timber theft (Petrzelka et al., 2013). Many of these barriers or challenges faced by absentee landholders can be addressed by incentive program design. For example, program recruitment methods can be designed to reach absentee landholders through the use of appropriate advertising messages (Morrison et al., 2017), advertising channels, and timing of recruitment events (Mendham and Curtis, 2010). Absentee participation is also likely to be supported by programs that allow some flexibility in timing for engagement and implementation of management actions. Further

research is needed to determine the extent to which issues affecting absentee landholders are addressed by incentive programs.

4.2. Groups

The number of group participants was relatively small, however the group entity type was positively related to management plan size. This highlights their importance as potential participants in incentive programs. Although groups have been acknowledged as managers in the private land conservation literature (Fitzsimons, 2015; Selinske et al., 2015) and in studies of landholders in agricultural landscapes (Gosnell and Travis, 2005), to our knowledge, they have not previously been considered in studies about participation in incentive programs. Participants classed as groups in this study included a wide range of group forms, from non-government organisations to local government, corporations, community groups and small informal groups of individuals who co-own and/or co-manage remnant native vegetation. We acknowledge that this is a very broad spectrum and that motivations for participation in incentive programs and objectives for land management may vary considerably between groups, however, in this study, the small number of participating groups did not allow further classification at a finer scale. Further research is needed to identify group types along with their motivations and constraints for participation in conservation incentive programs. Despite the wide variation in types of groups, there may be some characteristics that group landholders share. For example, groups may require longer time periods for decision making, a need that could be accommodated in incentive program design. As current information relating to groups and their participation in incentive programs is very scarce, it is an important area for future research to inform policy.

4.3. Covenants

Landholders with and without existing covenants (conservation easements) participated in the conservation stewardship tender and some were interested in applying for a new covenant. The largest cluster of participants identified with hierarchical cluster analysis was characterised by participants who did not have an existing covenant and did not express interest in applying for one. This highlights a large constituency of participants who were not prepared to enter into an in-perpetuity covenant but were still willing to offer management services over a five or ten year period. Participants in this cluster were resident, primary producing individuals or families. Given that previous research indicates that participation is reduced when the program employs compulsory covenanting (Comerford, 2013), this large sector of landholders may have been dissuaded from participation if the program had made covenanting mandatory.

The next largest cluster was characterised by landholders seeking a covenant and included both primary producers and non-primary producers as well as absentee and resident landholders. Therefore, there was a potential supply of covenants from both primary producers and non-primary producers and absentee and resident landholders. The final two clusters were characterised by participants who had an existing covenant and were not seeking an additional covenant. These clusters show that even with an existing covenant there is a perceived need for additional management cost recovery, that is, these landholders do not consider that a covenant on its own was sufficient to meet their management objectives.

4.4. Management plan size

Location and entity type were the only reliable predictors of management plan size when all project locations were considered together. This relationship between project location and management plan size is probably driven by differences in agricultural

productivity, rainfall and proximity to the city of Adelaide and large rural centres, as well as associated differences in average land parcel size, property size and land value. Group entities were likely to include larger areas in their management plans than entities classified as individuals/families. This could be explained by the ability of groups to pool resources and therefore purchase and manage larger areas of land. It might also be a consequence of historic development patterns leaving some large areas of uncleared land with relatively low production value where buyers do not expect to recover their investment through production. With groups being more likely to offer larger areas of land in the incentive program, they may be seen as an important sector of participants to recruit. However, maximising the area of land offered by each participant or the total area offered in the incentive program may not always be desirable. For instance, an adequate number of participants is required to provide competition in a tender making it potentially undesirable to have a small number of participants offering large land areas, and there may also be significant transaction costs for each entrant meaning increasing participation beyond adequate levels is not justified by the total budget for incentive payments (Whitten et al., 2013).

The SEAST project location was the only individual project with reliable predictors of management plan size. Here, group entities, primary producers and sites with an existing covenant were associated with larger management plan sizes, while having a female primary contact was associated with smaller management plan size. The relationship to primary production status may be due to the generally larger properties held by primary producers compared with non-primary producers (Mendham and Curtis, 2010), while the relationship to covenant status may be a consequence of previous government legislation (e.g.Upper South East Dryland Salinity and Flood Management Act, 2002) and associated policy having already established covenants on many of the larger remnants in the project location.

5. Conclusion

This study challenges the notion that, in agricultural landscapes, landholders interested in conservation incentive programs are typically farming individuals or families. Using empirical evidence from a case study conservation tender program we have shown that participating landholders can be diverse in land use, residence distance from the property and land ownership structure. They may or may not use their property for primary production, they may be resident on the property or absentee and they may own the land individually or jointly as part of a group. Both absentee landholders and groups were important participants in the conservation program, absentee landholders due to their considerable numbers and groups because they were likely to offer larger land areas in the tender.

Given the importance of absentee and group landholders revealed by this study, and the extremely limited information currently available regarding these landholder types, we recommend further research to address the following knowledge gaps. Firstly, research is needed to identify more specific group types within the broad category of group landholders and to investigate their motivations and constraints for participation. For absentee landholders, research is needed to further explore the drivers and patterns of absentee land ownership and to evaluate how rates of absentee landholder participation compare to rates of absentee land ownership. Finally, research is also needed to further examine the extent to which issues affecting absentee landholders, such as access to information, time constraints and unauthorised property access, are addressed by incentive programs. This knowledge will be valuable to inform future policy design for conservation incentive programs in agricultural landscapes.

List of tables

Table 1. BushBids conservation stewardship tenders

Project name	**Tender Rounds**	**Contract start**	**Contract length (years)**	**No. unique participants**
Eastern Mt Lofty Ranges (EMLR)	2	2006-07	5 or 10	55
Woodland (WLND)	2	2010-11	5	32
Riverbend (RBND)	1	2013	5	23
Southern Mallee (SMLE)	1	2013	5	9
South Eastern (SEAST)	2	2013	5	44

Table 2. BushBids project location size, native vegetation cover and land use

Project	**Total area km²**	**Native vegetation km² (%)[a f]**	**Covenant km² (%)[b d]**	**Public protected areas km² (%)[b e]**	**Land use (%)[c g]**		
					Primary production	Reserve/ vacant/ recreation	Residential
EMLR	2 758	233 (8 %)	88 (38 %)	9 (4 %)	76 %	2 %	21 %
WLND	5 878	3 581 (61 %)	245 (7 %)	120 (3 %)	81 %	10 %	7%
RBND	5 787	3 509 (61 %)	735 (21 %)	105 (3 %)	87 %	10 %	3 %
SMLE	6 964	618 (9 %)	162 (26 %)	44 (7 %)	96 %	1 %	1 %
SEAST	27 899	6 092 (22 %)	961 (16 %)	3 600 (59 %)	84 %	14 %	1 %

NB spatial statistics calculated using Geocentric Datum of Australia 1994 and Albers Equal Area projection in ArcGIS 10.4.1

[a] Per cent of total area. [b] Per cent of native vegetation. [c] Per cent of total mapped land use ('Primary production' includes agriculture, horticulture, livestock grazing and forestry; 'Reserve/vacant/recreation' includes golf, reserve, recreation and vacant; and 'Residential' includes residential, rural residential, non-private residential and vacant residential). [d] Spatial data source (DEWNR, 2017). [e] Spatial data source (DEWNR, 2015). [f] Spatial data source (DEWNR, 2011). [g] Spatial data source (DPTI, 2016).

Table 3. Relationship of participant characteristics to management plan size

Factor	**Df**	**F value**	**Pr(>F)**	**Coefficient ±SE**
Project location	4	8.4672	0.0004e-02 ***	
WLND				1.2 ±0.3
RBND				1.5 ±0.4
SMLE				1.8 ±0.5
SEAST				0.8 ±0.3
Entity type	1	8.3245	0.0045**	
Individual/family				-1.2 ±0.4
Gender of primary contact	2	1.7511	0.1772	
Primary production status	1	3.7677	0.0542	
Resident or absentee	1	0.6255	0.4303	
Covenant status	1	2.9944	0.0857	

Table 4. Probability of a non-zero coefficient P(inc), coefficients, Bayesian Information Criterion (BIC) and R^2 for management plan size in all locations combined and in EMLR, SEAST, WLND and RBND locations, determined with Bayesian Model Averaging.

Predictor/BIC/ R^2/n	**All locations**		**EMLR**	**SEAST**		**WLND**	**RBND**
	P(inc)	coeff ±SD	P(inc)	P(inc)	coeff ±SD	P(inc)	P(inc)
Intercept (Group entity, Both genders, Primary producer, EMLR location, Covenant)	100.0		100.0	100.0		100.0	100.0
Entity type	**92.0**		15.4	**79.1**		59.6	15.1
Individual/family		-1.14 ±0.52			-1.84±1.26		
Gender of primary contact	0.0		0.0	**84.6**		2.4	1.2
Female					-1.58±0.89		
Male					-0.10±0.42		
Resident or absentee	6.5		44.9	17.4		11.7	37.2
Primary production status	32.9		11.0	**90.5**		12.0	49.4
Non-primary producer					-1.40 ±0.71		
Project location	**100.0**		NA	NA		NA	NA
WLND		1.29 ±0.32					
RBND		1.48 ±0.36					
SMLR		2.00 ±0.53					
SEAST		0.97 ±0.31					
Covenant status	14.9		25.4	**100.0**		12.4	15.5
No covenant					-1.76 ±0.44		
BIC	-602.3		-151.9	-98.1		-76.3	-41.6
R^2	0.22		0.06	0.56		0.12	0.19
n	157		53	42		32	21

Pr(inc) probability of inclusion
BIC Bayesian information criterion
Coefficient and standard deviation shown only when Pr(inc) >75 %

List of figures

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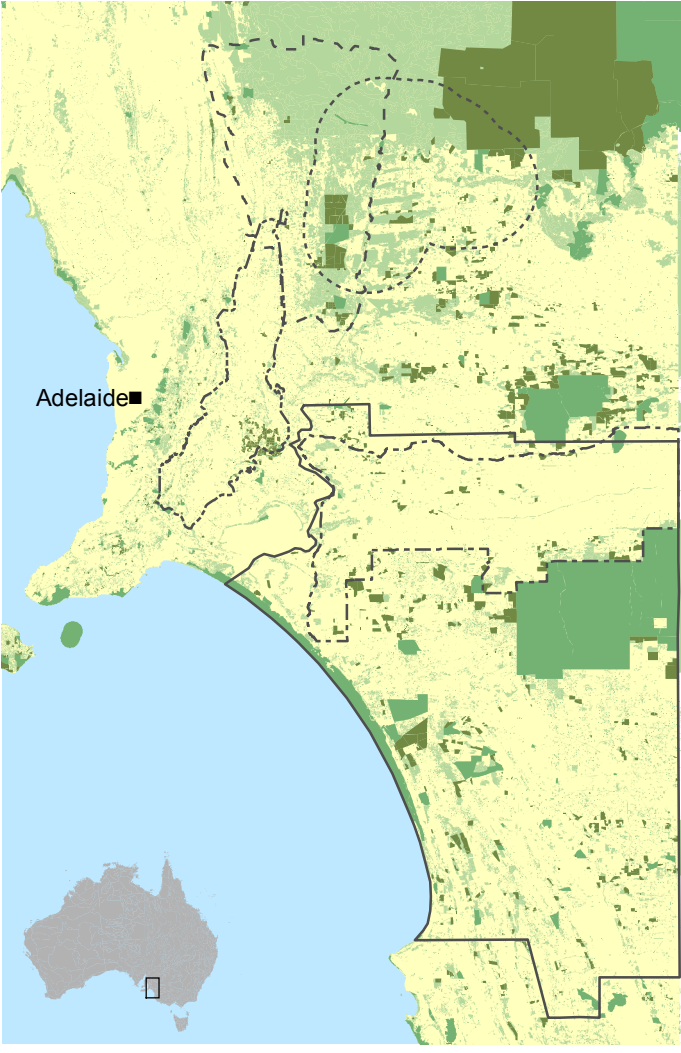
Highlights

- Incentive participants in agricultural areas are generally framed as resident farming individuals
- Empirical data from large conservation tender challenges this conceptualisation
- Participants were diverse in land use, residence location and ownership structure
- Absentee and group landholders were important types of participants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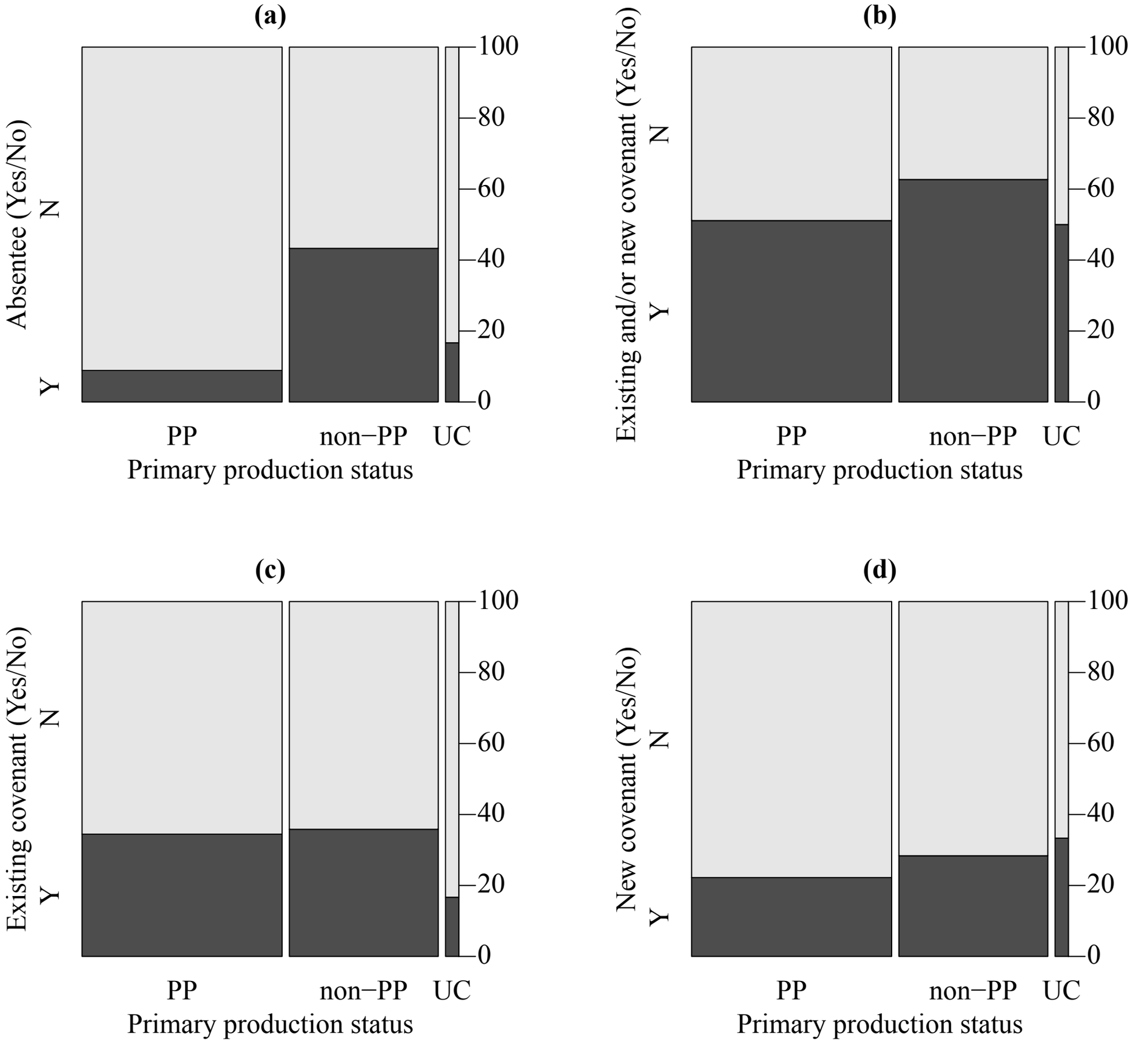
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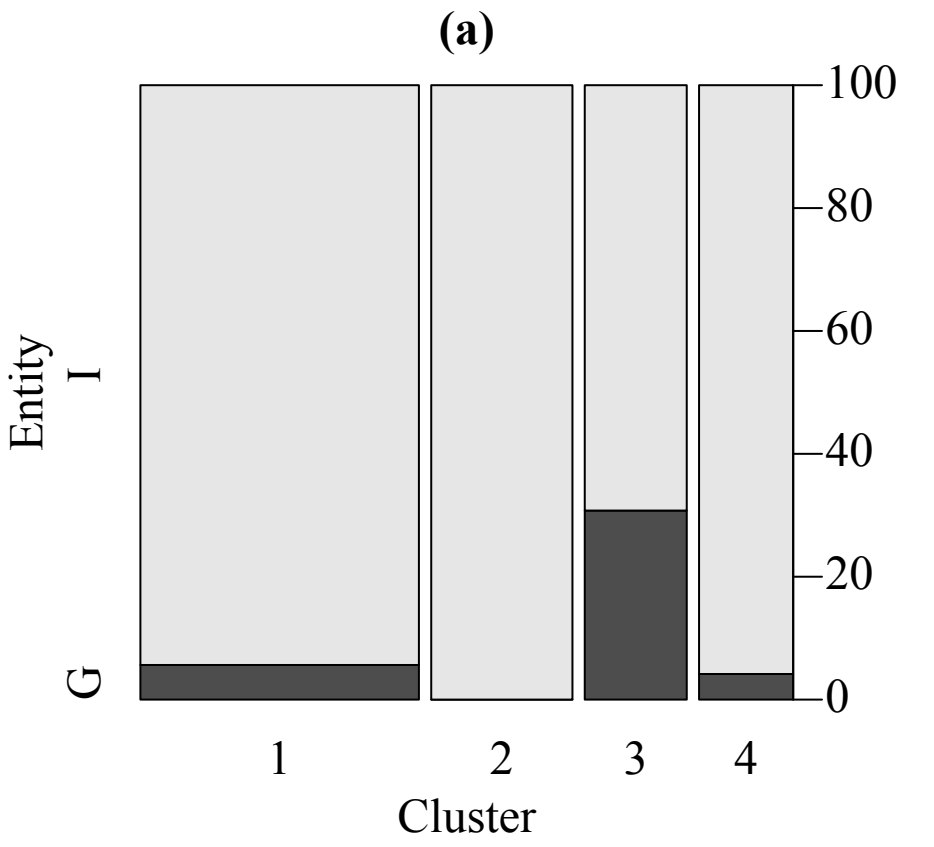
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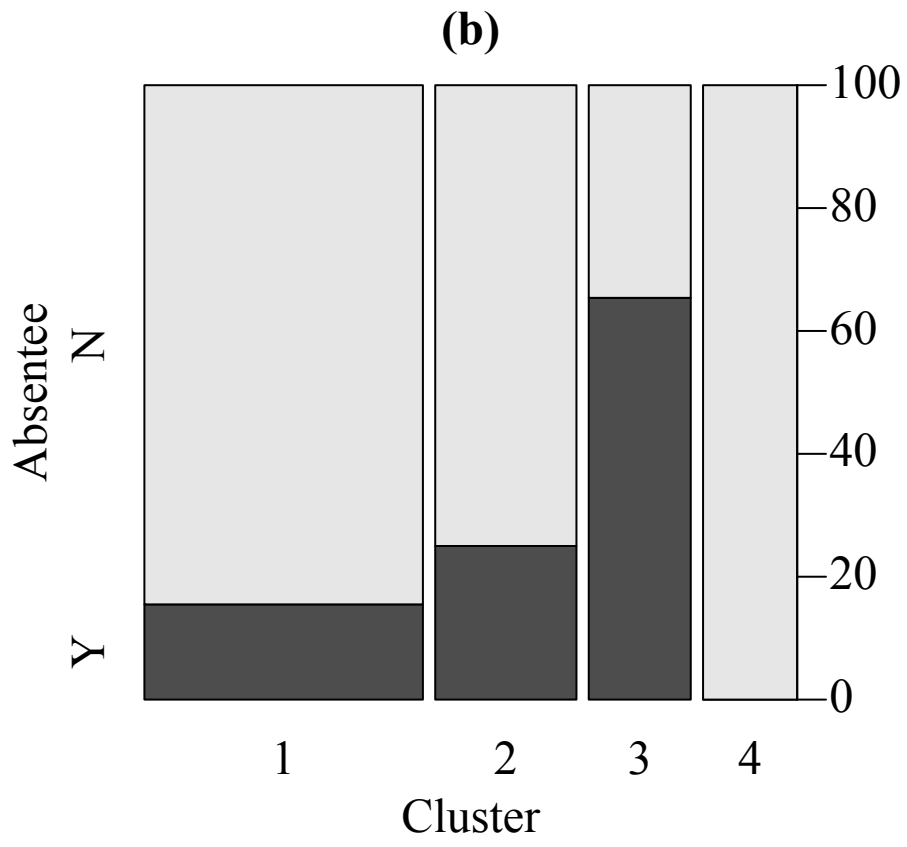
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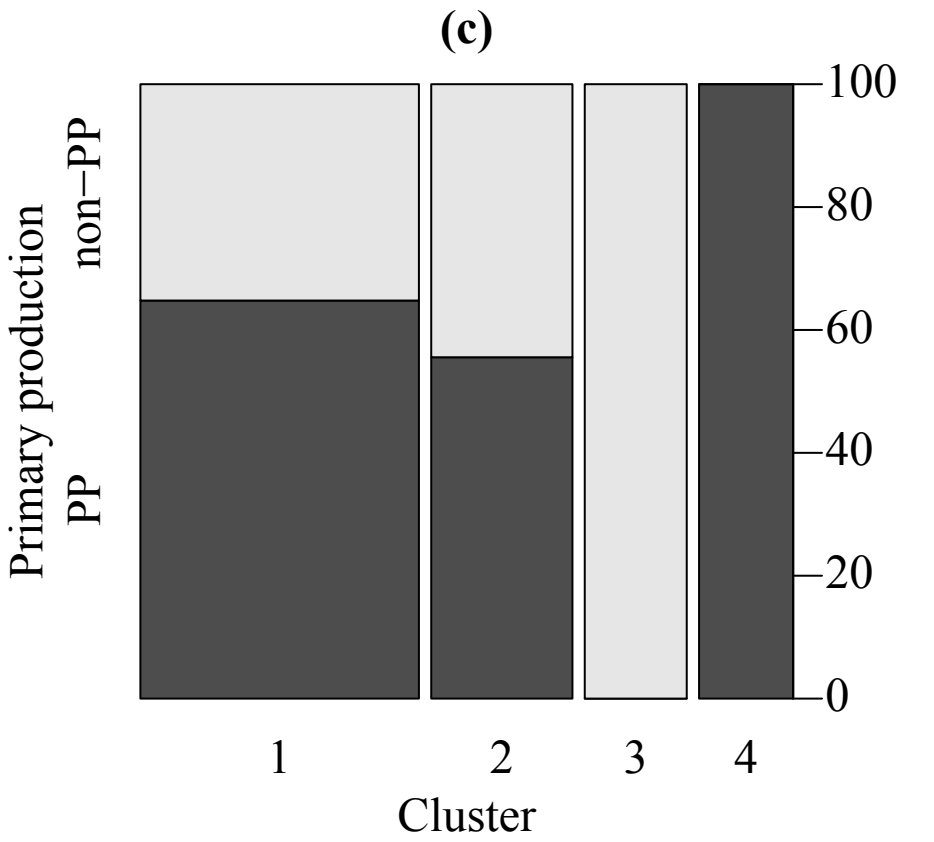
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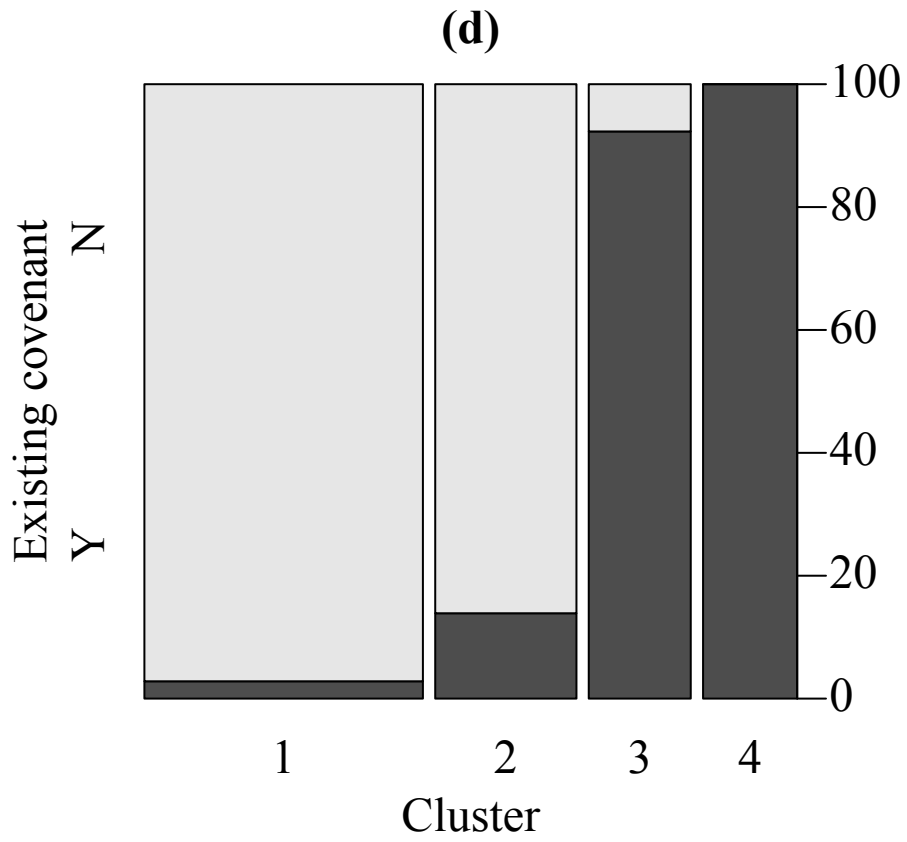
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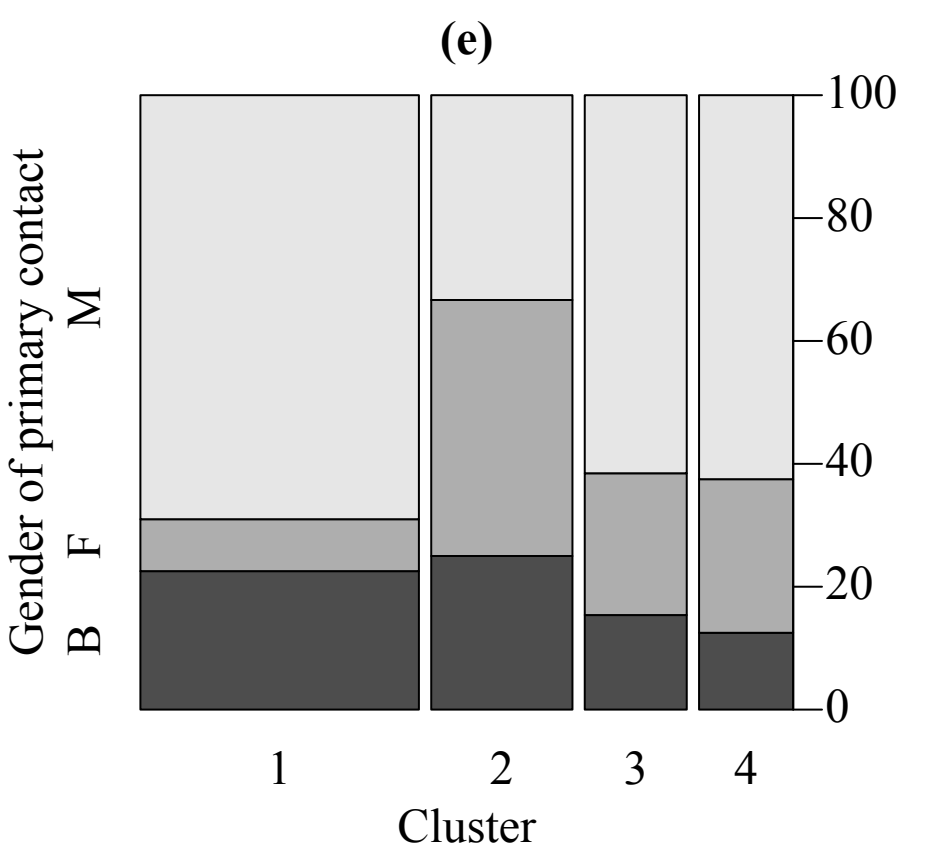
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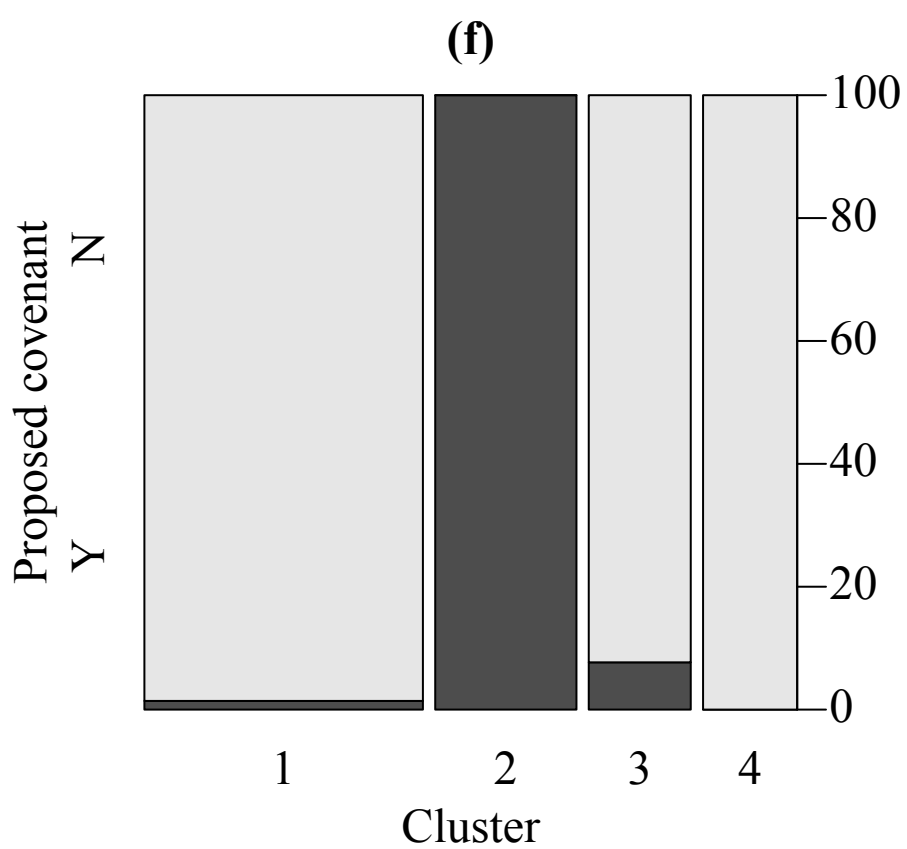
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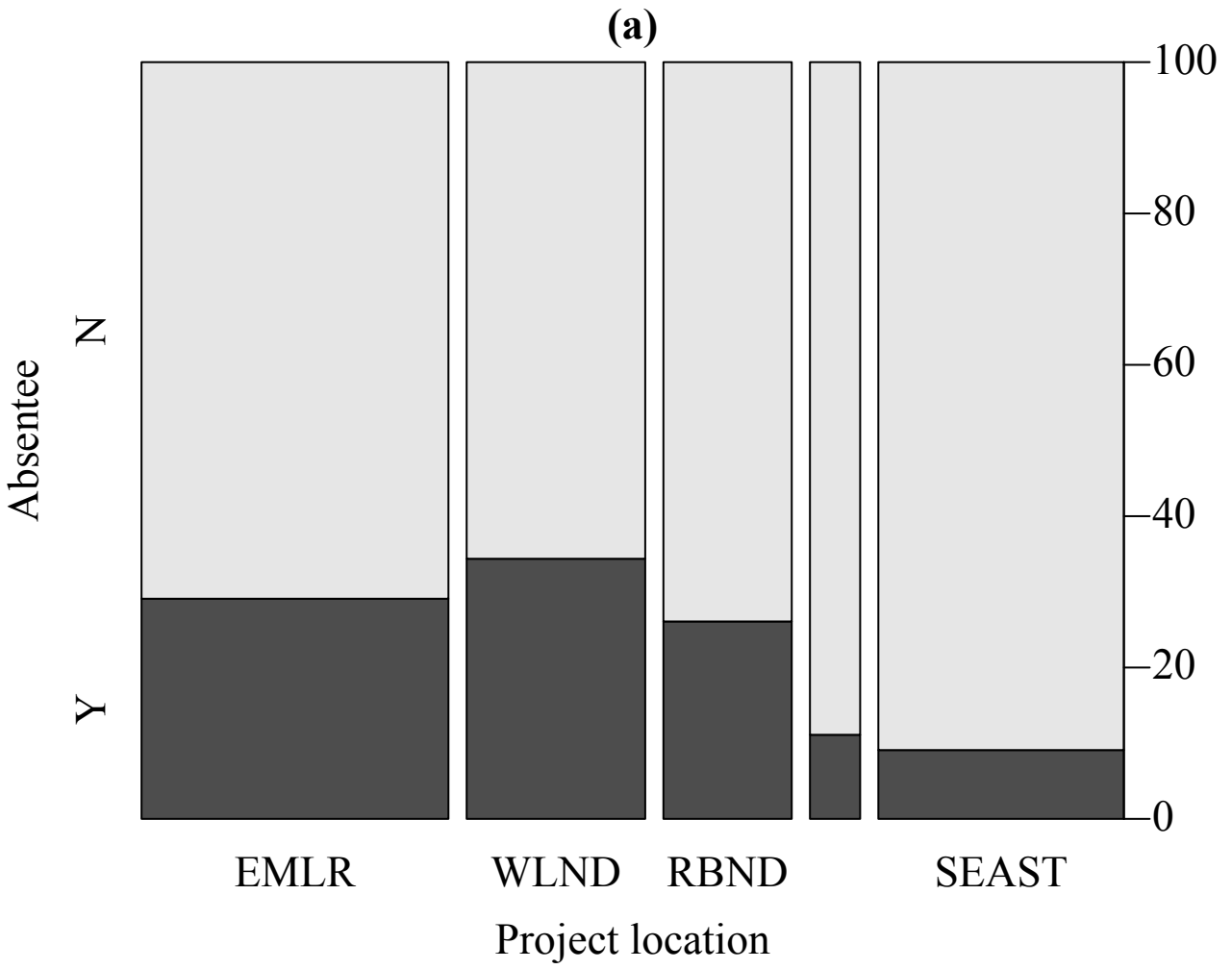
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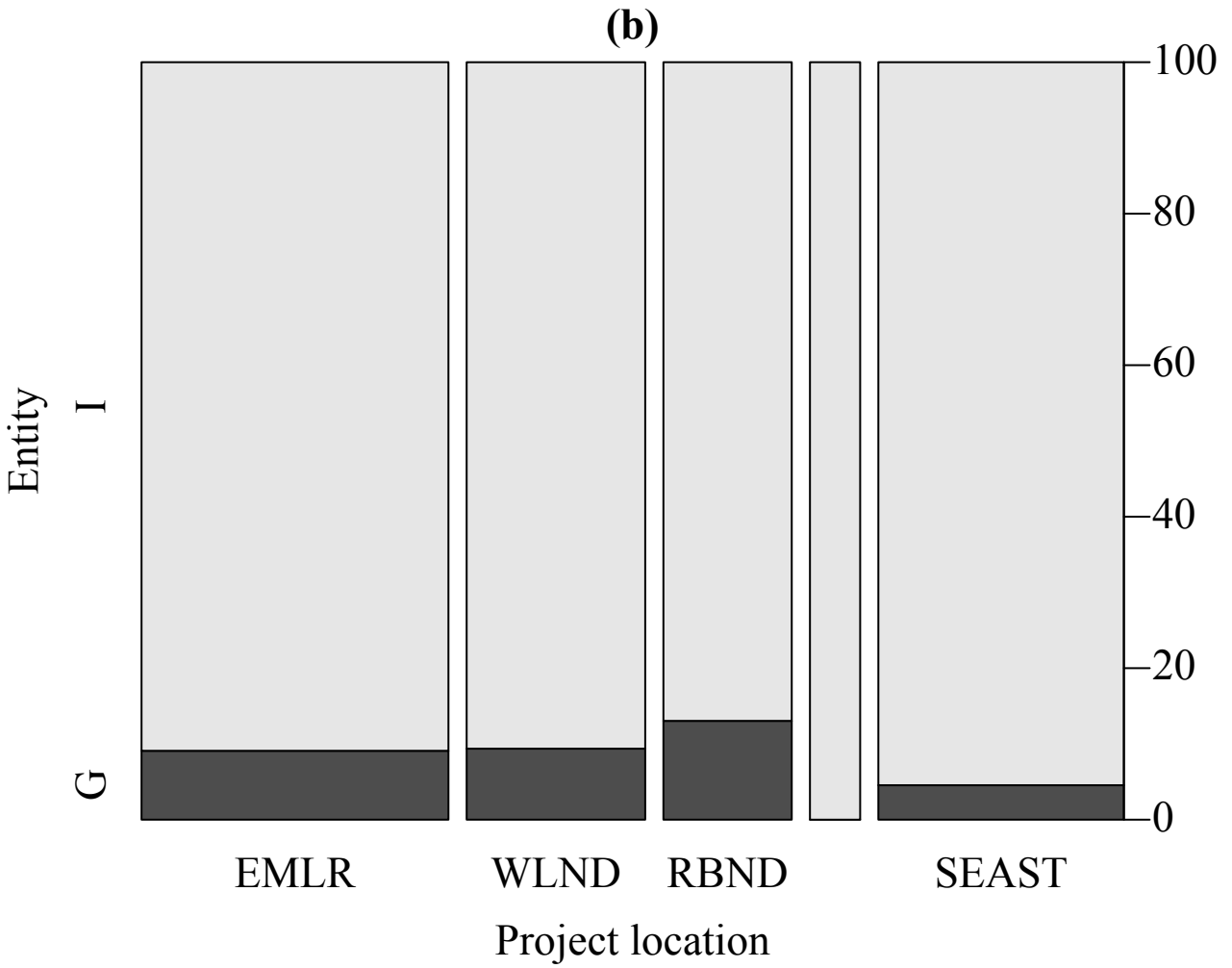
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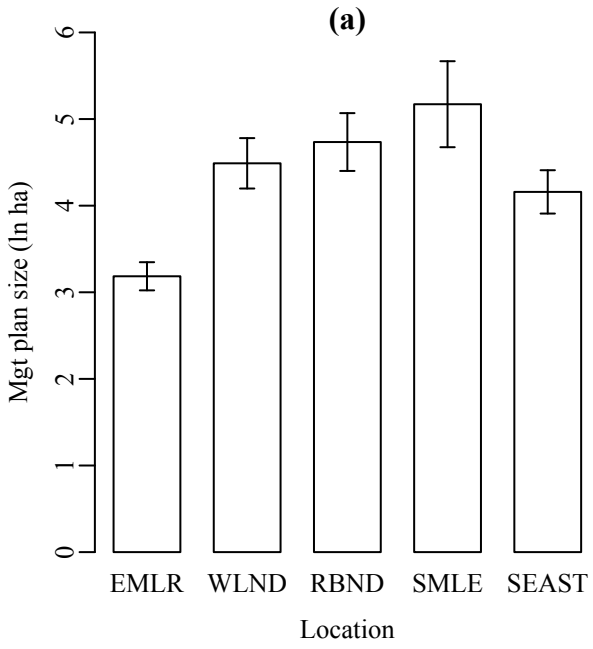
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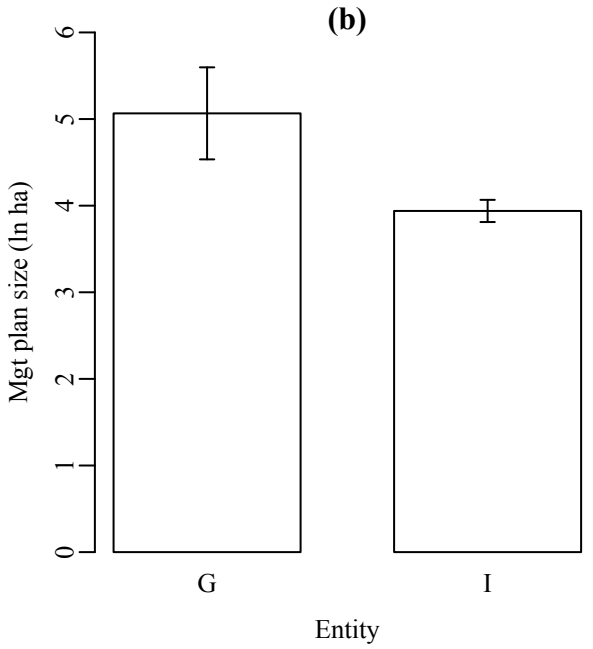
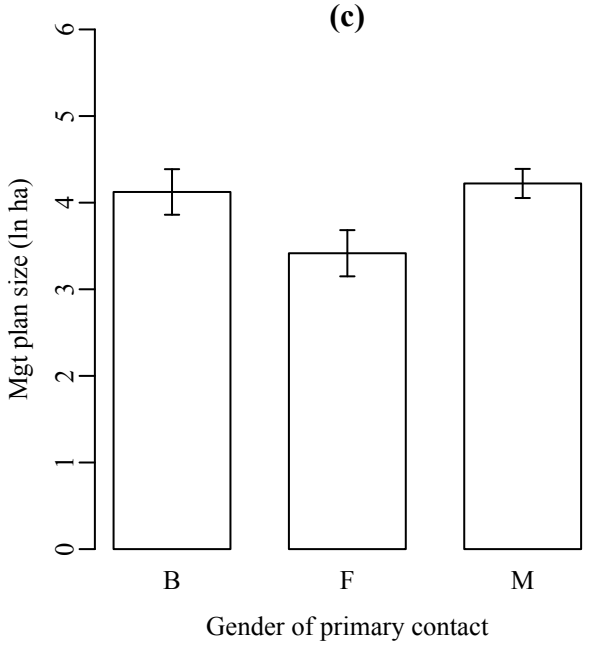
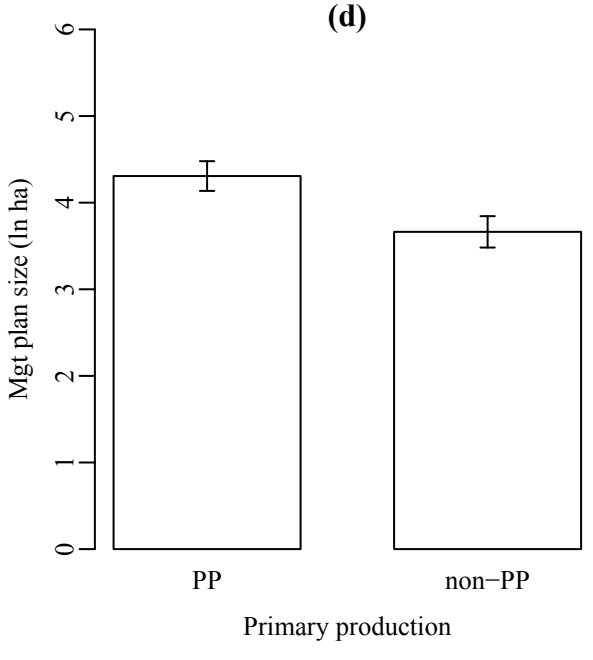
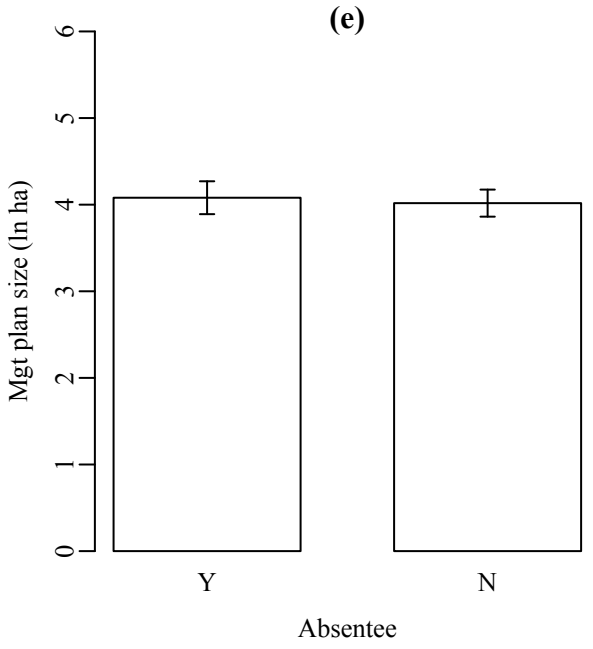
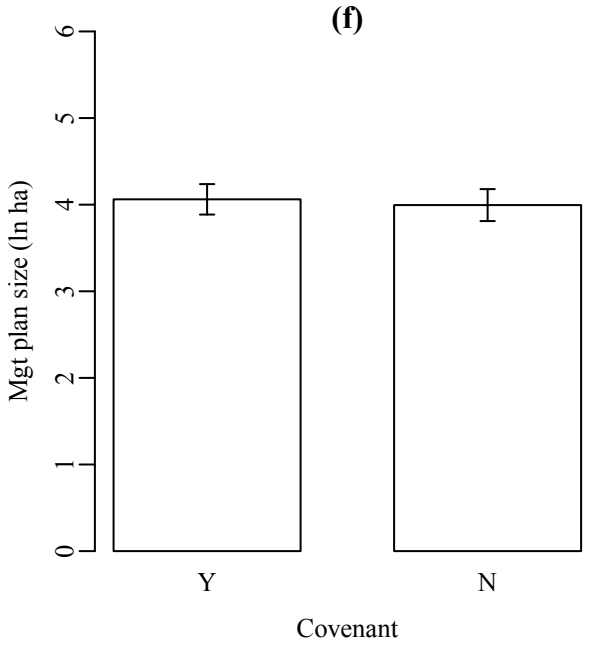
2
3
4
5
6
EMLR
WLND
RBND
SMLE
SEAST
Location


(b)
Mgt plan size (ln ha)
0
1
2
3
4
5
6
G
I
Entity


(c)
Mgt plan size (ln ha)
0
1
2
3
4
5
6
B
F
M
Gender of primary contact


(d)
Mgt plan size (ln ha)
0
1
2
3
4
5
6
PP
non−PP
Primary production


(e)
Mgt plan size (ln ha)
0
1
2
3
4
5
6
Y
N
Absentee


(f)
Mgt plan size (ln ha)
0
1
2
3
4
5
6
Y
N
Covenant