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Australian Family Cotton Farms**

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The Intersection of Farm Management Software and Gender in Australian Family Cotton Farms

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Abstract

This qualitative study explores farm management practices by women cotton growers using computer-based information systems, most particularly the agricultural farm management software *CottonLOGIC* within the Australian cotton industry. This study found that, although gender differences and inequalities persist in rural parts of this region, the agency of women cotton growers ensures not only a sustainable future for themselves and their families, but also for the broader cotton industry as a whole. This study analyses the use of farm management software by women cotton farmers within Connell's theoretical framework of gender relations (2002). This study suggests that women's active participation in farm partnerships and the acquisition of technological skills through the use of farm management software like *CottonLOGIC* mean that all cotton growers benefit through the feminising of specific farm management practices in family farm enterprises. This, therefore, has significant implications for developing the cotton industry into a truly sustainable entity, both in relation to the health of the social and physical environment.

INTRODUCTION

This study aims to understand how the use of farm management software, namely the agricultural decision support system (DSS) *CottonLOGIC*, affects the decision making roles of women as farm partners within the Australian cotton industry. In simple terms, a DSS may be identified as a computer-based information system that supports decision makers. The extensive use of computers has become essential for farm decision makers, not only for communication, and information acquisition and transfer, but also for farm management (Hearn & Bange 2002). Although recent research has indicated that farm women¹ have become the primary users of computers, previous studies suggest that they are hesitant to use computers for farm management and hence, their decision-making roles on family farms are unclear (James 1990; Stewart 2004;

¹ The terms 'farm women' and 'women farmers' refer to women who live on agricultural or pastoral properties. The term 'women cotton growers' is used when more specificity is needed. The term 'rural women' is broader and identifies women who live on properties, in country towns, and women who work in organisations in the rural sector. The term 'female farmer' is not used since the author considers it to be an awkward one with several nuances. Various terms identify rural men, namely 'farm men' and 'male farmers'. The term 'farm partner' refers usually to the husband and wife in the family farm business. In the main, the terms are applied as used in the source.

Bryant 1999). This study aims to provide clarification with regards to the influence of the gendering of farm management software usage and the potential impact this may have on farm partnerships within the regional cotton industry.

This paper is theoretically informed by Connell's theory of gender relations (1987, 2002) which will provide a framework for analysing the gendering of cotton farm decision-making roles. Hence, the key question we seek to answer here is: "What is the nature of the gendered relationship between farm partners, particularly with regards to computer-based information system decision-making processes on family cotton farms?"

WOMEN AND FARM MANAGEMENT

In relation to women in farming, Alston (1995; 1998a; 1998b; 2000; 2003) found that the participation of women in agriculture is 'invisible' with a persistent and regrettable absence of women from positions of authority and power. Alston (2000; 2003) also indicated that few women have achieved leadership positions in Australian agriculture, despite their qualifications, experiences, and contributions to the rural sector. Board (1997) recognised that harnessing the expertise and diverse skills of rural women leads invariably to better decisions. Despite this, the focus of government, agribusiness, and even the rural community itself, still rests with male primary producers as the main recipients and users of information and services related to primary production (Stewart 2004).

Studies² indicate that in the rural context, farm women lead busy lives, and time is a major constraint in the performance of their many functions. Their multiple roles range from office

² While every effort has been made to base this literature review on scholarly peer reviewed publications, in some cases, especially those related to farm management, the only available literature is in the form of final research and consultancy reports which are non peer reviewed. These are government reports of research and development carried out by agencies such as the Rural Industries Research and Development Corporation (RIRDC) and the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO). Agricultural research in

worker and farm manager right through to tractor/header driver and farm animal carer, in addition to as well traditional caring roles for children and elders (James 1989; Board 1997). Despite some evidence that male farmers are making a greater contribution to domestic tasks and childcare to compensate for the increased involvement of farm women in the running of the farm business (Kilpatrick, Johns, Murray-Prior & Hart 1999), women on farms are still required to do the bulk of domestic work as well as assist with the running of the farm business (Schaffer 1988; James 1989). Many Australian rural women bring to farming communities a myriad of non-agricultural skills such as teaching, nursing, and retail, administrative or clerical work. Furthermore, 65% of farm women who work off-farm have been tertiary educated (Kilpatrick et al 1999). Despite women having higher formal educational levels than their male counterparts (Alston 2003), they are less likely than male farmers to have undertaken formal studies and employment in rural-based scientific and technical areas (Board 1997). This is due, in part, to a generational effect, as prior to the 1970s women were banned from gaining college degrees in the fields of agronomy, horticulture, agricultural economics, and animal science (Alston 2000; 2003). Indeed, prior to the mid-1990s, few statistics were gathered on Australian women working in agriculture. This omission stemmed from a sense of shame that a developing nation such as Australia had women working out in the fields (Broad 1997). Yet by the mid-1990s, there was evidence of changing gender identities, as 70,000 women defined themselves as farmers or farm managers rather than as 'farmers' wives' (Alston 2003). Several reasons are given for this acclamation. When economic conditions in the rural sector deteriorated and structural adjustments were an imperative, farm women provided vital labour to replace more costly hired

Australia is applied and client-focussed. Much of the research is funded voluntarily by farmer levies on produce and is matched dollar for dollar by government funding. This research is disseminated quickly to stakeholders through extension discussions, consultancy reports, and industry conferences. Mainly due to funding and time constraints, these reports are only rarely - as at periodical intervals when an agricultural journal publishes a special issue on a specific topic - converted to peer reviewed journal articles or conference proceedings.

farm labour on the family farm. This was especially evident on smaller family farms. As a consequence, women's work has been crucial for the survival of the family in farming. Furthermore, some farm women have chosen or were forced to pursue careers outside of farming to generate additional income for the family when long term viability of the farm business is doubtful (James 1989; Poiner 1990; Alston 1995; Bamberry, Dunn & Lamont 1997; Kilpatrick et al 1999).

The family farm mode of ownership remains dominant with over 90% of Australian farms being family-owned despite various recent rural adjustment schemes to facilitate the exit of small farmers and the consequent consolidation of small family farms into larger holdings (Alston 2000). As well, there has been an increase in farming partnerships, most of which are between husband and wife (James 1990). With the gaining of legal partnership status, it appears that farm women are moving away from predominantly supportive roles to become more involved with the business side of the family farm enterprise (Fisher & Hutchison 1997). Nevertheless, James (1989; 1990) claimed that the role of women in decision making on the family farm is often overlooked and the scope of the contribution by women to family farm management remains unclear.

The theme of the 'invisibility' of women farmers emanated from North American research, especially by Sachs (1983) and resonated through feminist studies of Australian rural women. It was well documented that farm women's subordinate social position has been imposed by the patriarchal social relations of family farming which rendered women and their work 'invisible' (Schaffer 1988; Gould 1989; James 1989; Poiner 1990; Claridge 1998). Poiner's (1990) explanation of farm women's lack of visibility was the 'pervading male hegemony' of a conservative rural society.

Alston (2000) argued that an inferior role for women has been facilitated by patrilineal inheritance practices in agriculture where only 5% of farms are inherited by daughters. Alston (1995) contended that farm roles have developed based on gender stereotypes, that male farmers are participants in the 'more important' public sphere of outdoor work while farm women have become associated with the less visible private sphere of housework and children. As Alston (1995) states, This domestic work is often devalued as it is unpaid and perceived as not directly contributing to agricultural production and the marketplace.

Paradoxically, farm women are perceived to strongly believe in their farm roles based on gender. Bamberly et al. (1997) stressed that farm women have a strong commitment to their farming lifestyles, to the viability of the family farming operation, to the nurturing of their family, and to the community which supports them. Anecdotal evidence suggests that farm women tend to be suspicious of feminism as constructed by the media and are more likely to view it as a threat to their solidarity with their male partners (James 1989; Poiner 1990; Alston 1995; Board 1997; Rowe 1997).

In brief, an overview of the literature suggests that farm women are, to some extent, an under-appreciated and under-utilised resource with a commitment to maintaining traditional family ideologies on family farms. Nevertheless, their identities are fluid in the context of emerging social trends. Joint legal ownership of family farms is becoming a reality. Many farm women have tertiary educational qualifications and a broad range of skills and experience derived from both within and outside the farming sector. Structural changes are underway and farm women are empowered to become a more creditable and visible force.

GENDER, COMPUTERS AND FARM MANAGEMENT

Several studies have explored women's use of computers for farm management. Bryant (1999) found that the use of software reflected the traditional gender divisions of labour on farming properties in that farm women are associated with financial data entry and record-keeping, while male farmers analyse and plan the farm business. Bryant (1999) also contended that while many rural women are increasingly aware of the decision making and farm management possibilities of computer programs there is still a high level of dependence upon the male farmer, with his more detailed day-to-day outdoor farm knowledge, for the input data. The male farmer's reluctance to provide this data is often a key source of frustration in the farm woman's attempt to use computers for farm decision making and management tasks. Bryant (1999) concluded that a collaborative approach between men and women farmers in relation to data entry, analysis and interpretation is crucial if the farm business was to benefit fully from the adoption of farm management software.

Stewart's (2004) study of gender, technology and cotton farming found that ideologies of family farming, like technology, are socially shaped as a male domain. That is, both farm roles and technology are gendered according to whether or not they are predominantly indoor or outdoor activities or skills. Male farmers are more likely than farm women to make sophisticated use of computers for the purposes of farm decision making and management and that farm women are almost invariably recognised as lesser status, data entry operators. Stewart contended that this lead to a lack of confidence amongst women as controllers of data, which sometime led to avoidance of responsibility for developing information systems for decision-making purposes.

Bellamy, Webb, Mayocchi and Leitch (2002), in a study of the use of technologies for improved natural resource management, identified an improved adaptive ability in farm management by farm women due to increased use of computer-based decision support tools. This confirmed the

findings of an earlier study by Lewis (1998) of a strong association between innovative decision making by farmers and being better informed through the use of computer-based management information systems.

There is evidence that women have a more critical concern for the environment and health care than men (Alston 2003; Ridley 2004) with a greater concern for environmental sustainability and the effects of chemical use on family health. Yet despite these fears, family farms seem powerless in the wake of agribusinesses to escape the ‘technological imperative’ to adopt production innovations (Alston 1995). While farming families can no longer afford to isolate themselves from information about new technologies and changing practices, they need to be well informed about the consequences to the environment and to family health of their economic-based decisions.

In essence, it is apparent that cooperation in the use of the farm office computer by both farm partners (generally husband and wife) is critical for a more effective outcome. Collaborating is an opportunity for the male farmer, who frequently works outside in the paddock, to combine skills with the farm woman, who frequently works in the farm office. The study in this paper extends knowledge from earlier studies temporally and theoretically as explained in the following section.

THEORETICAL FRAMEWORK: CONNELL’S THEORY OF GENDER AS STRUCTURE

In this paper we utilise Connell’s (2002) theory of gender as structure as an analytical framework. In theorising gender relations, Connell established several units of analysis, namely gender orders

and gender regimes. The wider social sphere, represented by patterns in gender arrangements of social institutions such as ‘the state’, ‘the church’, and ‘the military’, contains a structure which Connell calls the gender order of society. Within gender orders are gender regimes which are established in smaller social settings such as families, neighbourhoods, schools, clubs, organisations, and workplaces. Within these social domains, Connell identified three main social structures: the division of labour; the exercise of power; and ‘cathexis’ which encompasses the domain of sexual social relationships (Connell 1987; 1995; Giddens 2001; Stewart 2004).

Connell (2002) revised his original theory of gender relations (1987) to include a fourth dimension. Thus, his theory of gender relations encompasses four main dimensions of gender: production, power, emotional, and symbolic relations. *Production* relations apply to the gender divisions of labour both at home and in occupational employment. *Emotional* relations as a concept are particularly applicable for emotional attachments, for example, marriage commitments. *Symbolic* relations refer to gender symbolism in life and in marketing, language, fashion, film, and even architecture. *Power* in the form of oppression operates through institutions where patriarchal dominance exists. Connell (2002, p.68) explained that while these components are analytically separate, in practice they constantly intermingle.

Giddens and Connell have similar definitions of gender. Giddens (2001:107) defined gender as “the psychological, social and cultural differences between males and females. Gender is linked to socially constructed notions of masculinity and femininity: it is not necessarily a direct product of an individual’s biological sex”. Connell (2002:8) in his contemporary theory of gender relations defined gender as “the cultural difference based on the biological division between women and men”. Connell (1987) asserted that men’s social privilege and power result from a ‘hegemonic masculinity’ tied to inherently masculine institutional and cultural definitions of

gender, and that gender inequality cannot be separated from the social construction of knowledge that serves to support a patriarchal social order.

Connell's (1987) original gender relations model was used recently by Alston (2000; 2003) with research into Australian rural women. The study by Alston is informed by concepts of gender order and gender regime for analysing the construction of gendered power relations within agriculture. Additionally, Stewart (2004) utilised Connell's theory of gender relations (1987) with its social structures of labour, power and cathexis. Stewart (2004) claimed that a weakness of the theory is methodological with no guidelines on how to study the concept of cathexis. The contemporary theory of gender relations (Connell 2002) is more recent and its use has not been extensive.

RESEARCH CONTEXT, DESIGN AND METHODOLOGY

Research Context

The management of cotton growing in Australia has become increasingly complex with the need to sustain reliable crop production while making the best use of limited water and soil resources, to utilise effective pest and weed management, and to limit detrimental environmental impacts (The Australian Cottongrower, 2006). A study by Hearn and Bange (2002) found that innovative farm management technologies such as the agricultural decision support system *CottonLOGIC* are considered keys to the adoption of sustainable farming systems.

CottonLOGIC is an advanced farm management suite of software programs to aid the management of cotton production. The software was developed in Australia in the late 1990s by the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Cotton Cooperative Research Centre (CRC), with support from the Australian Cotton

Research and Development Corporation (CRDC). *CottonLOGIC* consists of record-keeping and decision support modules to assist cotton growers and their advisors in the management of cotton pests, soil nutrition, and farm operations. Mackrell (2005) found that the design of *CottonLOGIC* into record-keeping and decision support modules have contributed to adoption and implementation success with growers being more likely to use the record-keeping modules while industry professionals are more inclined to use the decision support modules.

Design and Methodology

The research methodology of the study was qualitative thus letting the social world of cotton growing be understood contextually through the first-hand knowledge of participants, in a manner described by Walsham (1995). The rationale for a qualitative study was that an in-depth study of a situated experience would provide deeper understanding than gathering standardised quantitative data from a large sample of the population. The study is steeped with an interpretive paradigm, and as such themes have emerged from the interview data rather than being pre-determined beforehand as questions for a survey would have been (Patton 2002).

The unit of analysis was at the individual level, predominantly the Australian women cotton grower in her role on the family cotton farm. Pini (2003), in her study of women in the Queensland sugar industry, questioned the suitability of interviewing men in a feminist study. The authors had no such qualms and were prepared to accept the input of both farm partners in the interviews if there was agreement with the arrangement (Martz 2006). To enrich the data collection further and for the purposes of comparative analysis, a range of informed industry professionals were consulted for their perceptions of growers' roles in farm management.

All participants were selected according to a purposeful sampling strategy. The cotton growers were selected based on the following criteria: 1) farmed in the Australian eastern states of

Queensland or northern New South Wales; 2) were responsible for, that is, owned and / or managed family farms irrespective of size (as distinct from farms owned by large corporations); 3) indicated an awareness of environmentally sustainable and high-technology farming practices; and 4) were registered on a *CottonLOGIC* and / or Wincott (*Women in Cotton Industry Network*) database. The industry professionals were cotton agronomists and consultants, rural extension officers, researchers and educators, rural experimental scientists and *CottonLOGIC* developers who were located in Queensland or northern New South Wales. As professionals, all these participants had to have some knowledge of agricultural DSS either through development, usage, research or teaching, and, to some extent, were observers and/or advisors of cotton growers.

Data gathering took place during three field studies and one telephone study with 32 participants over three years. Appendix A lists interviewee biographical details with the identity of each interviewee disguised by a pseudonym. An interview guide was prepared to steer the interviews which were conducted at locations selected by participants, with each interview lasting at least an hour, and recorded on audio tape with permission. Interviews alternated between semi-structured and conversational depending on circumstance: semi-structured when the interviewee needed considerable guidance, and conversational when that was not the case. Usually, interviewees told their story without needing much intervention from the interviewer. Notes on each interview were recorded daily in an activity log and interviews were transcribed from audio tape into Microsoft Word as soon as possible.

Analysis was manual rather than computer-assisted since the number of interview transcripts was workable and the obligation to stay closely connected with the data was fundamental. Codes used in analysis were based on concepts or themes drawn from both the literature and theoretical framework. In short, this study of cotton growers using farm management software in the

Australian cotton industry was an interpretive single case using ideographic methods. It allowed a first-hand investigation, involving several field trips to study participants in their natural setting, taking place over an extended period of time, and producing a textual analysis of rich insights after a period of reflection.

DATA ANALYSIS

This section reports the analysis of gender relations in the context of farm management on the Australian family cotton farm using as a conceptual lens Connell's (2002) theory of gender relations with its four social structures of gender, production, power, emotional, and symbolic relations. The following analysis commences with production relationships. This is justified because the family farm as a commercial enterprise is production centric. That is, if production ceases so eventually will the farm as a business unit.

Production Relationships

According to Connell (2002), production relationships pertain to the gender divisions of labour both at home and in occupational employment. The Australian rural literature indicates that women's roles extend from household worker/manager to farm worker/manager as well as to carer for children and the elderly (James 1989; Board 1997). Men's roles are traditionally associated with the production and marketing aspects of farming with the majority of time spent outside (Alston 2000).

The notion of being part of a family farm management team was reiterated by several women growers in relation to a husband and wife joint partnership. Meg, a grower, explained that her role on the 'team' was as the farm bookkeeper:

You were asking about women's roles but in the cotton industry, it's more of a team. The bookkeeping is the biggest factor [of my role]. We use the computer for that. I do all the bookkeeping.

In the context of cotton growing, commonly the woman farm partner performed tasks in the conventional mould such as doing the farm accounts while the male farmer worked outside in the fields. However, the traditional gender divisions of labour did not diminish the importance of the task or a partner's appreciation of the other's contribution to the team effort. Brad (Meg's farm partner) recognised Meg's valuable contribution to production as he expressed his relief and appreciation of her willingness to help reduce the management burden. Brad was grateful that decision making in farm management could be shared with someone with the same goals. Furthermore, Brad acknowledged the importance of office work and his conviction that the inside / outside balance should shift so that less time was spent outside:

Meg does all the stuff inside here and I basically do most of the stuff outside. I'll tell you what I find. There are so many decisions that you have to make and so many things in the modern agricultural world, or certainly on cotton farms, it's a big load for any one particular person, and I just reckon that it really improves the efficiency of the whole thing. I can just rely on Meg to look after all the accounts, all the human resources sort of stuff. I don't have to worry about them... we should be working more on the business and be less hands-on.

Selma, a grower, also worked a great deal in the farm office. Her industry knowledge from participation in local grower associations meant that her role on the farm extended beyond bookkeeping and human resources towards strategic production decisions. She had very firm views on the running of successful cotton and cattle properties, and the importance of good management. Therefore, it was Selma, not her farm partner Bill, who noted that he should have more involvement in farm management with a reduced emphasis on outdoor work. Both Brad's and Selma's comments implied a reversal of the commonly accepted attitude that inside office work (unlike outside physical work) is not considered to be real work.

We work as a team really. I'm more focussed on the administration side of things. Bill [farm partner] is more focussed on the day-to-day running, and keeping out of the office which he shouldn't do. He needs to be more involved.

Both Meg and Selma did not limit their involvement to the farm office and that both women worked willingly alongside their male farm partners when circumstances dictated the need for their labour out in the paddocks:

And it really is a team. I actually drive out and I work with Brad. We do irrigating together (Meg)

And

If they need an extra hand, I'm down there or if cultivating and trying to get around something, I'll jump on the cultivator (Selma)

Despite evidence of traditional gender divisions of labour in the home and outside, there was a demonstrated softening of role distinctions. As more women were shouldering the administration tasks of the farm business, some men were more willing to help out in the house:

Interviewer: And does he ever help you in the house?

Julia (grower): Yes things are pretty good actually. Most men won't even make a cup of tea let alone cook a meal, whereas if I'm busy doing paper work and he's not busy, it's not this thing where a lot of men will ask ... what are we having for lunch? But he will go ahead and make it.

Several industry professionals recognised the husband and wife partnership style of farm management as becoming a norm across smaller family farms.

Reese (professional): I think that is a pattern across the industry. The smaller growers, the family farms, their children including the girls go out and work in the fields.

The financial benefits to the farm enterprise in combining limited human resources were identified. Correspondingly, the human capital of the women grew with their skills:

Kylie (professional): They [women] are very much a partner in the business and unless you have both the financial and production sides of things working very well, you're not going to make money today because farming's a business ... if you didn't have a wife to do it, you'd have to pay

somebody else and nine times out of ten, they [women] know the business so well that they really adding value with what they are doing.

It was evident that some women growers were becoming more involved in marketing, selling and buying, as well as investment decisions on family farms, tasks which have traditionally been in the male domain. For example, Selma explained her roles:

I'll deal with interest rates. I'll sell cotton. I'll make decisions about options, and things like that. He'll [farm partner] have no hassles with that. He's a fair bit more liberal than the traditional guys.

In the above scenario, Selma takes on the marketing, selling, and investment tasks that expose her to financial risks. In the recent past, this function would probably have been the domain of the male farmer or farm manager. Women operating outside conventional rural gender norms such as this would once have been treated with suspicion. However, as previously stated, Selma's farm partner husband would rather be out in the fields and not in the office. Therefore, for this family farming team, this is a win-win situation where tasks are allocated according to skills and preferences rather than gender. Beyond the farm gate, Selma is involved in local grower associations. Undoubtedly, these accomplishments honed in the farm office, benefit the wider community and vice versa.

There is a growing expectation that women's roles will be more varied as youth become adults in a rural society with the prospect of fewer gendered boundaries. Toni, a grower with two young daughters, explained:

Interviewer: *You're saying that the girls work outside. Do you think that is an indication of things changing?*

Toni (grower): *Yes definitely. I see no problem with that. My mum never did anything and I probably do a bit more than her.*

The loosening of gender-based restrictions was evident to Reese in her work for a cotton agribusiness. Since Australian agricultural colleges opened enrolment to women in the 1970s (Alston 2000; 2003), working in the rural sector became a career choice for an increasing number of women.

... but I think there are more women becoming involved in the industry as a whole, from being agronomist or growers though to the chemical companies and sales people and even out in the field, there are a few. Maybe not near as much as what males are but I think they are becoming more involved in the office side of things.

Within this section, gender divisions of labour in the production units on family cotton farms have been explored revealing notions of teamwork and adjustments in societal norms. It is evident that some behavioural changes are generational with many farm women unwilling to accept codes of behaviour from previous generations. As women adopted new responsibilities, such as preparing financial budgets, and marketing and selling cotton, it is expected that these roles would become sanctioned as normal codes of behaviour over time.

Power Relationships

Connell (2002) stated that power relationships in the form of oppression operate through institutions where patriarchal dominance still exists. Foucault, cited in Connell (2002, pp.58-59), proposed another form of power where “power is widely dispersed, and operates intimately and diffusely. Especially it operates discursively, through the ways we talk, write and conceptualise”. This power is less authoritative, oppressive and confrontational. Both institutional and discursive power is used as analytical concepts below to facilitate an understanding of gender in relationships of authority.

In the context of the cotton industry, institutional patriarchal power interviewees identified this as part an older generational pattern. For example:

Helena (grower): *With women, some husbands stop them going into the fields. They are not allowed to make decisions, but I think women's input is just as important as the men's.*

Selma (grower): *I think Bill's a bit different to most of the farm blokes around. I know blokes who don't let their wives get mail from the post office.*

Interviewer: *Is that your age group?*

Selma (grower): *No, I'm talking another ten years older. Oh, yeah, twenty years older.*

Discursive power was more in evidence in this study. Sigrid, an experimental scientist, explained how the financial information which the women acquired as they prepared the farm accounts gave them the knowledge to challenge decisions of some magnitude.

Sigrid (professional): *Whereas a consultant might tell a [male] grower to spray such-and-such, they might not even question how much that will cost or if there is an alternative. Whereas the women, because they know how much it was, and they put it in [the budget], they are possibly more challenging to their consultant.*

Many of these decisions were of strategic importance to the farm business and provided the farm women with a measure of control, thus supporting the findings by Bryant (1999) that some women are using data from record-keeping to participate in and influence decisions about farm management. Sigrid illustrated the light-hearted banter between her parents regarding the purchase of machinery.

Sigrid (professional): *Women seem to get their power and ability to make decisions on the farm because they know exactly what the budget was, because they've done the budget. A lot of the men wouldn't have a clue. What Dad often says 'I think I'm going to buy a round-bale machine'? Mum's like 'Yeah right, no, it's not in the budget. We can't. But we can put it in next year'.*

The statement below by Elle, a grower, illustrated a structured decision-making process where the four partners jointly decided on the more significant strategic management issues while the male partners together made the operational decisions.

Elle (grower): *any decision that we make regarding management decisions, there are four of us in our partnership, we have a meeting and the four of us make the decision. If it's a big management decision then the four of us must agree. The two men make the decisions on the*

day-to-day running of the farm, this is what we plant, and this is where we're going to plant it and all that sort of thing.

All the same, farm women have been identified as an under-utilised and unappreciated resource in decision making and direction setting in the rural sector (Alston 1995; 1998; Board 1997; Claridge 1998). As Reese, a consultant, explained, the farm woman is often well-positioned to offer an alternative perspective.

That's right and there are also things that women will see in management that a man can't see. Like a man is looking at the things all the time whereas a fresh face, not necessarily the wife or the women involved, but any fresh face but it's normally the woman ...

Major decisions in the cotton industry currently revolve around reducing chemical and water usage. Julia, a grower, and her farm partner had reflected on the implications for their young family and had made a conscious decision to abide by industry guidelines for chemical applications:

I get annoyed about the whole spraying issue... but we have made a decision ourselves that we would do the right thing.

Many of the women cotton growers claim to be part of the family farm team, yet day-to-day decisions connected with production - as applied to crop planting, spraying, or harvesting - are dominated by the men. Reese, a cotton professional, explained that women on family farms are not so involved in operational decisions on production but more with record-keeping:

... But I think a lot of growers; the males take on the decision making themselves in conjunction perhaps with their agronomist. I think that women are taking more of a role in the record-keeping though.

Diane, a service manager for an agribusiness, justified women farm partners' exclusion from operational and production decisions.

Diane (professional): ... *but as far as the actual agronomic side of things, most of them [the women] don't have that background to be able to discuss it with them [male partners].*

George, an independent consultant, confirmed the lesser impact of women on operational day-to-day decisions:

Women on the farms always have had a strong orientation to the strategic positions, not the day-to-day decisions.

In order to participate in operational level decisions, there was the necessity to be acquainted with chemicals, product costings, as well as the science of crop and soil management. Meg admitted that the main factor in her not continuing with *CottonLOGIC* was that she felt that the software required a greater knowledge of agronomy than she had. However, Julia explained that she and her male farm partner always shared financial decision making, albeit in a less formal way:

We don't spend any money basically unless we talk about it. But where like the men go off and do whatever they like and the wives don't even know, neither of us go buying or do anything without seeing what the other person thinks.

Alston (1995, p.63) claimed that if a farm is owned in partnership by a male farmer and his family, the farm woman will remain marginalised from the farm business. She described the male-oriented culture in farming as follows:

The structure of the farm family shapes the very nature of the farm woman's life. If the farm is owned by her father-in-law or in partnership with her husband's brothers, she will remain marginalised within the family and the business for much of her life.

Several times during interviews, it was implied that the management context had changed once extended family, such as brothers and brothers-in-law, had left the farm partnership and the controlling entity had reverted to the male farmer and his wife:

Toni (grower): ... *now that the boys [farm partner and his brother] have split their partnership and we're working separately, and now the girls are old enough to help, they drive the tractors, move the irrigators*

As stated in the literature review, there has been an increase in farming partnerships, most of which are between husband and wife. Australian rural women now make up 40% of all farm partners (James 1989; 1990) with farm women moving away from a predominantly supportive role to become more involved with the business side of the family farm enterprise (Fisher & Hutchison 1997). The change in legal partnership has given the farm woman the opportunity to assume a greater role in strategic decisions of farm management. The comment below was made by Sarah to illustrate her increased participation in marketing decisions without her brother-in-law in the partnership:

My husband is not chauvinistic. We work collaboratively. With regards to decision making, we know we will grow cotton. I have input into every bale sold and I'm involved in marketing. But that didn't happen when we were with Gordon's brother. Now we are out on our own. This year is the first crop in our partnership without my brother-in-law.

While there was little verification of institutional power in the study, except from hearsay, discursive power was in evidence and usually it was wielded by the women who were familiar with the financial circumstance of the farming business. As indicated previously, the situation for farm women varied immensely. Factors affecting their participation in farm management included age, their educational background, the presence of relatives in the partnership, and the employment of agronomists or consultants. Nevertheless, the women interviewees were strongly aware of their rights as farm partners and disapproved of patriarchal and patronising attitudes.

Emotional Relationships

Emotional relationships apply when attachments are based on emotions (Connell 2002), as in family commitments, and in business and lifestyle choices such as the running of the family farm. In the example below, Selma expressed the strength of the attachment to the farm:

Selma (grower): *We have to work as a team. We've had to fight a lot of hard battles to have what we've got. We're determined to stay viable and on the land. We have to take an active role.*

Three of the farm women explained that historically women have not always been so connected, nor have they participated by sharing the farm management load. This was commented on by

I suppose my mother was never really involved in any of the farm stuff but it was more the point of view that if they know you can do it then they get you to do it ... and she's often said to me don't always say you can do everything (because) then you will have to do it.

As explained by Julia, her mother appeared to lack emotional commitment to the farm. However, there may have been several reasons for this, none of which were given. Her mother may have been burdened nurturing children, and housekeeping for an extended household. As well, there may have been negative responses to any of her suggestions about farm management. However Julia, herself, had adopted a greater connection to the farm represented by active participation in farm management decisions.

Although times are challenging in rural Australia, emotional commitment to the family, farm, business, community and lifestyle seemed resolute amongst most of the interviewees. This confirmed the findings of Bamberry et al. (1997) who noted that farm women have a strong commitment to farm, family and community.

Symbolic Relationships

Symbolic relationships in gender relations refer to gender symbolism in language, fashion, film, marketing and even architecture, and its contribution to the construction of identities (Connell 2002). Connell (2002, p.73) states that “patriarchy has long been legitimated by belief systems

which picture gender as a timeless unchanging division ... over the last century and a half, social and intellectual movements have chipped away at these assumptions”. Diane, a woman cotton agribusiness manager, opined that the marketing of *CottonLOGIC* was directed mainly to men in the cotton industry:

The thing that I see why CottonLOGIC, ... and those sorts of things, haven't been picked up, the marketing of the extension of those programs has been directed towards men and not so much the women. One of the reasons, and it's just a theory, it's safer and easier, and it's in one of those grey areas

As discussed, Stewart (2004) found that rural services such the marketing and extension of agricultural products had been focussed, in the past, more towards the male farmer. Diane perceived this was also the case with *CottonLOGIC*. Paradoxically, the *CottonLOGIC* courses were run by Sigrid, an experimental scientist, and much of the material promoting *CottonLOGIC* showed women as cotton scouts. All the same, George, an independent consultant, observed that in many cases, the perception of farm women is still unflattering:

The women are starting way behind the eight ball. Even if they are intellectually far ahead of the farmer, they are perceived as way behind the eight ball.

There is evidence that this practice is changing to become more family focussed with the entire family invited to participate in field days. According to Naomi, a cotton extension coordinator, this encourages the women to be involved and not left behind at home caring for children:

But certainly if you're running field days, mostly men attend. We're really trying to encourage – same with our IPM [Integrated Pest Management] courses (and) we make provisions for the family to come at a discounted rate. We're really trying to encourage as a choice, decision making and learning.

As stated earlier, recent studies have found that farm women are defining themselves as farmers or farm managers rather than simply as ‘farmers’ wives’ (Alston 2003). This study has

determined that the involvement of women cotton growers in a diverse range of farm related activities justifies their self-styled description of themselves as cotton growers rather than simply cotton growers' wives.

In summary, relationships of production, power, emotions and symbolism from Connell's (2002) theory of gender relations illuminate that teamwork was highly valued by farm partners, especially by the women themselves. The women cotton growers were confident of the value of their labours in the farm office and paddocks. They were committed to their way of life, and aware of their identity as cotton growers not just as wives, important as that function is. While women's tasks on farms generally fell within traditional gender norms being inside work, the blending of male and female roles through necessity meant that gender distinctions were becoming blurred. Even so, farm women's participation in decision making associated with the production aspects of farming was low.

DISCUSSION

The social dimensions of gender relations as defined by Connell (2002), namely, production, power, emotion and symbolism, are highly relevant in the context of the study. Combined together, these concepts signified the relations between farm partners, usually husband and wife, as together they managed the family farm as a small business enterprise. Relations were productive because the farm partners laboured together to sustain the family farm as an economically viable business entity. Power was characterised by the allocation of decision-making roles. The bonds of the farm partners were emotional because of marital responsibilities and all that family life on a farm entailed. Symbolism had an important association with marketing and influenced perceptions within / of the cotton industry.

The analysis of the data elicited some interesting findings such as the prevalence of teamwork in the farm partnership, the conviction of the women regarding the value of their roles as farm managers, and the changing focus of marketing towards women and families in the industry. These are discussed below.

Multidisciplinary Teams in Farm Management

Few studies have investigated multidisciplinary teamwork in the rural sector. Studies into multidisciplinary teamwork in health care highlight the value of diversity, as well as the obstacles when health care professionals have differing attitudes towards the outcome. Further, because of the separate development of the individuals in health care teams, work tends not to be collaborative (Firth-Cozens 2001). Cott (1998), in a study of multidisciplinary teamwork in the Canadian health care system, claims that definitions of teamwork emphasise some of the basic assumptions of multidisciplinary teams. These are that team members should have a shared understanding of roles, norms, and values so that the team functions in a cooperative, egalitarian but interdependent manner, and that cooperative decision making should benefit the purpose (or patient) rather than the individual team member. In brief, while a group works together to achieve a certain outcome, a multidisciplinary team is a group of people with different training and experience working together with a common purpose. Therefore the tasks they perform as team members may not be the same but instead are related to their expertise in benefiting the collective outcome.

For this study, the concept of multidisciplinary teams essentially describes partnerships on family cotton farms in the Australian cotton sector. The evidence suggests that teamwork on the family farm is of a collaborative but interdependent nature. Moreover, since roles may overlap, there is certain flexibility about which tasks are to be performed, when and by whom, in order to achieve

a viable and sustainable family farm business. It was apparent that the women had no hesitation in regarding themselves as team members in the family farm business. All the same, in a few cases the women declared that the functioning of the team would improve with greater cooperation of farm partner husbands.

Women as Decision Makers in Farm Partnerships

Like most rural sectors, the cotton industry is subject to volatility, as in the weather, market supply and demand, costs and prices, legislative compliance, environmental policies, and community expectations. It is essential for women as farm partners to have the resourcefulness to respond to these fluctuations. The knowledge and skills that women bring to the workplace are diverse, enrich rural society, and enable them to adapt and cope. Women's roles on farms vary from farm to farm, and from season to season with on-farm and off-farm work placing full demands on their times. Certainly for most farm women, their time is in short supply due to the extensive and varied roles they assume. Some women, especially when children are young, assume traditional roles inside the home while others spend more time on outside duties.

Several women growers recognised that the use of financial software, along with knowledge of the farm budget, influenced their farm management roles, notably for strategic decisions. However on the production side of the farming operation, the women were consulted less. For them, there were numerous constraints. Aside from lacking confidence in their agronomic knowledge, the main one was that the male grower and the farm agronomist/consultant made decisions frequently and in haste in the fields based on their experience and intuition. This was to the disadvantage of many of the women partners who were often not present. This situation highlights the fact that technology courses for women farm partners may need to include an agronomy component to supplement software training. This would enable the women to be

better informed and, if they aspire to it, to participate more usefully in farm decision making at an operational level.

Bellamy et al (2002) in their report of a cross-industry rural Australian study exploring the use of technologies for improved natural resource management found that 70% to 80% of women in rural industries self-reported as being jointly involved in major (strategic) decision making with their farm partner / spouse and / or other family members. Bellamy et al. (2002) also found that the quality of those relationships was crucial in helping to foster greater involvement in on-farm decision making. The study indicated that only 10% of cotton women participated in joint decisions at an operational level compared with those in other rural industries such as beef and grains where 60% of women self-reported to contribute to production decisions (Bellamy et al. 2002). This meant that the women in the cotton industry seemed to be considerably less involved in the day-to-day decisions associated with production or marketing than in other rural industries with more input into the long term strategic decisions.

In the abundant literature on women on farms in Australia, personal conflicts between self fulfilment and farm wifely duties have been regularly recorded (Sachs 1983; James 1989; Alston 1995; Stewart 2004; Allan 2005). Nevertheless for the women in this study, the sense of isolation, unhappiness and despair regularly documented were not substantiated. Despite trying drought conditions, only one women grower for one brief moment admitted to personal feelings of inadequacy and discontent. The recent establishment of Wincott (*Women in Cotton Industry Network*) as a resource and self-support organisation by the women of the industry denotes a recognition of their self-identity, of their achievements, as well as limitations in accessing knowledge. Wincott encourages members to ask question and seek answers without

embarrassment. It is a source of motivation, backing, and confidence for many of its women members despite some initial resistance from men in the industry.

There are claims in the literature that farm women are an underutilised resource although their changing status as legal farm partners has given them the opportunity to assume a greater role in farm management (Alston 1995; 1998; 2000; Claridge 1998). Two women growers hinted at discordant relations in farm partnerships when extended families were involved. For these women, the position improved when, with their farm partner, they became the controlling entity and dominant decisions-makers after extended family such as brothers and brothers-in-law exited the farm partnership. This confirmed the findings by Stewart (2004) that farm women were able to build more equal partnerships with their farmer husbands when other males were not involved in the farm partnership. Furthermore, these same women were inclined to use computers in ways that reflected greater power.

Gender Stereotypes in Marketing Symbolism

The perception of the supremacy of masculine discourse in rural services, such as rural extension and marketing, may be partly responsible for farm women's reluctance to utilise computers for decision making. Stewart (1997, pp.241-258), gives numerous instances where 'hegemonic masculinity' is represented in advertisements in specialist farm literature by depicting older, weathered male farmers and heavy, powerful machinery. Conversely, emphasised femininity was symbolised in industry related journals by young models on the catwalk wearing fashionable cotton garments. Rarely were women depicted driving heavy machinery or men modelling cotton garb. Within the ideologies of farming, the symbolism of hegemonic masculinity versus emphasised femininity is associated with Connell's notion of power relations. Nonetheless, the rural sector is beginning to change, as in the latest 'Cotton Yearbook' (2008) by the Australian

Cottongrower. Images of wholesome family scenes are becoming more common. This atmosphere is less threatening to women as it encourages their involvement alongside that of their farm partner husbands.

CONCLUSION

In this section, the contributions of the paper in relation to the identified research problem are discussed as well as the limitations of the paper and topics for future research.

Implications for Theory

Walsham (1995) categorised generalisation as concepts, theory, specific implications, or rich insights. Distinct from the representativeness of findings (external validity) in quantitative studies, generalisability in a single interpretive case study such as this, involves generalising from empirical, rich descriptions to theoretical statements. For this study, the outcome is rich insights rather than the generation or testing of theories. As explained earlier, this paper extends extant scholarly literature in the research domain of the study, namely gender, farm management software, and farming, certainly within the context of Australian cotton. Furthermore, Connell's (2002) gender relations theory as a conceptual lens has provided novel views of the social world of women cotton growers. These are the theoretical contributions of the paper.

Implications for Practice

The practical implications from the increased decision choices of women cotton growers are innumerable. As accepted farm management team members, farm women should be considered when rural goods and services are promoted, when positions for farm managers on rural properties are advertised, and when government policy affecting the rural sector is being prepared. It is possible that greater skills in the use of farm management software may be a

means of improving the self-confidence of farm women as decision makers, and that involving farm women in decision making may help in finding sustainable farming solutions outside those in existing practice. The study may therefore provide some guidelines for the future design, development, and delivery of agricultural DSS such as *CottonLOGIC*.

In response to the research question “What is the nature of the gendered relationship between farm partners, particularly with regards to computer-based information system decision-making processes on family cotton farms?”, the findings suggest that women cotton growers are no longer ‘invisible’. While reluctant to challenge traditional notions of identity, farm women are not immune to social trends with generational change taking place on family cotton farms. With their diversity of skills, women are becoming valued and ‘visible’ members of family farm management team especially in the area of strategic decision making. Ever since farm women took over the bookkeeper role in family farm enterprises, the knowledge acquired has assisted them in influencing financial decisions at many levels on a farm.

Limitations

Constraints of the study were methodologically based. Cotton growers and professionals were interviewed who were information-rich cases, not statistical representations of the cotton industry. Undoubtedly, there were others in the industry with a story to tell, yet did not fit the sampling criteria. Further, little attempt was made during analysis to separate statements of cotton growers and industry professionals since themes were examined from the perspectives of both. Consequently, future research could take these limitations into account.

Evidence from the study recognised the imperative of sustainable and innovative practices in cotton farm management to impact on an improved triple bottom line (social, environmental and economic outcomes). The study endorsed the existence of gender differences and inequalities in

rural Australia. Nevertheless the environment is dynamic, with transformations occurring in social structures. Women cotton growers are not passive agents but are taking responsibility for their own futures. With the awareness and confidence gained through involvement in interpersonal networks, participation in training, and the acquisition of technological skills, they are constructing and reconstructing their lives.

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Appendix A

Brief Biographies of Participants in Field Studies

Darling Downs – Gwydir Valley – Namoi Valley

Interviewee	Family Members	Occupation and Qualifications
Naomi	N/A	Cotton Extension Coordinator, DPI, Toowoomba (east of Dalby). Postgraduate degree
Toni	Farm partner Laurence, three school-aged children	Cotton Grower, Cecil Plains (south of Dalby)
#Ryan	N/A	Extension Officer Dept of Primary Industry, Dalby
Reese	N/A	Consultant Qld Cotton, Dalby. Advanced Diploma in Rural Business Administration
Julia	Farm partner, two school-aged children	Cotton Grower, Chinchilla (west of Dalby)
Cate	Farm partner Alan, two school-aged children	Cotton Grower & Wincott Convenor, Moree
#Sigrid	N/A	Member of CMSS & Experimental Scientist, CSIRO Plant Industry ACRI, Narrabri. Bachelor degree
Rachel	Farm partner Tim, two adult sons who work on the property	Cotton Grower, Boggabri (south of Narrabri)
Nicole	Farm partner Michael, four preschool & school-aged children	Cotton Grower Baan Baa (south of Narrabri)
#Paul	N/A	Coordinator, Technology Resource Centre & Member of CMSS ACRI, Narrabri
#Ken	N/A	Project Leader of CMSS & Senior Research Scientist, CSIRO Plant Industry ACRI, Narrabri. Postgraduate degree
Renee	Farm partner Dean, three school-aged children	Cotton Grower & Publicity Officer for Wincott, Wee Waa
*Cara	Farm partner and two adult children	Cotton Grower, Wee Waa

This interviewee was a key informant.

* The data from this interview was not used.

Theodore – Emerald

Interviewee	Family Members	Occupation and Qualifications
George	N/A	Consultant, Gin Gin (east of Theodore on Queensland coast). Postgraduate degree
*Lisa & focus group	Farm partner, school-aged children	Cotton Grower, Theodore
Selma	Farm partner Bill, four preschool & school-aged children (have full-time nanny)	Cotton Grower & Wincott Regional Representative, Emerald
Tom	N/A	Instructor, Emerald Agricultural College.
Uma	Farm partner Jason, one toddler child	Cotton Grower, previously an Agronomist, Emerald. Honours degree
Diane	N/A	Growers Services Manager, Cotton Australia, Emerald. Postgraduate degree

* The data from this interview was not used.

Darling Downs – Namoi Valley – Border Rivers

Interviewee	Family Members	Occupation and Qualifications
Kirsten	Agronomist partner	Agronomist, Wee Waa. Honours degree
# Ken	N/A	Project Leader of CMSS & Senior Research Scientist, CSIRO Plant Industry ACRI, Narrabri. Postgraduate degree
Sigrid	N/A	Member of CMSS & Experimental Scientist, CSIRO Plant Industry ACRI, Narrabri. Bachelor degree
Jack	N/A	Member of CMSS & Project

		Technical Supervisor ACRI, Narrabri
Lucy & Gwen	N/A	Agronomists Walgett, (west of Wee Waa). Diploma & bachelor degree
Russell	N/A	On-farm Agronomist, Twynam Collarenbri (north of Wee Waa). Bachelor degree
Kylie	Farm partner, three preschool & school-aged children	Executive Officer Cotton Consultants Australia (CCA) (NSW Rural Woman of the Year 2004), Narrabri
Steve	Farm partner Jessica, brother David, school-aged children	Cotton Grower & Director of Cotton Australia, Narrabri
Elle	Farm partner Geoffrey, two school-aged children	Cotton Grower, Mungindi (south of St George). Bachelor degree.
Meg	Farm partner Brad, several children of varying ages from previous marriages	Cotton Grower, Mungindi (south of St George)
Michelle	Farm partner, three adult children	Cotton Grower, Warra (west of Dalby)
Sean	Farm partner	Cotton Grower & ACGRA Chair, Dalby
⁺ Naomi	N/A	Cotton Extension Coordinator, DPI, Toowoomba (east of Dalby). Postgraduate degree
Ben	Partner, children of varying ages	Senior Lecturer in Plant Pathology, School of Agronomy & Horticulture Gatton Campus UQ. Postgraduate degree

This interviewee was a key informant.

⁺ This was the second interview.

Telephone Study

Interviewee	Family Members	Occupation and Qualifications
Helena	Farm partner, two teenage children	Cotton Grower, Emerald. Bachelor degree
Jodie	Farm partner, children	Cotton Grower, Bowenville (near Dalby)

Heath	Farm partner, children	Cotton Grower & ACGRA Representative, St George
Sarah	Farm partner, three school-aged children	Cotton Grower, Mungindi
Richard	N/A	Consultant, St George
Cyd	N/A	Policy Advisor, Cotton Australia, Brisbane