Daniela Orge Fuentes and Henrik Wiig

Closing the gender land gap

The effects of land-titling for women in Peru

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Preface

This is the first report from the project on land and gender in Peru at NIBR financed by the Norwegian Research Council (193726/S50). Daniela Orge Fuentes is thankful for the research travel grant from the Norwegian Mapping Authority's Centre for Property Rights and Development which later led to formulation of the project.

We also thank the GRADE research institute in Lima, Peru, for letting us use their panel study data from the evaluation they did on the special rural land-titling project PETT, together with CUANTO, also based in Lima. The women from the Peruvian feminist NGO Flora Tristán also shared considerable knowledge on the gender aspects of PETT and provided valuable inputs regarding gender roles in rural Peru. Finally, both Orge Fuentes and Wiig want to direct a special gratitude to the people of Tambo, Ayacucho, for sharing their life stories, opening their homes and providing a glimpse of how women's realities are often so different from men's lives.

Keywords: land titling, gender, joint titling, Peru. JEL codes: O-01, O-02

Oslo, November 2009

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Land formalization reforms in developing countries are often criticized for cementing historically unequal property rights between the sexes. The Peruvian formalization law is gender neutral and was only supposed to formalize existing informal property rights. However, protests from the feminist movement led the implementing agency to favour joint ownership between spouses. Our analysis of the 2004 data in the GRADE survey shows that 43 per cent of all formally titled plots are jointly owned compared to 39 per cent in the control group of untitled plots. However, the level is more than three times larger than 13 per cent joint ownership in the Peruvian LSMS 2000 as calculated by Deere & León (2003). Gender equality might be even more pronounced as joint ownership increases to 56 percent for the subsample of titled male-headed couple households. The result is superior to formalization programmes in many other countries with compulsive joint ownership. The econometric analysis shows that joint ownership is more common in the more traditional highlands with smaller plots than in the more commercial agricultural areas on the coast; educated and married women have higher probabilities of obtaining joint titles.

Keywords: land titling, gender, joint titling, Peru

JEL codes: O-01, O-02

1 Introduction

In most developing countries agricultural land is the property of men. Landownership is associated with status, power and wealth. Scholars also posit that those who own the property within the household often determine who has more bargaining power within the marriage and make the household and farm decisions (Agarwal, 1994a). Moreover, a growing empirical body of literature shows that women's landownership not only enhances their bargaining power, but also leads to improvements in households' incomes, as well as improving other measures of welfare, such as child health and school attendance (Deere and León, 2001b). This has spurred an interest in policies that promote women's access to land and other assets, and hence gender equity, among development practitioners and academia in general.

Since the early 1990s governments throughout the developing world have been pursuing formalization of land rights through land titling and registration programmes. Generally conceived as part of pro-growth agendas, such programmes have aimed at providing tenure security in order to encourage and activate land and credit markets, thus enhancing agricultural productivity and production. In some countries, formalization of land rights has also been accompanied by individualization of collective or community-owned lands to create the incentives for enhanced market production.

These land programmes were often conceived without attention to their impact on gender. Critics considered that the formalization of land rights, at best, would cement the existing unequal division of land between men and women. At worst, female landowners might lose land as these titling processes tended to favour the man as the primary agriculturalist within the household. Furthermore, in regions of customary land tenure where each community member has access to a minimum amount of land to ensure their subsistence, there was concern that the individualization of land rights would lead to the end of such socially equalizing practices, to the detriment of women as they often constitute the weaker parts in a local community.

In Latin America a number of countries adopted policies of joint titling of land to couples in their land titling programmes as a means of addressing the gender land inequality problem because of the pressure of the organized rural women's movement, feminist NGOs and the national women's offices. In practice, however, joint titling of land to couples is difficult to achieve and many of the Latin American countries have experienced a great disparity between official laws and guidelines concerning the land titling process, and the real impact, which often has been no

more favourable to women than the situation before the land titling started (GRADE, 2007a).

Peru launched its Special Land Titling and Cadastre Project (PETT)[1] in 1992, and it still has no special provision to secure women's land rights. Even though the joint titling of land to couples was never adopted as official policy, the activism of NGOs and rural women's groups appears to have had an impact on how the formalization programme was actually implemented. The evaluation of PETT by the Peruvian research institute Development Research Group (GRADE) commissioned by the Peruvian Ministry of Agriculture (MINAG) as part of their contract with the project donor Inter-American Development Bank (IDB) is based on a survey of 2,034 households that received titles during the second phase of the programme. It found that 76 per cent of all households with couples who by 2004 had a joint title for at least one of the household's plots (2003)[2]. In our calculation from the same data set we find that 56 per cent of the plots in such male-headed couple households who had received PETT titles were jointly titled in 2004, compared to 49 per cent for the control group of households that had not received PETT titles. This represents a significant difference in the incidence of joint ownership.

The share of joint ownership drops to 43 per cent for PETT titled households in the full sample where also single-households are included compared to 39 per cent for households that had not received PETT titles. However, it represents a massive increase in joint ownership when we compare with historical figures. An analysis of the Peruvian LSMS[3] for 2000 by Deere & León (2003) revealed that only 13 per cent of the land plots were then jointly owned. Hence, the high level of joint titling in the PETT programme is rather revolutionary as the level of joint ownership is even higher than in some countries with mandatory joint titling. There are however many single headed households in the full sample, which implies that the higher figure in the subsample of plots owned by male headed couple households is probably a more relevant gender equality measure.

This paper analyses what the effects of the Peruvian rural land-titling project have been on women's rights to land. The PETT programme has been categorized as *gender neutral* as it never adopted any gender specific regulations and laws regarding the project implementation. Despite, or perhaps as a consequence of this, PETT was subject to heavy criticism from civil society late in the late '90s for having neglected women and their rights. In the frontline of this criticism was the feminist NGO Peruvian Women's Centre Flora Tristán (CMP). The NGO led a nationwide campaign and conducted research to find out what was in fact happening with the rural women in their encounters with PETT. One of its biggest concerns was the situation of women living in consensual unions, a way of living together which is very common in rural Peru (CIA, 2009). CMP found that PETT officials had little awareness of gender issues and gender-sensitive practices and that women in

[1] Over the last decade PETT has issued certificates for over 5.8 million plots in rural Peru according to their home page. PETT was merged into its urban land-titling counterpart, the Organization of Formalization of Informal Property (COFOPRI) in 2007.

[2] The statistical institute CUANTO carried out the data collection.

[3] The LSMS (Living Standards Measurement Surveys) has been sponsored by the World Bank and carried out in a number of Latin American countries during the 1990s.

consensual unions lost out compared to their married sisters due to gender bias in the project implementation itself. Rural women suffer from higher illiteracy rates, and women are more prone to be monolingual than men. They all represent factors that might disadvantage female landholders and their ability to claim their rights and thus obtain land titles. CMP's research also concluded in that women's lack of ID papers was another considerable hindrance as PETT staff could not write out land titles to people without formal identification papers. The NGO hence launched an awareness campaign on ID papers which coincided with (and possibly reinforced) ongoing governmental programmes in the countryside. CMP was also later given the opportunity to conduct gender-sensitivity training with PETT officials.

The aim of this study is to find the effect of the Peruvian rural land-titling project on women's rights to land emphasizing joint titling. We use the GRADE data set from 2004 to estimate decisive household characteristics for joint and female single ownership where women's educational level is found to be an important explanation. Not only is the number of plots a household owns important, but also the land quality and access to inputs matter. We do not find any differences in erosion or salinization between the different types of ownership, but there is significantly more irrigation on plots owned by men than on joint and female-owned plots. These results are consistent with qualitative data gathered by both authors in the Peruvian highlands in 2002 and 2007.

2 Background

A left-wing military regime carried out a comprehensive land reform in the 1960-70s where the large landowners had to give up their property and the land was taken over by small scale farmers. However, few institutional changes to improve the efficiency of the reform were implemented, and hence some regard the land-titling programme of today as a finalization of the land reform.

2.1 Peru

Peru lies in the western part of South America and has a population with many different ethnic groups, whereas around 45 per cent are of indigenous heritage. As a consequence, Peru has two official languages, Spanish and Quechua. Besides the official languages there are a large number of other indigenous languages.

Poverty and inequality is widespread in Peru as 44.5 per cent of the population live under the official poverty line (ibid.). The Gini Index was 49.8 in 2005 (INEI, 2007a). However, poverty in Peru remains mostly a problem for the rural highland population as 76.5 per cent of the highlands' population live in poverty while the coast has 49.0 per cent (INEI, 2007b). The agricultural sector contributes only 7.6 per cent of the country's GDP (Escobal and Valdivia, 2004), but still constitutes the backbone of the household economy in rural areas. Approximately 65 per cent of the labour is allocated to the agricultural sector, and nearly half of all income comes from agricultural activities (de la Cadena, 1988 cited by Deere & León 2001b). Landholdings are fragmented into small plots due to the equalitarian inheritance regimes which allow for the splitting up of lands (Escobal and Valdivia, 2004). The average agricultural unity[4] size is 2.3 hectares with an average of 4.1 parcels or plots per unity (Wiig, 2005).

The principal crop in the highlands is the potato. The soil quality of the highlands is mostly poor because of the different agro-climatic areas, of which many of them are unsuitable for agricultural cultivation and are only good for grazing livestock. The region's mountainous surface also makes it more prone to erosion. People in the rural highlands live mostly in small communities whereas the legal status of these

[4] The agricultural unity is the most important point of reference in the national agricultural census CENAGRO III. It is defined as all land, or the group of land plots used totally or partially for agricultural production, without concern to its sizes, tenancy regimes or legal status. The agricultural unity is managed by an agricultural producer and can hence be a household or a commercial business (Ellis, 1993 p. 109).

communities varies. Some of them have status as peasant or native communities[5] with one title[6] for the common land, while other communities have individual land rights (Goetghebuer and Platteau, 2009). Individual and common property regimes may exist side by side, namely multiple tenure (2005). Wiig (2004) argues that the community structure allows voluntary cooperation and that peasants share irrigation systems and workloads. Despite this, each land plot is individually controlled, even in registered native and peasant communities with common properties rights to land. Escobal & Valdivia (Escobal and Valdivia, 2004) claim that the growing population is putting the resource regimes under pressure and that this makes it more common now with individual rights to land.

Poverty related indicators score high in the highlands, i.e. high child mortality, birth rates and hence higher consumer-producer ratio[7], as well as low education levels and access to public infrastructure and services. Complementary inputs are also low as they have not benefited from the public irrigation projects (ibid.). A large share of the poor are indigenous[8], and two thirds of the extreme poor are Quechua speakers (INEI, 2007a).

The richer coastal zone in Peru is more densely populated than the highlands and only around 29 per cent of the population live in poverty (Deere and León, 1998b). The population is mostly Spanish speaking reflecting less existence of indigenous communities. The big agro-exporting industries operated by large companies are also found in the coastal areas. The average agricultural unity size is here 3.5 hectares, substantially higher than in the highlands. The less harsh climate with better soils also favours a more diversified agriculture than in the highlands, even for the small-scale peasantry.

2.2 Land reform and counter-reforms

The Peruvian land reform began in the late '60s and is one of the most comprehensive in Latin America (MINAG, 2007). Peru was at that time the prime example of inequality in the distribution of lands with approximately 5 per cent of the population possessing nearly 90 per cent of all the land (Deere and León, 1998b). During the reform around 427,000 households, close to one-third of all rural households, were allotted approximately half of total agricultural and forest land in Peru (García, 2002). Land was granted under the slogan stating that the land belongs to the one who works on the land (1998a).

[5] The distinction between peasant and native communities lies mostly in their geographical location. The native communities lie in the Peruvian Amazon, while the peasant communities are found mostly in the highlands. The latter tend to look at themselves more as farmers than indigenous, even though they are Quechua or Ayamara speakers.

[6] Obtaining a title for the common lands in peasant and native communities requires that these communities are in fact registered as *recognized communities;* otherwise they are not eligible for common land titling.

[7] The ratio between working and non-working members, the demographic structure of the household (Muños et al., 2007).

[8] The use of the term indigenous is highly polemic in Peru, and many refuse to use it and even refuse to admit that there is an ethnic component in the inequality in Peru (Del Castillo, 2000).

Less than 10 per cent of the land was allocated to individuals according to Deere and León (Antle et al., 2003) as most land was organized as large Agrarian Production Cooperatives (CAP). However, over the years these cooperatives divided their land among the individuals, and the cooperatives were changed into agricultural cooperatives of users (Del Castillo, 1997b cited by Deere and León 1998a). After this, most of the land was managed on an individual basis even though most of the land was cultivated and worked on individually among peasants from the very start of the land reform (Deere and León, 1998b).

Few women benefited from the land reform as land was normally granted to household heads, to persons over 18 years old and according to a number of other requirements that women normally did not fulfill. Most discriminatory to women was nevertheless the criteria that land were only given to the household heads which were normally thought of as being male (see e.g. Deere and León, 1998b; Fernández et al., 2000; Trigoso, 2007b). At that time the state functionaries who implemented the reform did not collect gender-specific data from the beneficiaries, but it is commonly accepted that women were in fact excluded from the reform (Deere and León, 1998b).

The cooperative experiment formally ended in the 1980s as individual property rights to their land were introduced, including the right of alienation. Only the recognized peasant and native communities were exempted as these communities still hold one common title deed (ibid.). Deere and León (Del Castillo, 1997a cited by Deere and León 1998a) claim that during the '80s the lands were rapidly individualized due to heavy loan burdens the cooperatives had acquired, and due to the macroeconomic climate that had generated an agricultural crisis. Despite this, land titling was not advanced, and land markets did not develop as access to formal credits was difficult. Little is known about the implications of the counter-reforms on women, even though women, who had actually benefited from the land reforms and had been part of one cooperative, received smaller land plots than the men when the time of division of the lands came up (Deere and León, 1998b).

Law No. 653, passed by the government of Alberto Fujimori, formally put an end to the agrarian reform by legalizing the sales, rentals and mortgaging of agricultural lands. With this law former regulations on inheritance of agricultural lands were also suspended and the Civil Code's regulations became valid, giving married women more protection, but at the same time removing the rights of women living in consensual unions (Republic of Peru, 1995).

Law No. 26505, generally referred to as the *Land Law*[9] (MINAG, 2007), further guaranteed the beneficiaries of the land reform to get land titles. Perhaps the most controversial of the last law was that it now allowed peasant communities to choose their own organizational structure: continuation of owning land as commons or individualization the land rights (ibid.) and thus also splitting up the commons. The general assemblies of the recognized communities can give, rent, sell or mortgage community lands. Such decisions need a 50 per cent majority on the coast and a two-

[9] Its full name is "Law on private investments in the development of economic activities in national land territories and territories that belong to peasant communities and natives", number 26505.

thirds majority vote of the qualified members of the communities in the highlands and the jungle.[10] As for the land-titling programme that was established in 1992, one of the most important laws has been Decree No. 667, the Law on the Registry of Rural Landed Property,[11] which among other things establishes how the proceedings concerning the formalization of properties rights shall occur.

2.3 PETT

The Special Land Titling and Cadastre Project (PETT) was initialized in 1992 with the objective of formalizing the legal situation of all rural properties in the country (VIVIENDA, 2007). PETT has had two components: mapping lands and registering them in the cadastre, and secondly, titling them and registering the land plots in the National Superintendence of Registry Offices (SUNARP). The project was initially a sub-division branch of the Ministry of Agriculture (MINAG), but on June 12, 2007, it was merged into the Organization for Formalization of Informal Property (COFOPRI) that was concerned with formalization of urban property, and was finalized in accordance with a Ministerial Resolution No. 183-2007-VIVIENDA (MINAG, 2007). The Ministry of Housing, Construction and Drainage is hence now responsible for both the rural and the urban land-titling projects.

According to the old PETT home page, the project has targeted all peasants and has the expected impact of giving peasants the opportunity to be officially recognized as property owners in the eyes of the state and the population in general (MINAG, 2007). This would give the peasants the opportunity to seek credits in the banks making use of lands as collateral, as well as making it easier for peasants to apply for different types of aid programmes from both public and private institutions. The formalization of property rights is also expected to reduce conflicts related to tenure and increase tenure security, as well as contribute to strengthening the land markets.

PETT has until now provided formal titles on about 1.9 million plots of rural land, with over one million titles issued in the first stage of the project (1996-2002) (2007a).[12] According to the impact evaluation of the titling programme by GRADE (2007a), only 28 per cent of the existing and registered parcels in the 1994 CENAGRO[13] had been titled in the highlands and almost 70 per cent on the coast (IDB, 2008).

The Inter-American Development Bank (IDB) is the main donor financing the programme giving US$21 million for the first stage in 1996 and US$23.3 million for

[10] This provision in the current law has been subject to much debate and the government of Alan García attempted to modify it in 2008. However, the decree that was passed under his rule provoked rural and native peasant organizations, and the Congress finally annulled the law in September 2008 after many months of riots and demonstrations.

[11] This was later modified by Decree number 889 and by Law number 26838 and 27161 .

[12] According to the Peruvian Ministry of Agriculture (MINAG, 2007) 1,189,279 titles were executed by September 2001.

[13] According to GRADE (2007) these figures must be interpreted carefully since CENAGRO declared many lands and parcels that were owned or managed by peasant communities as individually held land. This suggests that the per centage of titled parcels probably is higher than the numbers presented here.

the second stage in 2001, while a third stage is under preparation (MINAG, 2006). The first focused on the coastal areas, the second on the highlands and the third will enter the Amazonian rainforest.

The Ministry of Agriculture in Peru estimates that in 2006 there were 3,650,198 rural individual plots, and that 5,998 peasant community held landholdings, and 1,424 native community held lands (ibid.). Before the land titling was introduced, there were only 269,388 individual titled plots, while in 2006 PETT had titled over 50 per cent of all plots (Deere and León, 2001a; 2003; Acosta, 2006).

2.3.1 Gender-sensitive land titling

Organizations from the Peruvian civil society claimed in the late '90s that PETT had failed in addressing the gender dimension in the project implementation, resulting in women being systematically disadvantaged by the programme (Trigoso, 2007a). At the same time more focus was put on the gender aspects of such reforms internationally, and the project donor IDB started to put pressure on PETT in order to make it incorporate gender-sensitive measures in its policy implementation (IDB, 2001 p. 3). The 2001 loan project summary also contained a precise formulation stating that "…Gender considerations also need to be taken into account in the titling process" (Deere and León, 2001a). However, what was meant precisely by gender considerations was not spelled out.

In general, joint titling of lands to couples has been proposed by both academics and activists as a means to empower women and make sure women's rights to land are not neglected. Joint titling is assumed to reinforce civil codes (including the Peruvian civil code), which state that men and women are jointly responsible for the administration of household assets and that they must agree on the selling and mortgaging of their property (ibid.). However, the Peruvian marital regime, the *gananciales*, is also based on the separate recognition of the individual property brought into the marriage or acquired during the marriage. This concern both bought and inherited properties. Notwithstanding, any profits, rents or income derived from the property acquired during the marriage is considered to be common property. In case of separation, divorce or death of one of the spouses, half the generated profits are granted each of the spouses (Deere and León, 2001a).

The land-titling project in Peru has been characterized as *gender-neutral* (Republic of Peru, 1991; Deere and León, 2001a) as it has not made any specific reference to women's rights, but rather has recognized rights to *natural or legal persons* (2001a). However, Deere & León (Deere and León, 2003) claim that the land titling programmes in Latin America have overall been more beneficiary to women than the land reforms. This is partly because inheritance of land is the main means by which women on the continent acquire land, and it appears to be more equitable than other ways of acquiring land. If a land-titling programme only *formalizes* already existing rights, women will at worst end up in the same situation they were before the land-titling programme was implemented. The potential non-negative or neutral effect on women's land rights in Peru is then clear when looking at statistics from the National

Survey on Living Standards (LSMS)[14] from 2000 which states that 75 per cent of all acquired land by women was through the inheritance (Trigoso, 2007a).

Since PETT was criticized, it also agreed to have gender-training sessions conducted by the NGO CMP in some of Peru's regions. This training was aimed at making the officials more aware of gender issues in the titling process (GRADE, 2005). The GRADE data set, which employs the baseline data used in this paper, actually indicates that the amount of parcels with joint titles had increased substantially from 36 to 62 per cent for the households with a male household head, but there are substantial differences between the regions (Deere and León, 2001a).

Joint titling is said to be a privilege only for married individuals however, and not for couples living in consensual unions (Herrera, 2002). PETT has been accused of granting titles mostly to men, and especially for men living in consensual unions. It is still common to assign men the household head label, and if they undertake the administrative proceedings to acquire the titles without having a "formalized" marital status in their ID card, the land title might as well be given to them alone. According to the National Survey of Rural Households (ENAHO) survey from 2001, almost one-quarter of Peru's population lived in consensual unions (Deere and León, 1998b). This might then imply that a large portion of unmarried women living in partnerships are much less secure in terms of acquiring land rights than their married sisters.

Women in Statutory and Customary Laws

After signing the CEDAW[15] convention on the elimination on all forms of discrimination against women in 1981, Peru had to make a revision of its Civil Code. The Civil Code of 1984 gives men and women the same duties and responsibilities in the family, and both can represent the family legally (de la Cadena, 1991). Both can thus be heads of the household. Women and men are formally equal with respect to rights and duties under Peruvian Law, in laws concerning property, inheritance and in the Civil Code.

When it concerns laws regulating inheritance, women in Peru are not as deprived as in other Latin American countries. Testamentary freedom is restricted and two-thirds must be set aside to the spouse and children, the so-called *Marital Part*. It is unclear how this law affects inter-vivo transfers and the internal distribution between the spouse and the children. Nevertheless, the Civil Code does not grant inheritance rights to couples living in consensual unions as the Land Reform provisions did. This can be potentially prejudicial to rural women, especially those living in the highlands where approximately 40 per cent of all couples have not formalized their marital status.

Having said that, the practice does not always proceed in accordance with the theory. Rural Peru has highly patriarchal power structures. Despite this, inheritance tends to be bilateral with both daughters and sons inheriting (Deere and León, 2003), at least

[14] The LSMS (ENNVI in Spanish) has been sponsored by the World Bank and has been carried out in a number of Latin American countries during the 1990s (Deere & León 2003).

[15] Committee on the Elimination of Discrimination against Women

to a certain degree. Testimonies from our fieldwork in rural Ayacucho say that women have traditionally tended to inherit less than their brothers and male relatives. Even though times are changing, it is still common in some rural areas to assign more land to men.

In Peru inheritance is the principal means for women to acquire land ownership, although acquiring land through the state (land reforms or titling programmes) or through the community are venues that are of almost no significance (Deere and León, 2003). The community venue could, in Peru, be of great importance due to the relatively large amount of inhabitants that live in peasant and native communities. Nevertheless, in these communities, where land is held as commons, the traditions are unfavourable, and might even be discriminatory against women. Even though the Peruvian Civil Code is relatively favourable for widows, in indigenous communities the state recognizes and protects their ways of implementing customs and practices (Republic of Peru, 1993). The Peruvian Constitution (Barrig, 2006) allows the peasant and native communities to exercise jurisdiction in accordance with customary laws as long as it "doesn't violate the fundamental rights of persons" (ibid. chapter VIII). This then leads to the difficult discussions about the tension between the communal and collective rights versus individual rights, and how and when to accept cultural practices that might inhibit gender equality and might even discriminate against women (Barrig, 2006).

What is evident is that the different laws' directives on equality between the sexes do not necessarily lead to equality in reality. Women tend to have less public tasks and lower education (Mayer, 2002). The male preference in inheritance is reinforcing as both men and women tend to believe daughters do not have to inherit land because "they will get land when they marry anyway".

Low share of female landownership is probably also linked to the fact that most women are not considered agriculturalists. In most surveys the number of women who are reported as managers of land plots is considerably lower than the number of plots actually owned by women. Men have the main responsibility for fieldwork while the women only "help". Their traditional responsibilities have been in the home, taking care of children, cooking, washing clothes, collecting firewood, grazing the livestock, stocking seeds, selling products in the markets, and from time to time, working alongside the men when their labour is required. The ethnographic literature is however indecisive on the degree of separation of economic accounts between the spouses (2003).

Low levels of female ownership of registered land are one of the reasons why Peruvian women have also been credit-constrained. Both Yancari's (2004) analysis of the ENAHO 2001 data and Field and Torero (2001a; 2003) analysis of the data collected by the urban titling agency COFOPRI from 2000 find that women in Peru have much less access to credit than men. The latter determined there was a positive relationship between formal female property ownership and their access to credit. Joint titling of land to women might have a further positive impact on women's access to credit.

3 Theoretical Framework

3.1 Access to land

Deere and León (Deere and Doss, 2006) claim that the gender asset gap in Latin America is significant due to five factors: male preference in inheritance, male privilege in marriage, male bias in the community and in the state-led programmes of land distribution and formalization of rights to land, as well as the market which also seems to be gender-biased against women, probably due to the fact that men tend to have higher purchasing power than women. They do nevertheless claim that the various venues are becoming more equalitarian as female inheritance is more and more common; in addition, the state-led reforms tend to be more gender-sensitive than in the '60s and '70s when land was *de facto* only given to men as land was granted the household head, which has been considered to be male. Just recently there has been an emerging recognition of the dual-head household[16] (Katz, 2003; Deere, 2005; Lastarria-Cornhiel, 2008). At the same time the number of female-headed households have increased, and a there has been a trend towards a feminization of agriculture due to male migration and/or employment in off-farm pursuits and decreased viability of peasant farming (Deere and León, 2003).[17]

Getting an accurate scope of the gender asset gaps has nevertheless proven difficult due to the lack of good data. It has been, and continues to be, the norm to consider agriculture a male activity, something that has also been captured in the agricultural censuses where few women tend to declare themselves as agriculturalists, unless they are in fact landowners. Another concern regards the actual design of the agricultural surveys that have not had the practice of including the variable sex on the questionnaires when asking whom the plots belong to (Deere and León, 2003).

The Peruvian LSMS was the first of its kind in Latin America as it specifically asked who owned the land plots, and also whether the title was in the name of the household head, the spouse, the couple or others. This survey revealed that the land distribution of titled lands was not that unequal, if one considered the jointly held lands. Women owned 12.7 per cent of the land, while 74.4 was owned by men and

[16] The term dual-headed household is used when one recognizes that husband and wife share responsibility for household representation and the management of the property – and civil divorce (Deere and Leon 2001a p. 33).

[17] Note that the figures presented from different sources and different countries reveal diverging patterns. A feminization of rural agriculture is true for some cases, and for some others the increase in feminine participation in agricultural activity is linked to the export-oriented agribusiness. See the above-cited authors for an extensive discussion on this.

12.8 per cent was owned by couples (ibid.). Data retrieved from the Peruvian Ministry of Agriculture from 1994 (2003) show that only 20.3 per cent of the principal farmers in Peru are women, while almost 80 per cent were men, something that support the claims that women are really not considered agriculturalists.

Moreover, there is still a considerable gender land gap even though numbers presented by Deere & León (2004) indicate that Peruvian women are not as deprived as many of their fellow sisters in other Latin American countries. This might indicate a bias against women in the different venues relevant to acquiring land.

As Table 1 shows, the main form of acquiring land in Peru for women is through inheritance/family venue. Yet the figures also reveal that men are in absolute terms favoured in all forms of acquiring land, even though inheritance is a relatively more important source for women.

Table 3.1 *Form of acquisition of land ownership by gender in %*

	Inheritance	**Community**	**State**	**Market**	**Other**	**Total**	
Female	75	1.9	5.2	16.4	1.3	100	N=310
Male	48.7	6.3	12.4	26.6	6	100	N = 1512
Couples	37.3	1.6	7.7	52.6	0.8	100	N=247

Distribution by gender is statistically significant at 99% level. Figures derived from LSMS 2000. Female/male ownership can both be in single and couple households. Elaborated by Deere and León (2003).

3.1.1 The market

According to statistics in Table 1 the market is the second most important way for women to acquire land in Peru, as 16.4 per cent of the land acquired by women was through the market, compared to the 26.6 per cent for men. One striking point is nevertheless the relatively limited importance of the market as a way of acquiring land compared to inheritance. The difference is especially important for women, something that might indicate that the land market is somewhat gender-biased and that men are more likely to participate successfully in the market than women. What reasons lay behind women's low market integration today are uncertain, but it is possibly linked to the low per centages of female-owned land.

Even so, women can start purchasing land if they get access to credit. Field and Torero (2003) found that women's access to credits in Peru is limited and gender-biased against women. They do nevertheless find that women with property documents have higher probabilities of obtaining credits. Yancari (see e.g. FAO, 2002) presents figures from the ENAHO 2001 survey that state that Peruvian women have less access to credits in Peru, as 18.3 per cent of the female-headed households received credits, opposed to the 81.7 per cent by households headed by men. This seems to be the trend for most women in the developing world (2003).

3.1.2 The community

The importance of the community structure in rural Peru could be of great importance for women in terms of acquiring land. However, the figures in Table 1 reveal their very limited importance. Deere and León (2009) point at the intra-community organization as a limitation for women in terms of obtaining land since community-assembly memberships traditionally have been restricted to one person per household, namely the head which is still considered to be the man unless the man is absent for some reason. This has resulted in that primarily men have been present in assemblies which have allocated land to its inhabitants, the *comuneros*. Despite the fact that communal lands are inalienable and are now getting land titles for the communal lands as a whole, individual management is the norm. Goetghebuer and Platteau (Deere and León, 2001b) also claim that the most fertile lands, the irrigated lands, are even beginning to be granted to families on a more permanent basis.

As mentioned earlier, the Peruvian constitution allows for the use of customary jurisdiction inside the recognized peasant and native communities. This might be contrary to the Civil Code prescriptions, concerning among other things, widowhood (Huanca, 2007; Trigoso, 2007a). Qualitative interviews with women's rights activists and the leader of the women's peasant organization FEMUCARINAP confirm this (see Deere and León, 2001b for a brief presentation of different studies on this). Widowed women in communities might be subject to local practices, e.g. the removal of the family land from the household in order to "re-unite" it with the community when the man dies.

3.1.3 The family

As the figures in Table 1 show, the family is the main contributor to women's landownership through the inheritance venue. This is supported by the consensus that contemporary inheritance in the Andes is bilateral (2009) and by our own field study interviews that suggest that highland women have tended to inherit land as well, however always at a lesser scale than men. Goetghebuer and Platteau (2003) suggest nevertheless that daughters inheritance rights are normally identical to those of their brothers, opposed to many of the patrilineal systems one finds in Sub-Saharan Africa. They found no significant gender bias in their study based on data from three communities in the region of Cusco in the Peruvian Andes. However, they do not control for size of the bequest and quality differentials in the land plots inherited. According to Deere and León (de la Cadena, 1988 as cited by Deere and León 2001a), there is a substantial difference in the amount of land owned by men and women in Latin America, even though they do not find a significant gender gap in the amount of land owned by men and women in Peru when doing a t-test based on data in the LSMS 2000 survey. One possible explanation could be that land has lost its value as a source of power and income in the communities; land ownership has been increasingly "feminized" (GRADE, 2007a). Trigoso (Deininger, 2003) also claims that inheritance patterns in Peru vary greatly from region to region. In some regions women and men inherit lands of different qualities and sizes; in some regions inheritance is equalitarian while in other regions women might even inherit more than men. However, Trigoso (2007b) does not state whether the differences in

inheritance patterns vary relative to the land value, something that might serve as a good indicator of how equal or unequal inheritance traditions tend to be as land on the coast is generally of higher value than in the highlands.

3.1.4 The state

The state venue comprises different government-led programmes aimed at distribution of land or of registration and formalization programmes similar to PETT. In the past, in policy interventions such as these, too little attention was placed on protecting the rights of women worldwide (2002). As shown in the previous chapter, the Peruvian land reform was not gender-equitable, and as for the ongoing land-titling programme, it seems as it has become gender-sensitive by focusing on joint titling. What remains a question is how the lack of a formalized partnership status affects women's abilities to obtain rights. Even though it is now claimed that the ongoing land-titling programme in Peru has gained increased gender sensitivity, it remains to be seen what the effects are on unmarried couples.

It is also relevant to investigate whether women tend to keep land that was theirs originally, and that they do not suffer from *land grabbing*. Women are normally considered a marginalized social group, especially in patriarchal societies. Vast evidence from other Latin American countries and other continents' land-titling and formalization programmes tend to pass over women, see e.g. Deere & León (2001b) for various Latin American countries, Brown and Purvanti (2003) for the Indonesian case, Lastarria-Cornhiel et al. (1997) for Honduras, Nicaragua and Indonesia, and Lastarria-Cornhiel (1998) for several African countries. The lack of gender focus can thus have negative consequences for women as they are neglected by the titling agencies, and/or as a consequence of more proactive actions by others as described by Feder and Nishio (Deere and León, 2001b)

Some have imposed mandatory issuing of joint titles and given priority to female household heads, while others have only pursued joint titling if requested by the couple (Deere and León, 2001b). Deere & León (ibid.) argue that joint titling must be mandatory to be effective. However, the titling experience of Nicaragua shows a great disparity between the provisions expressed in the law and its actual implementation. Statistics presented by Deininger and Chamorro (2002) reveal that gender-sensitive legislation does not necessarily result in the expected

Joint titling is supposed to serve as a means to increase the security for women in case of separation, divorce, widowhood or abandonment. Joint titling can also, by explicitly granting rights to women over important economic assets, serve as a means to improve women's bargaining position within the household (Lastarria-Cornhiel, 2001). When property rights are explicitly expressed through the joint allocation of land, it can contribute to reinforcing the Civil Code's prescriptions that both spouses represent the household. It is a safeguard for the spouses in the sense that they cannot make decisions regarding their jointly owned possessions without having the consent of the other. However, as stated in the Peruvian case, laws regulating formal adjudication and registration of property rights are often silent with regard to gender, something that can lead to *de facto* gender bias in application (see e.g. Agarwal, 2003; Larson et al., 2003; Bezabih and Holden, 2006; Goldstein and Udry, 2006).

3.2 The importance of land rights

In the last decades there has been increased focus on securing land rights for both peasant and urban dwellers in developing countries. The main idea of the Peruvian economist Hernando de Soto is that titled land can be used as collateral for credit and hence "releasing dead capital for productive investments". It is also easier to defend the property rights regarding the fruits of the investments on land with a land title. The final standard argument is that individual property rights make it possible for less productive farmers to rent or sell their land on the market to the more efficient farmers, this way creating a surplus to be shared by the two parties (Benschop, 2004).

Nevertheless, tenure security will not necessarily result in the same security for women and children if their interests are not specifically protected during a formalization process (see e.g. Lastarria-Cornhiel, 1997; Meinzen-Dick et al., 1997; Feder and Nishio, 1998; Deere and León, 2001a). An increased amount of literature and research has focused on the potentially negative distributional repercussions land tenure reforms can have if they are not sensitive towards gender issues (Katz, 2003). As women are assuming larger and larger roles in the peasant or subsistence agricultural sector, it then seems appropriate to claim that female ownership and tenure security should be given as much attention as that of the men and the households as units (1994b).

3.2.1 Empowerment and equity

Agarwal (1997) defines empowerment as "a process which enhances the ability of disadvantaged ("powerless") individuals or groups to challenge and change in their favour existing power relationships that place them in subordinate economic, social, and political positions." It can thus be seen as a means of strengthening individuals so that they can fight for equality themselves. Meinzen-Dick et al. (Agarwal, 1994b; Meinzen-Dick et al., 1997; Katz, 2003) argue that improving the equity of resource distribution is a strong explicit and implicit theme in the analysis of gender and property rights.

The empowerment argument used on female landownership concerns women's *relative* position besides men as ownership to land can give women a strengthened status and thus an ability to challenge patriarchal structures in the household and in the communities where rural women live (1994b). Agarwal (2007), for example, finds that for widows in Rajastan in India landownership did provide them greater respect and consideration, and Allendorf (2006) finds in a recent study from Nepal that women who own land are significantly more likely to have the final say in household decisions.

Deere and Doss (see e.g. Singh et al., 1986; De Janvry et al., 1991; Taylor and Adelman, 2003) claim that this kind of argumentation has received increased attention and acceptance within the international development community. Research focusing on the potential empowerment aspects related to female land ownership often rejects the unitary agricultural household models which is dominant in development economics (see e.g. Udry et al., 1995; Udry, 1996; Browning and

Chiappori, 1998; Quisumbing and Maluccio, 2003). The model that assumes that the household members pool their resources and share preferences has been rejected in various empirical studies (Quisumbing, 2003). New models take into account that men and women within the household may have diverging sets of preferences, resources and responsibilities (1980). The collective models, as presented by the seminal papers of Manser and Brown (1981) and McElroy and Horney (Lastarria-Cornhiel, 2001), propose that the household decisions are the result of bargaining processes. They emphasize the influence outside options can have on the spouse's bargaining power and hence on intra-household behaviour.

3.2.2 Rural development and household welfare

Access to land is of great importance for rural households' welfare. There has also been a growing interest in women's role in these households as women's responsibilities in reproducing and maintaining the family has increased over the last 50 years, whether there is a male reference person present in the household or not (ibid.). Female-headed households are nevertheless in the increase, both *de jure* and *de facto* because of migration and abandonment (Lastarria-Cornhiel, 2001). The tendency for a feminization of agriculture as mentioned before is also an important factor in this context.

In most societies the norm is that women feed and clothe their children, even when a male spouse is present. Studies have shown that resources controlled by women are more likely to be used to improve family food consumption and welfare, reducing child malnutrition and increasing overall well-being (Deininger, 2003). Food security and family welfare can thus be important reasons for protecting or enhancing women's rights to land. The UN, for example, stresses that women play key roles in addressing the household food security and nutrition problems in the developing world.

Empirical research has also shown that women tend to use wealth in a *different* manner than their partners (2003). As the bargaining household models suggest women who are in possession of economic assets contribute to different household expenditures. Quisumbing and Maluccio (2002) show in their four-case study that *assets* controlled by women have a positive and significant effect on expenditure allocations related to the next generation, such as education and children's clothing.[18] Katz and Chamorro (2007) find in their study from Honduras and Nicaragua that female land rights in these countries lead to small, but positive and significant increases in expenditures for food and children's education, and Allendorf's (2004) study from Nepal finds that mothers who own land are significantly less likely to have children that are severely underweight. For the Peruvian case, Deere et al. (2003) do find a large, positive and significant link between female land rights and the net household income. With reference to one of the objects of land titling, which is to increase the creditworthiness of rural households, land ownership can confer direct economic benefits such as collateral for credit, which can be used for either consumption or investment purposes. Nevertheless, norms governing intra-

[18] However, such consumption choice by women might come at the cost of more lucrative long-term investments by men, which might increase income and hence consumption at a later stage.

household decision-making and income-pooling can restrict women from fully participating in these benefits if they do not share formal property rights to the land.

Agarwal (1996) argues that the so-called incentive argument for land tenure security has not yet been extended to cover family members which implies that women still lacks title deeds to use as collateral to invest in productivity-enhancing technology or inputs. Udry (2004) find a substantial difference in productivity concerning women's and men's plots inside the same household. It is actually puzzle that the average output per hectare is higher for women than for men while at the same time women's plots have less inputs as male labour and fertilizer. He suggests that a reallocation of variable factors, among them work effort, from men's to women's plots can increase output in the household. Deere et al. (Fernández and del Castillo, 1999; Fernández et al., 2000; Trigoso, 2007a) find that female land rights are positively related to off-farm income in Peru and Paraguay, but significantly so only in the case of dual-headed households in Peru where the bargaining power thesis is operative.

4 Research questions and hypotheses

4.1 Effect on women's rights to land

Our main analytical interest is to find the effects of individual land titling on women's rights to land. Peruvian NGOs criticized the lack of gender sensitivity in the rural land-titling programme as systematically disregarding women and their rights. This criticism adds to similar claims from academics and women's rights activists from other countries pointing to the fact that state-led interventions such as land titling can and will have negative distributional effects for women if their rights are not properly secured. One such consequence can be *land grabbing* (claiming land that belongs to others) during land registration, which harms women in less favoured economic, social and political situations.

The GRADE baseline is from 2004 and the follow-up data collection is from 2006. An impact analysis comparing plots which have been titled during this period with still untitled plots should hence be possible, but we found it impossible to identify the same plots inside the household across the two years. We hence chose the second best option of comparing the distribution of ownership by sex in the titled and non-titled plots. This can best be done with descriptive statistics and statistical tests. There are three main categories of ownership: property rights in the name of the head of household (assumed to be male mostly), in the spouses'/cohabitant's name and joint ownership, which is also referred to as co-ownership/property. If the programme sticks to registering rights only (i.e. only granting "formal"[19] rights to land which already has a well-defined owner) there should not be any discrimination attributed to the actual implementation of the programme, and the distributions between the three categories of ownership should be more or less the same in the titled and non-titled plots.

The baseline data from 2004 is from the second year in the project implementation of the second round. The most aggressive criticism towards PETT was raised in the late '90s and the beginning of this millennium. The NGO CMP took several measures to raise the gender sensitivity of the PETT officials. They also found structural factors in discriminatory practices and traditions in the rural areas that might have inhibited women from obtaining land rights (Fernández et al., 2000). Women's general lower status can thus be reflected in the fact that women inherit less through inheritance practices, have less to say in decision-making, and at the

[19] By formal we mean a written contract accepted by the state, even though similar contracts witnessed by others might be accepted by all parties involved in a potential conflict.

same time they are often less educated than men. All these factors make them less prepared to fight for their rights in a land-titling programme. At the same time they found a culture of discrimination toward women among the government officials during the first PETT round when they went out in the field asking for the head of household only and not bothering to ask for both adults who manage the household (DEMUS, 2004).

The NGO CMP focused on one of the greatest hindrances for women in terms of being eligible to get their names on the land titles, namely the lack of identification (ID) papers. The lack of ID was one of the things this NGO found to be most important when it concerned why women had fewer rights to land than men. It is not possible to get a land title without an ID number and unregistered women are hence inhibited from all kinds of state-led projects. The work with the land titling thus culminated in a campaign with several other NGOs, highlighting the fact that approximately 50 per cent of all rural women lacked formal ID papers (Trigoso, 2007a). This campaign received nationwide support and attention and resulted in a state-led project to encourage the "identification" of rural women and men (2000). This focus coincides with a worldwide campaign of multilateral organizations and the donor community in general for issuing identity cards to reduce marginalization.

Fernández et al. (2001a) and Deere and León (2004) claim that women's marital status has gained extensive attention. As in most countries worldwide, couples living in consensual unions are subject to much less jurisdiction that ensures the cohabitants' rights in case of household break-ups, death and so forth. As joint titles were proposed as a means to ensure women's rights, the question came up regarding whether unmarried couples were given the same treatment.[20]

Finally language barriers have also been an issue in this context. Peru has two official languages: Spanish and Quechua. Despite this, most government documents and activity is conducted in Spanish, a language that the rural poor Quechua-speaking (or other indigenous language) women in particular do not speak and read.

Due to these reflections we have formulated the following hypotheses that we will test for both using statistical tests and regression analysis:

H_1: Women's land rights have been neglected in Peru during the implementation of the rural land-titling project.

This hypothesis will be tested using statistics on the relative distribution of rights between men and women. We will compare the distribution of property documents given to the household heads, the spouses and for joint ownership before and after titling. This is possible since most people have some kind of property documents that certify their landownership, even if they have not had/got their ownership formalized through PETT with the issuance of a title.

Our method consists of comparing the relative distribution of rights (i.e. the rights distributed between the categories "household heads", "spouses/cohabitants" and

[20] This critique is however problematic as the PETT implementation of joint ownership for married couples might actually disregard the intention of the gender neutral law, while their practice in consensual unions of granting property rights to the original owner (for example, in inheritance) is the correct. The NGOs hence criticize PETT for not breaking the law.

the "joint ownership") between the non-titled plots and the titled plots. If there is a statistical difference between the relative distributions of rights, the zero hypothesis of no change can be rejected.

H_2: Married women have a higher propensity than women living in consensual unions to obtain land titles through PETT, primarily through the issuing of joint titles.

H_3: Education increases women's propensity to obtain PETT titles.

H_4: Women with a mother tongue other than Spanish have lower propensities to obtain titles with PETT.

Hypotheses 2-4 refer to the determinants of women's land rights. As stated, there might be reasons to believe that women's marital status does matter for the granting of land titles, especially joint titles. We also hypothesize that women in general have lower status, among other things reflected in their lower levels of education, making them more sensitive to not obtaining rights. Lower levels of education are not only important in terms of having the capacity to read and write, but can also be important for legal literacy, knowing what laws exist, how to use them to protect their own rights and so forth. We also expect that women with higher levels of education have been travelling more outside their own communities and this experience makes them more able to claim property rights.

Spanish is a language that is learned primarily in school and furthermore developed by contact outside the community structures. Being bilingual is thus a probable consequence of having some schooling as they are highly correlated. This will empower women and make them better equipped to claim their rights. Deere et al. (2002) also use education as a proxy for labour market opportunities and hence the possibility to buy land on their own. Katz and Chamorro (2008) find in their Nicaragua and Honduras study on women's land rights that women's education level is highly significant for the total amount of land owned by women. Our education variable is more as a proxy for women's overall capacities gained by education and its spillover effects. It is important however to note that education per se correlates with inherent and learned abilities that are not included in the econometric model.

These three hypotheses are tested using a multinomial logit model where the dependent variable is the categorical variable *namedoc* which determines in whose name the title/property document is issued. We then test for the various independent variables' significance regarding the different probabilities of getting the various outcomes *namedoc* can take. See next chapter for a description of the variables and the expected signs of the coefficients.

4.2 Land size and quality

We investigated the distribution of land by sex in the previous section. However, another dimension is the size and the quality of land. We will hence investigate whether women have smaller plots, plots of worse qualities (with problems of erosion and salinization) and have less access to complementary inputs like

irrigation.[21] A more thorough discussion of the methodology and results of the quality indicators can be found in Fuentes (Lynch, 1997; Deere and León, 1998a).

H_5: Women have smaller land plots than men.

If men were more powerful we would expect they would keep the larger plots for themselves and leave the smaller plots for joint ownership or to the female spouse. We test the size differences with a t-test for mean plot sizes for the land owned by men and women in 2004, as well as we run OLS regressions using plot size as the dependent variable and control for differences in plots owned by men and women, as well as the sex of the household head to determine whether women own smaller plots than men.

The same logic could be applied to the quality of the land itself and the access to irrigation. Women might obtain lands of worse qualities and with access to less irrigation than men. We expect women as the weaker family member to inherit the less productive plots.

H_6: There is a higher probability of both erosion and salinization on co-owned and female-owned land.

H_7: Women have less access to irrigation than men.

Water and rights to irrigation are interlinked with rights to land (see e.g. Lynch, 1997 on the Peruvian highlands or; van Koppen, 1998 for a broader discussion on water and irrigation rights). Water can either be regarded as a characteristic of the plot, e.g. if a water channel is within user distance, or as production input which depends on the owners' characteristics, e.g. allowed to tap from a passing water channel. We would expect women to be disadvantaged in a patriarchal society in both dimensions. Important explanations might be that state-led irrigation bureaucracy designating irrigation infrastructure to the household unit rather than at the plot level (Deere and León, 1998a). Project administrators and local community leaders might even be more prone to consider men irrigators (2003).

[21] These quality variables should ideally be aggregated to one indicator so that they might be negatively correlated, e.g. irrigated plots are more labour- and input-intensive, and hence tend to be smaller. This is however not the issue there.

5 Econometric and statistical methods

5.1 The multiple linear regression model

We apply econometric multiple linear regression models (MLRM) to test our hypothesis. The ordinary least squares (OLS) model is described in Greene (2004) as in equation (1) below:

$$y_i = \alpha + \beta_1 x_{i1} + \ldots + \beta_k x_{ik} + \varepsilon_i, \quad (1)$$

y_i and x_i are observable variables and ε_i is the unobserved error term. The elements of the β's are unknown parameters characterizing the population. The coefficients are unbiased if there is no correlation between the independent variables and the error term, both which are met under the Gauss-Markov Theorem terms as described in Verbeek (Kennedy, 2003), among others.

5.2 Probability models

Probability models are used when the dependent variables are limited in some way. In such cases the OLS estimates are usually biased (Kennedy, 2003). The use of these models in this study is due to the fact that we want to estimate the probabilities of obtaining different types of titles as individually held titles and joint titles. We also use such models to find the probability of having irrigation on a plot. All probability models come in the logit form. The decision to use the logistic model relies on two factors. First, the multinomial probit model is difficult to compute (Greene, 2003)[22] and the probit version is also limited in its use because it needs to evaluate multiple integrals of the normal distribution. The logit model has therefore been used widely in a number of scientific disciplines, including economics (Verbeek, 2004). Since we need to use the logit version of the multinomial model, we find it more appropriate to use the logit version in the binary model as both models then rely on the same distributional function.

[22] A quick test showed us that it would take STATA version 9.2 up to eight hours to compute one regression with 10 independent variables.

5.2.1 Logit model

The logit model is a binary choice model designed to be used when the dependent variable is a "choice" between two discrete outcomes. The model describes the probabilities of $y_i = 1$ given a vector of x_i individual exogenous and observable characteristics. The logit model will generally look like:

$$P\{y_i = 1 | x_i\} = F(x_i, \beta), \quad (2)$$

where y_i can only have two outcomes, normally 0 and 1, or 1 and 2, or

$$Y^*_i = \beta' X_i + \varepsilon_i, \text{ where } \varepsilon_i \sim N(0,1) \quad (3)$$

where X_i is the same vector and β' is a vector of parameters. ε is the error term and should be independent of X_i and represents the unobserved factors that contribute to the variance of Y_i^*. The logit model assumes a logistic distributional function and a variance of $\pi^2/3$ instead of 1 as in the very similar probit model, while both models have expectations of zero (Verbeek, 2004).

5.2.2 Multinominal logit model

The multinomial logit model (MNLM) is a multi-response model used when the outcomes of the dependent variable are more than two. In cases where there is no natural ordering of the alternatives in the dependent variable, as there is when the dependent variable is a property document type, it is not realistic to assume that there is a monotonic relationship between the underlying latent variable and the observed outcomes in the dependent variable y_i (Long, 1997). In such cases one must use a MNLM. In general the multi-response models are used to describe the probability of each of the possible outcomes of the dependent variable as a function of a number of characteristics, i.e. the independent variables (ibid.), and can thus be thought of as a model which simultaneously estimates binary logits for all possible comparisons among the outcome categories (Long, 1997).

The model specifies the probability of each of the outcomes as a non-linear function of the x's-: the independent variables. We assume that the probability $Pr(y = m|x)$ is the probability of observing outcome *m* given x. The dependent variable y has J nominal outcomes which are numbered from 1 through J, but without ordering. The expression $Pr(y = m|x)$ is thus a function of the linear $x\beta_m$, with the vector of $\beta_m = (\beta_{0m}....\beta_{km}....\beta_{Km})'$ which includes the intercept β_{0m} and the coefficients β_{km} for the effect of x_k on the outcome m. β_m differs from each outcome (Long 1997).

In our model the categorical and dependent variable is *namedoc*. This variable takes the values of 1-4 depending on the property document type, and in whose name the property document is issued: 1= household head, 2= spouse/cohabitant, 3= both (joint ownership) and 4=other. In that way the coefficient effect of, for example, education on the probability of obtaining a property document (with or without a title) in the household head's name is different from the coefficient effect of education on the probability of obtaining a property document in the spouse's name.

In probability models one must make sure that the sum of the probabilities are non-negative. To ensure that one takes the exponential of $x\beta_m$: $\exp(x\beta_m)$. While the result is non-negative, the sum of all probabilities: $\sum_{j=1}^{J}\exp(x\beta_j)$ does not total 1 as it must (Long and Freese, 2006). To make sure they do, one divides the $\exp(x\beta_m)$ by $\sum_{j=1}^{J}\exp(x\beta_j)$. Furthermore, the probabilities must be identified since more than one set of parameters generates the same probabilities of the observed outcomes. A set of manipulations thus gives us the final model which is commonly written as (ibid.):

$$\Pr(y_i = 1 \mid x_i) = \frac{1}{1+\sum_{j=2}^{J}\exp(x_i\beta_j)} \tag{4}$$

$$\Pr\{y_i = m \mid x_i\}\frac{\exp(x_i\beta_m)}{1+\sum_{j=2}^{J}\exp(x_i\beta_j)} \; for\; m > 1 \tag{5}$$

As for potential problems on heteroscedasticity, we allow for that by using the cluster function offered in the statistical software STATA 9.2. This function specifies that the observations are independent across the clusters, which for our case are the households, but are not necessarily independent within the household. Specifying this option produces robust standard errors (2007b). This function in used in all regression models, the OLS, the logit and the MNLM.

5.3 Statistical methods

Various different methods exist to compare two different groups of data and to check whether the difference is significant or is just a consequence of randomness. The decision regarding which models to use concerns the distinction of variable types, i.e. whether they are categorical or continuous. We do use both t-tests and chi2 tests.

6 Analysis and results

6.1 Presentation data source

6.1.1 Survey data

The plot and not the household is our analytical unit[23]. We use a panel data set constructed and collected by the Peruvian research institute Development Research Group (GRADE) and CUANTO. The survey contains 2,034 households and was collected in order to evaluate the second stage of the PETT programme on behalf of MINAG and donor IDB. A comprehensive methodological description of this GRADE data set is given in GRADE (GRADE, 2007a). The baseline was collected in 2004 and the final survey in 2006, but we do not utilize the latter due to data problems.[24] It is not a representative survey for the whole of Peru as they concentrated their efforts on regions that were eligible for PETT titling in 2004. The evaluation failed to find any important significant results in their impact analysis, but this is probably due to the rather short time period between the two rounds.

The sample was selected from the cadastral register. The cadastral register offered a population of potential beneficiaries of PETT since a land plot that has not been mapped and put in the cadastre cannot be titled through the programme (2003). The GRADE team received data on 2,207,199 land plots at the national level that had been included in the second phase of the PETT programme. The data base offered information about the geographical location of the plots as well as information on the time of inscription, but no information of the owners of the plots. The data included information on the location of the plots according to districts (municipalities) as well as an inferior level called "sector" (homestead).

The first process consisted of removing plots that had been inscribed before 1999, plots that were from the *Selva* (Amazonas) region as well as "sectors" with less than

[23] We hence assume there is no selection bias in not all plots within a household is not recorded

[24] The two mid-surveys do not ask the same questions as the 2004 and 2006 final surveys did. We intentionally used the 2006 data, but we realized that the main dependent variable was measured differently than in 2004, eliminating one of the possible outcomes, namely the possibility that a property document can be in the name of the spouse. We found this very important, and a big limitation for presenting clear results. The relative complexity of the econometric methods made it clear that the use of 2006 data with a "limited" dependent variable would not give us comparable results over the two years. Secondly, the plot-to-plot comparison we wanted to do between the two years was an impossible task due to the fact that we were not able to identify the same plots throughout the years and thus also the owner of the plots.

21 plots. After this cleaning process there were 1,639,421 land plots in the data base. At this point it was established which plots should be titled as the cadastral registry contained information on whether the property was recorded in the Public Registry or not. This data was thus divided into 9,350 sectors based on the geographical distinction coast/highland. From this data base districts with less than eight sectors were removed, as they represented areas with very low levels of cadastral coverage. At this point it was established through the cadastre information that around 30 per cent of the land plots had titles registered by PETT. According to the final report made by the consulting group (GRADE 2007), one of the important elements in making the sample for analysis was to consider the degrees of titling coverage. This is due to the assumption that the degree of titling in an area will vary systematically on the effects of the titling project in each region. Titling density was thus used as stratification criteria.

The data was grouped according to titling density/coverage: sectors with low coverage, less than 30 per cent of all plots titled; sectors with medium coverage, between 30 and 69 per cent coverage; and sectors with high degrees of coverage, over 69 per cent. A subdivision according to titling coverage was also done at the district level. The sample was subsequently divided into five different geographic areas (*dominios*): northern coast (DOM1-CN), south-central coast (DOM2-CCS), northern highlands (DOM3-SN), central highlands (DOM4-SC) and southern highlands (DOM5-SS). This became the initial sample framework. They selected sub-samples from the 15 strata with a certain proportion according to the number of districts in each stratum. The selection within each stratum is made by random selection. From the selected sample another random selection round was applied. After this selection the names of the people associated with each plot were received.

The strategy applied by the consulting group was to make a sample consisting of plots already titled, and plots without titling, in each sector. In that way they could apply impact evaluation methods. It was also expected that many of the untitled plots would be titled within the two-year period between 2004 and 2006. The sample ended up consisting of data from a total of 14 departments. The distribution of households per department and sector can be seen in Table 2 and 3. As we see does the sample consist of 37.16 per cent households form the coast while the remaining is from the highlands. For a complete explanation, see GRADE (2007a) which describes the whole sampling and selection process.

Table 6.1 *Frequencies of household by department*

Department	Frequency	Per cent
Ancash	348	17.11
Arequipa	164	8.06
Ayacucho	30	1.47
Cajamarca	327	16.08
Cusco	112	5.51
Ica	123	6.05
Junin	123	6.05
La Libertad	239	11.75
Lambayeque	147	7,23
Lima	146	7.18
Moquegua	31	1.52
Piura	63	3.1
Puno	50	2.46
Tacna	43	2.11
Tumbes	88	4.33
TOTAL	2034	100

Table 6.2 *Geographical regions (# of households in baseline sample)*

Dominio	Frequency	Per cent	Cumulative
DOM1-northern coast	427	21.01	21.01
DOM2-central and southern coast	328	16.14	37.16
DOM3-northern highlands	466	22.93	60.09
DOM4-central highlands	441	21.7	81.79
DOM5-southern highlands	370	18.21	100
Total	2.032	100	

The survey is extensive as it tries to capture different aspects and expected effects from the programme including: the effects of the demand for investments, the effects of the supply of formal credits, increased intra-household incomes through larger opportunities to access credits, increased productivity, changes in conservation techniques and land-related conflicts. For our analysis the survey's focus on gender through the achievement of joint titles is of special importance. The survey asks specifically for the type of title issued to each plot, as well as that the sex of the owner of the land plot is accessible due to the listing of all household members and their relationship to the household head. Marital status, how the land plot was accessed (through inheritance, adjudication, market transactions etc.), educational levels, and mother tongue are other key variables we use.

Table 6.3 *Key variables*

Variable name	Variable type	Description of variable
Pettdoc	D	Do you have a PETT document? 0 =no, 1 = yes
Namedoc	C	In whose name is the property document issued? 1= in name of hh head, 2 = in spouse's/cohabitant's name, 3 = both 4 = other
spco_mtong head_mtong	D	Mother tongue: 0 = Spanish, 1 = Quechua / other indigenous language. Differentiated by hh. head and spouse/cohabitant
Hhhsex	D	Sex of household head: 0 = male, 1 = female
Marstat	D	Marital status; 0 = unmarried [30], 1 = married
Dualhead	D	Households with a couple/ single: 0=single h.hold 1= couple h.hold
spco_educ head_educ	Cn	Educational/ years of school attendance. Versions for household head and spouse/cohabitant
Hhsize	Cn	Household size, amount of persons in household
spco_age head_age	Cn	Continuous variable for age. Version for household head and spouse/cohabitant.
sali(1-4)	O/D	"Do you have problems with salinization?" 0=none,1=slightly,2=moderate,3=high
eros(1-4)	O/D	"Do you have problems with erosion?" 0 =none, 1 =slightly, 2=moderate, 3 =high
size(1-3)	Cn	Continuous variable for size of land plot measured in hectares
slope(1-3)	O/D	"Is this land plot steep?" 1= flat, 2= slightly, 3= steep
Soilqual	O/D	"How is the quality of the soil in your land plot?" 1= very good, 2= good, 3= average, 4= bad, 5= very bad
acq(1-6)	O/D	"How did you get this land plot?" 1 =inheritance, 2= purchase, 3= adjudication, 6= parcelling, 7= communal (from the community), 9= other
irri	D	"Do you have irrigation?" 0 =no, 1 = yes
no_plots	Cn	Number of plots held by the household
all_land	C	Counts all plots, with or without title, specified by ownership;1= all land owned by men, 2=all land owned by women, 3=all jointly held land by man and woman in relationship, 4= all land owned by others (not specified regarding sex)
women_all_land	D	1=if plot owned by woman, 0 otherwise (all plots, with and without title)

Continue next page

dom(1-5)	D	dom1=northern coast, dom2=southern and central coast, dom3=northern highlands, dom4 = central highlands, dom5=southern highlands
wom1-5	D/I	Interaction variable between the variable *women_all_land* and the different *dom* variables. Takes the value of 1 if plot owned by women in dom1, 0 otherwise. The same applies to the other *dom* dummies
man1-5	D/I	Same variable type as above, only for men's plots

D= Dummy variable, C= Categorical variable (non-binary), O= Categorical and ordinal variable, Cn =Continuous variable, I= Interaction variable

6.1.2 Qualitative data

Our secondary source of data stems from fieldwork done in the spring 2002 and summer 2007. This data has a twofold character. We conducted interviews with researchers, representatives from NGOs working on gender and land issues as well as representatives from peasant and women's organizations. We furthermore conducted small sample surveys in the Municipality of Tambo in the department of Ayacucho as well as open-ended qualitative interviews with both men and women in different communities. In the community Acco we conducted semi-structured interviews.

In the district centre of Tambo we also had the opportunity to conduct interviews and talk to public functionaries both from the local administration, as well as officials from the MINAG, the Ministry of Agriculture and National Program of Management of Watersheds and Soil Conservation (PRONAMACHS), the Peace Judge (the local conflict mediator) and representatives from the local branch of the Peruvian women's organization Mother's Club.

The qualitative interviews are used to create hypotheses to be tested on the GRADE data set and to explain the regression results thereof.

6.2 The effects of PETT on women's rights to land

The first research question is to identify the effects of the Peruvian land-titling project PETT on women's rights to land. We test the H_1 hypothesis on neglecting of female rights using the variables *namedoc* and *pettdoc* as described in the list of key variables (Table 4). *namedoc* is the variable taken from the survey which asks in whose name the property document is issued. The variable *namedoc* takes the values: 1) in the name of the household head, 2) in the name of the spouse/cohabitant, 3) in both names, 4) other. This question is asked both to the people with a PETT title, i.e. *pettdoc* =1, and to those without a title, i.e. *pettdoc*=0. Note that most people without a PETT title have some other kind of property document that verifies that they in fact own the land. In the cases where people have responded that they do not know, or do not have any kind of document, they fall into the category of "other" in the *namedoc* variable. The other category is a category which serves as a catch-all for all other ownership constellations.

The high number of titled plots in the baseline data from 2004 is rather counter-intuitive for impact-analysis purposes. The consulting group's purpose was originally to measure the impact on the plots which were untitled in 2004, and were supposed to become titled within the two-year period from 2004 to 2006 in order to see how they differed from the ones that already had a title in 2004. Because the data base GRADE used to find the titled and non-titled plots was not updated, the consulting group ended up with a much higher group of titled plots in 2004 than was originally planned and as is normally used for impact-analysis purposes.

We use two samples in our analysis. The first is the full sample and in the second we include only male-headed couple households, i.e. where both a man and woman live together as spouses/cohabitants in a household (*dualhead*=1) and where the man is reported as head (*hhhsex*=0). We exclude single households, i.e. where no couple resides and female-headed couple households.

The reason for this is that we expect women, who are listed as spouses or cohabitants in male-headed couple households (*dualhead=1* and *hhhsex=0*), might be more prone to be deprived of their rights during the titling than women in households where the woman is reported as the head. Moreover, little information can be obtained from analysing the distribution of rights without knowing the sex of the other possible owners of the plots as would be the case for "single households". This method reduces the sample by lowering the number of observations used in the test.

Table 5 below summarizes first the relative distribution of rights between men and women for "couple households" where the man is reported as the household head in both PETT titled and no PETT titled households, then for the full sample and at the bottom similar figures calculated by Deere and Leon (2003) on the Peruvian LSMS survey from year 2000 (which does not include the "other" alternative).

Table 6.4 *Gender differences in land plot ownership by PETT and no PETT plots*

Sample	Plot		Men	Women	Joint	Other	Sum
Couple households with male household head (sub-sample)	PETT	Obs	811	278	1831	332	3,252
		Share	24.9	8.5	56.3	10.2	100.0
	No PETT	Obs	201	46	382	137	766
		Share	26.2	6.0	49.9	17.9	100.0
		T- value	(-0.7465)	(2.3268)**	(3.2242)***	(-5.9773)***	
All types of households (full sample)	PETT	Obs	1207	881	1966	471	4,525
		Share	26.7	19.5	43.4	10.4	100.0
	No PETT	Obs	253	157	412	230	1052
		Share	24.0	14.9	39.2	21.9	100.0
		T- value	(1.7444)*	(3.4152)***	(2.5318)**	(-10.1864)***	
LSMS 2000a	Titled plots	Share	74.4	12.7	12.8	-	100.0 (n=1,923)

t values in parentheses, * p<0.10, ** p<0.05, *** p<0.01. a) Statistics from the Peruvian LSMS survey from 2000 calculated by Deere & Leon (2003)

Introducing a test of independence, we find that the Pearson chi2 is 41.2 for the sample of male-headed couple households and 104.5 in the full sample which hence implies we can reject the H_0 of no-association (or independence) between the PETT and the no PETT distribution of the four ownership types. However, we see that the

level of joint ownership is significantly higher in the former with 43 per cent compared to 39 per cent in the full sample. When reducing the variable dimension to a dummy recording whether the plot has a given ownership form or not and then constructing a t-test for difference in mean between the PETT and the no PETT sample, we find that the increase is valid at 5 percent level for joint ownership and 1 per cent level for female ownership.

This difference in the 2004 GRADE survey between PETT titled and no PETT titled plots is significant but not of a major size. However, the figure represents more than a threefold increase in joint ownership compared to the 13 per cent found by Deere and Leon (2003) on the Peruvian LSMS survey from year 2000 for plots with any title type. The full sample figures are highly comparable as both surveys were collected by CUANTO applying the same questions and methodology. However, differences in sampling area might contribute to explain some of the increase since PTRT-2 program covered in the GRADE survey mainly took place in the highlands where joint ownership is more common but female ownership less common (see table A3 in appendix). Joint ownership increases to 48 per cent for PETT titled plots if we suppress the "other" category the same way we assume Deere and Leon (2002) have done for the LSMS 2000 survey to make them directly comparable, something which might indicate even more empowerment of women due to PETT titling.

The increase in joint ownership becomes even more striking in the subsample of plots from male-headed couple households, a subcategory which probably tells more about women's role and position within the household than the full sample which also includes single households. Joint property is then 56 per cent for PETT plots compared to 49 per cent for no PETT plots. There is also more female ownership and less male ownership. The overall conclusion is hence that there is a tendency towards women obtaining more land rights with the PETT programme.

A geographical breakdown for male headed couple households in the appendix table A3 shows that there are considerable regional differences. As the PETT worked its way through the country, starting at the coast thereupon moving to the highlands, differences might exist between the regions due to the titling timing. This adds to other cultural or socio-economic factors. The use of the region distinction rather than the department distinction is justified for several reasons. There is a clear idea behind the construction of the regions as groups. They are representative in terms of titling coverage/density and in terms of the overall scope of titled plots on the Peruvian coast and in the highlands. Secondly, the regions also take into account the distinction coast versus highlands which is important in terms of various matters: the timing of the titling and the different socio-economic and ethnic factors described previously. The Peruvian departments do not manage to make these distinctions as several departments have areas that are considered both coast and highlands. The difference is especially large in the northern highlands (dom3) where joint titles constitutes 58 per cent of PETT plots compared to 52 percent in the control group and similar for central highlands (dom4) regions with 63 percent compared to 49 percent (see table A3 in appendix). The share of both other and male ownership is lower, while female and joint ownership is higher reflecting a positive gender equalizing effect.

Another interesting aspect seen in Table 5 is that the share of land owned by women either formalized through PETT or not, is much higher when including female-headed couple households and the single households headed by either a woman or a man. The divergence is mainly explained by the inclusion of single household land, whereas 60 per cent of all households categorized as single are female, while for couple households' category only 3.4 per cent (49 households) of them have reported themselves as having a female head. In other words; the amount of female land with a PETT title increases to 19.5 per cent when including all types of households, male land plots with PETT title to 26.7 and joint ownership is reduced to 43.5[25]. The descriptive statistics on the household types in the sample data can be found in the appendix, Table A1.

This trend is also found in previous studies. Katz and Chamorro (2004) find in their study from Nicaragua and Honduras that female heads own significantly more than female spouses. Deere et al. (2002) also find the same pattern in their study from Peru, Brazil and Paraguay. Female headship is positively related to ownership.

In any case, we can reject our H_1 using the available data and interpreting the t-tests and chi-square tests, and there is no evidence to support the claim that women have been neglected. The overall trend seems to be an increase in women's land rights individually and jointly with their partners.

6.2.1 PETT hypotheses

H_2: Married women have a higher propensity to obtain land titles through PETT, primarily through the issuing of joint titles.

H_3: Women's higher education levels increase women's propensity to obtain titles with PETT.

H_4: Women with a mother tongue other than Spanish have lower propensities to obtain titles with PETT.

To test for hypotheses 2-4 we have made four MNLM models using the categorical variable *namedoc* as a/the dependent variable. The variable *namedoc* is the same as used in the chi-square test in Table 5 and is the variable that in the survey asks: "In whose name is the document issued?" What is different from the testing in Table 5 is that we specify *namedoc* to only be applied on the observations with the PETT title, i.e. when the dummy variable *pettdoc* = 1.

The sub-sample is composed of couple households, as it makes little sense to test for the probability to obtain different types of property documents as titles in single households. Thus these households are excluded from all MNLMs.

A couple's marital status, as previously explained, is a factor that we expect to influence women's propensity to acquire rights, at least for the category of joint titles. Educational levels of the spouses/cohabitants are also important as stated earlier. We expect that higher levels of education for women have a positive impact on the probabilities of acquiring land rights in the woman's name, either alone or jointly

[25] The corresponding percentages for land plots without PETT titles are: 14.9 per cent female land, 24.1 male land and 39.2 jointly owned land. The remaining fall into the "other" category.

with their spouse/cohabitant. Katz and Chamorro (2004) find evidence for this in their study from Nicaragua and Honduras. Deere et al. (2007b) found in their study that female headship and age were positively related to ownership.

Inheritance has been shown to be the most important source of acquisition for women. We could thus hypothesize that the amount of land owned by the person's parents is important in terms of acquiring land rights. Our fieldwork from Ayacucho show that women often pass on their land to daughters or directly to granddaughters, but this practice differs by regions according to Trigoso (2002). Regretfully this survey does not ask from *whom* the land is inherited. The variable *acquisition* only differs between the different forms of acquisition. However, inheritance is an important determinant for land ownership, thus we consider it an important variable to include in the models. As our previous tests have demonstrated there are regional variations in the data set the *dom1-5* dummy variables are included. By including these regional dummy variables we can also control for different cultural practices.

The fourth hypothesis states that there are gender-asset differences with respect to the languages spoken by women and men. Whether or not to consider the mother tongue variable as an ethnic dummy is a difficult case. Ethnicity is a polemic issue in Peru. In most cases only the people from the Amazonas area are considered truly indigenous or native, while the large Quechua-speaking group in most cases is considered *campesinos* (peasants), even amongst themselves. Notwithstanding, and irrespective of the ethnic label, Quechua and Aymara-speaking people are poorer than Spanish-speaking people, on average. Herrera (2004) finds that having an indigenous language raises the probability of being poor, at least in the rural highlands. In such a way the mother tongue variable can also be perceived as a proxy of wealth.

There are however pitfalls in using the mother-tongue variable solely as a determinant for indigenous heritage and the high levels of marginalization and poverty that are linked to the ethnicity/ language variable as stated by Escobal and Valdivia (2002) and Herrera (2005 p. 9). In the northern highlands there are, for example, large groups of people who have Spanish as their mother tongue, even if their heritage is historically the same as the Quechua-speaking people who inhabit the vast majority of the highlands. Figueroa & Barrón (2006) thus state that "language is only a partial marker of ethnicity in Peru". Because of that they suggest that place of origin is a much more reliable ethnic marker. This thus adds up to our other reasons for checking for the inference of geographic differences. Despite this we still believe some proportion of ethnicity is relevant in a gender discourse. Barrig (Deere and León, 2001a; GRADE, 2007a; Trigoso, 2007b) claims that women's lack of bilingualism[26] is one of the signs of the inequalities that exist between men and women in Andean rural Peru.

In Peru the lack of ID has been set forward as a main contributor to women's exclusion from titling (see e.g.Udry, 1996 on Burkina Faso). We do not control for this due to the lack of relevant variables in the baseline data.

[26] In this case, speaking Quechua, Aymara or another indigenous language besides Spanish.

6.2.2 Model specifications

We have constructed the following four models shown in Table 6 below.

Table 6.5 *Econometric models*

Variable	Model 1	Model 2	Model 3	Model 4
In whose name is the property document issued? 1= in name of hh head, 2 = in spouse's/cohabitant's name, 3 = both 4 = other	DV	DV	DV	DV
Household size	IV	IV	IV	IV
Marital status	IV	IV	IV	IV
Number of years of schooling	IV	IV	IV	IV
Spouse/cohabitants age	IV	IV	IV	IV
Spouse/cohabitants mother tongue	IV	IV	IV	IV
Continuous variable for size of land plot measured in hectares	IV	IV	IV	IV
Number of plots held by household	IV	IV	IV	IV
Way acquiring land plot	IV	IV		
Dummies for sample regions: dom1=northern coast, dom2=southern and central coast, dom3=northern highlands, dom4 = central highlands, dom5=southern highlands		IV		IV
Salinisatin			IV	
Erosion			IV	
Soil quality			IV	
Time it takes to walk from household to plot			IV	

DV= Dependent variable, IV= Independent variable

The control variables included are as follows: Where Y_i is the dependent variable *namedoc* that can have four different outcomes: 1= in name of household head, 2 = in spouse's/cohabitant's name, 3 = both (i.e. joint ownership) 4 = other (not specified with respect to sex). The variable *educ,* indicating the number of years of schooling, is used for both household head and spouse/cohabitant, but for the variables *age* and *mtong*, mother tongue, we found very strong correlation (over 0.8) between the head and spouse/cohabitant variables so the head versions were dropped.

Moreover, there is the variable *marstat* to control for marital status, the *size* variable to control for plot size differentials, the *acq* dummy variables to control for the possibility that different acquisition venues determine in whose name the different property documents are issued, and finally the *no_plots* variable that describes how many plots are owned by the household. We hypothesize that the more plots a

household owns, the larger the possibility is that women own some. The *no_plots* can also be interpreted as a proxy for income/wealth of a household that we hypothesize to be positively related to female land ownership as wealthier households might also be more educated.

The second model is similar to the first, but the *dom* variables have been added in order to control for regional differences. In the third model different land and soil characteristics variables have been included as well as the *timedist* variable. In studies from other countries (Long and Freese, 2006) it has been found that there are differences between where men's and women's plots are located in relationship to the household. This has to do with the division of labour as women in most societies tend to have more responsibilities related to work inside the home such as taking care of children and the elderly as well as cooking and washing clothes. This is also true for rural Peru, even though women are normally also responsible for the grazing livestock, storing seeds, some harvesting and selling products. If in fact women own plots that are closer to the household in order to take care of the household tasks, the time it takes to get to the plot might be a determinant for female land ownership. Nevertheless it is uncertain whether or not obtaining formal right to land through PETT matters.

The inclusion of soil and land characteristics serves two purposes. First, if in fact women tend to have rights to lands with poorer qualities, then it might also be that these characteristics in the land also make it more possible for women to obtain rights to these plots. Then, for example, if these poorer-quality land plots heighten the possibilities for women to obtain rights to the land, then it may well mean that women in fact tend to have these kinds of plots.

The fourth model is similar to the second, but it contains only the geographical dummies as well as the basic household characteristics.

6.2.3 The variables and their expected signs

In Table 7 below we see the independent variables and their expected signs. For the whole "other" category we have put a question mark since this category is not specified for either sex. This is also the reason why we have chosen to use this category as the base outcome in all models when running the MNLM in STATA.

Table 6.6 *Key variables and their expected signs*

Key variables and expected signs on the dependent variable *namedoc's* four outcomes - MNLM				
Variable name	**Property document in hh head's name (1)**	**Property document in spouse's/ cohab's name (2)**	**Joint property document (3)**	**Other (4)**
Mother tongue of spouse/cohabitant (f)	?	- if spco-mong=1	- if spco-mong=1	?
Mother tongue of h.hold head (m)	dropped	dropped	dropped	?
Marital status	?	?	+ if marstat=1	?
Schooling years of spouse/cohabitant	-	+	+	
Schooling years of h.hold head	?	?	?	?
Household size	?	?	?	?
Age of spouse/ cohabitant (f)	?	+	+	?
Age of household head (m)	dropped	dropped	dropped	?
Salinization	-	+	?	?
Erosion	-	+	?	?
Size of plot	-	+	?	-
Slope	-	+	?	-
Soil quality	-	+	?	-
Acquisition	?	?	+	?
Irrigation	+	- if irri =1	?	?
Number of plots in household	+	+	+	?
dominio dummies 1-5	?	?	?	?
Walking distance from household to plot	?	?	?	?

6.2.4 Regression result

The MNLM is generally thought of as difficult to interpret, in spite of being a relatively easy mathematical extension of the binary model. Our models contain four possible outcomes on the dependent variable, and the second model, 17 independent variables. The number of possible outcomes of such a model is overwhelmingly large. Therefore, we only focus on the second model as this turned out to be

significant when performing a Wald test and is also the one with the most significant estimates directly related to our research question. Hence, we do not go into all possible combinations of outcomes or all variables that turned out to be insignificant with the Wald test.[27]

The Wald tests the hypothesis that all the coefficients associated with each of the independent variables are simultaneously zero. In the MNLMs one should test the overall significance on the individual coefficients since in these models with *J* categories in the dependent variable, there are always *J-1* non-redundant coefficients associated with each independent variable (Long, 1997).

Despite the difficulties in interpreting the models there are some overall patterns that are evident, looking at the strength of the coefficient estimates and their significance. The estimated coefficients from Model 2 are found in Table 8 below, with the Wald test of significance in the far right column.

The regression output results from all MNLM models are available from the authors. The models have been run using "other" as base, but we also ran all regression models with household head as base to check for consistency in the estimation results. The result estimates with the two different outcomes are approximately the same, both in terms of p-values and coefficients. The following interpretation of the second models used will from here on be based on the estimates using "other" as base.

[27] The Wald test result can be found in the appendix Table A2

Table 6.7 *Estimation results from model 2-MNLM*

Estimation results from model 2- MNLM					
Variable name	**Property doc in hh head's name (1)**	**Property doc in spouse's/ cohab's name (2)**	**Joint property doc. (3)**	**Other = base (4)**	**Wald test results (p-values)**
Household size	-0.0551	-0.0256	-0.0441	-	0.7858
Marital status	-0.597*	-0.00922	0.887**	-	0.000***
Schooling years of spouse/ cohabitant	-0.181***	-0.193**	-0.0650	-	0.0101**
Schooling years of head of household	-0.0601	-0.00835	-0.120*	-	0.1722
Age of spouse/ cohabitant (f)	0.00782	0.0210*	0.00991	-	0.3557
Mother tongue of spouse/ cohabitant(f)	0.114	-0.134	-0.150	-	0.8973
Size of plot	0.111	-0.130**	0.0313	-	0.0086***
Number of plots in household	-0.0292	-0.0915	0.108***	-	0.000***
Acquisition1-inheritance	0.608	0.295	4.739***	-	0.0012***
Acquisition2-purchase	1.874**	0.994	6.076***	-	0.000***
Acquisition3-adjudication	1.349	-0.795	4.861***	-	0.0003***
Acquisition4-parcelizations	3.177**	2.982**	7.878***		0.000***
Acquisition5-communal				-	-
Acquisition6-other	0.185	-2.002	3.999***		0.0007***
dom1 dummy-northern coast	-0.156	0.406	-0.00317	-	0.6745
dom2 dummy-central and southern coast	-0.472	-0.591	-0.987**	-	0.1638
dom3 dummy-northern highlands	-0.672	-0.381	-0.296	-	0.4955
dom4 dummy-central highlands	-0.527	0.751	0.0911	-	0.0368**
dom5 dummy-southern highlands				-	-
constant	1.414	-0.448	-4.254	-	
N	3219	3219	3219		

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

There are various interesting points that can be drawn from these results. The variables *marstat*, *spco_educ*, *size*, *no_plots*, the *acq*-dummies as well as some of the *dom* dummies are all significant. The Wald tests performed for all models also show that these variables are significant in all models where they are included. This gives a good indication of the robustness of the estimates of these variables.

As the MNLM is not a linear model (2007a) it is difficult to interpret the coefficients a part from the sign of the coefficients. The best way to consider both the signs and the strengths of the different coefficients associated to each of the possible outcomes is to compute the marginal and discrete changes of the variables on all four outcomes. The table below, Table 9, only presents the effects of the *significant* variables with the Wald test as shown in the previous table. The table shows the disaggregated effects of the independent variables as marginal and discrete changes.

Table 6.8 *Computed marginal and discrete changes for significant variables from model 2*

Mulitnomial logit: Changes in Probabilities for namedoc				
MARITAL STATUS				
	Household head	**Spouse/cohabitant**	**Both**	**Other**
0->1	-.27116223	-.01829344	0.30894288	-.01948722
SPOUSE/COHABITANT EDUCATION				
	Household head	**Spouse/cohabitant**	**Both**	**Other**
Min->Max	-.12123282	-.04185716	.11223334	.05085664
-+1/2	-.02069227	-.00717156	.01957643	.00828744
Marginal effect	-.02069741	-.00717268	.01958235	.00828774
SIZE				
	Household head	**Spouse/cohabitant**	**Both**	**Other**
Min->Max	-.1982745	-.09341438	.37187922	-.08019032
-+1/2	-.00005868	-.01075902	.01177621	-.00095851
Marginal effect	-.0000609	-.01075306	.01177342	-.00095946
NUMBER OF PLOTS				
	Household head	**Spouse/cohabitant**	**Both**	**Other**
Min->Max	-.28383211	-.12878151	.4853577	-.0727441
-+1/2	-.01969549	-.01071481	.03461415	-.00420384
Marginal effect	-.01970582	-.01071373	.03462655	-.004207
ACQUISITION AND DOMINIO				
	Household head	**Spouse/cohabitant**	**Both**	**Other**
acq1				
0->1	-.42257791	-.15281975	.77449125	-.19909356
acq2				
0->1	-.35493779	-.15932078	.78042346	-.26616495
acq3				

Continue on next page

0->1	-.26682769	-.10117079	.47298896	-.1049905
acq4				
0->1	-.26081829	-.07990432	.43798071	-.09725809
acq6				
0->1	-.25212312	-.08379413	.42224622	-.08632896
dom4				
0->1	-.11979313	.06548308	.05426657	.00004348

As the table shows, the magnitude of the coefficients changes a lot when presented as marginal and discrete changes. We see that when the variable marital status changes from 0 to 1, that is from unmarried to married, the probability for a male household head to obtain a title is reduced by –0.27, while the same change in the variable has almost the exact opposite effect, with 0.31, on the probability of getting the outcome "both" which implies a joint title. Interestingly does being an unmarried woman negatively affect the possibility of acquiring a title individually.

The change in the variable indicating the spouse's/cohabitant's level of education which is a continuous variable can be measured differently. The marginal effect of this variable nevertheless depends on which level the independent variable is held constant. In STATA the mean is the default. If we look at the min->max effect we see what effect the variable has on each outcome of the dependent variable when moving from 0 years of education to the maximum years of education, which are 6 for the women in this sample. The table reveals that the marginal effect of women's education is quite low, but negative on the probability for a man to obtain a title in his name as the head of the household. The effect is also negative for the probability for a woman to acquire a title in her own name surprisingly, even though the marginal effect is very small, only –0.021. The marginal effect on the probability of obtaining a joint title however is positive, but also small. If we nevertheless look at the min->max effects, the estimated changes in probabilities change a lot. The probability function is intriguing as the probability for a woman spouse/cohabitant to obtain a title declines with her education level

The effect of the number of plots owned by the household are also substantial for the probability of the outcome "both", at least when looking at the maximum effect attained when moving from the minimum to the maximum (min->max effect). This is nevertheless not a major surprise as the more plots a household owns should heighten the possibilities that women also own some. The probabilities from Table 9 confirm this. The signs of the marginal change in the probabilities are negative for both the man and the woman separately, but positive for the probability of obtaining a joint title. The effects of this variable are nevertheless small. When looking at the min->max effects, we get an overall idea of what the effect of going from 1 to 20 plots, which is the maximum in this sample, does for the different probabilities. The average change is 0.243 while it is –0.284 for the male, -0.129 for the woman, and 0.485 for the probability of obtaining a joint title.

A part from the emphasized effects we see that the acquisition -*acq* dummies have large effects on the probabilities of obtaining joint titles, but overall negative mid-

sized effects on the probabilities of achieving the household head and spouse/cohabitant outcomes. There is little difference between the various types of acquiring land, surprisingly. We would expect the inheritance venue to be more important to men and women individually, and the purchase venue to the both category due to the Peruvian system of *ganaciales* as described earlier.

As for the only significant regional dummy, *dom4* for central highlands, we see that a change from 0 to 1 on that variable shows a change in the different probabilities, mostly according to the signs of the other variables. Its impact on the male household's head is negative, but relatively small, and positive for women and the probabilities of obtaining joint titles, thus with small effects.

6.2.5 Answering the first research question

We do not find any traces of discrimination against women during the land-titling implementation in Peru, rather the contrary. When taking a closer look the numbers of titles issued to men and women together we find that the overall trend is that women are acquiring more rights than they had in the sampled households, and when comparing for the titled plots and the non-titled plots. Women acquire more rights to land through two venues: the issuing of titles in their name individually and through the joint titling together with their partner.

Our findings partly contradict GRADE's (IDB, 2001) findings which state that the amount of joint issued titles to households have decreased overall, sharply on the coast. We also find differences between the coast and the highlands, while the former has a relatively smaller share of joint titles issued. GRADE's method consists in comparing the "old group", i.e. the group who already had titles in 2004, with the "new group" who acquired their titles between 2004 and 2006. As mentioned earlier we do not make use of the 2006 data due to the difficulties in identifying the same plots in the two years.

We do however find that there are methodological uncertainties of measuring the "success" of PETT at the household level as GRADE does since it is common for one household to own various plots. While GRADE (2007a) states that the per cent of households with joint titles is 76.2 in 2004, we find that almost 10 per cent less of all plots owned by couple households with male head are jointly titled, while the per centage of joint titles is even less when including all land plots and all types of households. There are two reasons which may explain the divergence in the numbers GRADE presents and we find. First, do we only account for households with couples where the man is reported as the head? However, we have found our method to be almost insignificant for the overall results as only 3.41 per cent of the couple households in the sample have reported themselves as having a female head and in these 49 households only own 2.44 per cent of all land plots. Secondly, and more important, is the fact that GRADE did their analysis at the household level while we do it at the plot level. GRADE, we believe, has estimated the numbers of the total share of households that we categorize as being led by a couple who have a joint title. Due to the fact that a household can own up to 20 plots in the sample, and multiple tenure is common, we find it inaccurate not to take this into consideration. In order to get an overall scope of the magnitude of gender differentials when it

concerns land ownership, it is indispensable to treat each plot as a unit and account for the ownership of each plot in the sample.

Maybe the most important finding is that when comparing our numbers, taking account for all land plots with the ones presented on from the LSMS survey, it seems as if there has been a dramatic increase in the number of jointly held plots and female held plots, as well as a considerable decrease in the number of plots owned by men alone. The comparison between these numbers indicates that our discrimination hypothesis does not hold, and that PETT has been a success, at least in terms of issuing joint titles. This result is also what we found in Tambo as there were few histories of women that had been deprived of their rights within the programme. We never spoke to any woman in person who had experienced this, but we were told by leaders of the local branch of the "Mother's Club" that it did happen that women lost their rights because their male relatives "took advantage". The local *Peace Judge* also confirmed this, even though he said that when women had such problems, they rarely came to see him as "they didn't want problems".

Another major problem with interpreting our results as if women are not discriminated is that the sampled households are mostly "second generation" beneficiaries, i.e. mostly from the PTRT2. At the start of this second phase PETT had already gained nationwide criticism from civil society for having neglected women's rights; in addition, the IDB did mention the gender issue specifically in their loan proposal for the financing of the second stage of PETT (Fernández et al., 2000). Moreover, the NGO CMP did focus on the ID problem. The federal government has later launched national campaigns to make people come and get "identified".

In other words there are several aspects that contribute to the assumption that PETT's second phase probably has had much more gender awareness than the first. It might contribute to explaining why we do not find evidence for the discrimination hypothesis. No matter how, there has been a tremendous change in the property-rights distribution since the LSMS survey was conducted, even if we take account of measurement errors and some degree of uncertainty related to our results.

We have not been able to reject our hypothesis, which states that there is a difference between married and unmarried women in terms of obtaining land rights with PETT, with the available data. The computed marginal and discrete changes show what distinct difference there is between the married and unmarried. As CMP found in several departments, the government officials had very different perceptions on whether the unmarried where supposed to get the same treatment or not (2007). A reason for this can be that PETT has had a quite decentralized organizational structure. This can allow for local variations and interpretations of legal proceedings. Although only *dom4* of the regional variables is overall significant, a more thorough inspection of the *dom-* dummies' coefficients reveals regional differences. The coast dummy (*dom2*) especially has a strong negative coefficient of the probability of obtaining a joint title, even if it is not significant overall when using the Wald test. PETT has had an enormous high rate of draught of personnel and this might explain why gender has not been on the agenda for a prolonged time according to Trigoso (2007a).

In addition, most of the results support the hypothesis that women's educational levels make them more prone to claim their rights and thus also acquire land rights. Women's educational level is significant, but the effects of it are not very strong though. One very intriguing finding is that women's higher educational level reduces the probabilities for women to obtain/acquire a title. This result is rather contra-intuitive. One explanation could be that when women are more educated, they are also more aware of laws and rules concerning the titling. As it seems that women in general are more land-scarce than men, partly due to discriminatory inheritance patterns, women should not be entitled much land. The fair, and "according-to-the-rules", proceeding is that all shall acquire titles to land they had a right to claim due to inheritance or other ways of acquiring land. According to the law, land acquired when one is married and cohabiting should be jointly titled while all land acquired before entering a relationship should be individually titled.

Thus, an educated woman will be more aware of the correct proceedings and fight more for the joint titling than the individual for herself as women normally own little anyway. Regretfully rural women's education levels are still low, even though times are changing, and it is now common to send girls to school as well and not keep them at home as in the past old days.[28]

We find that women's education affects other outcomes. However, having Quechua, Ayamara or another native language as a mother tongue is not an important determinant for a woman in terms of having more or less probabilities of obtaining a PETT title. It may not be surprising because what we believe is the *real* issue is the capacity women have to speak *both* their native language and Spanish at the same time. Bilingualism is taught at school, and we do find support for the hypothesis that women's education level is an important contributor to women's capacity to claim their rights. One possibility could have been to check for bilingualism alone, but unfortunately that question was not asked in the survey. The findings from the econometric analysis are also supported by what we were told in Tambo. Before going into the field we hypothesized that most PETT field officials would be male and Spanish-speaking. It turned out that all respondents in Tambo remember that the PETT brigade, as it is called, was composed of both men and women, and they spoke both Spanish and Quechua. If in fact the officials spoke a language both the men and the women did understand, then having Quechua as mother tongue would not matter anyway, even though almost all female respondents did not speak Spanish. What we were told also was that despite the fact that the PETT brigade did speak Quechua, some of the things they talked about were difficult to understand. We interpret this situation as a divergence between the education levels and the levels of legal literacy between the inhabitants of Tambo and PETT. We furthermore got the impression from both our male and female respondents that it was mostly the men who attended the meetings with PETT, as the women did not have time. They had to stay home to cook and take care of the children. Despite this it does not seem that it affected their possibilities to obtain their titles. However, if women never have

[28] We were told by a Tambina woman: "Before, when I was a girl they wouldn't send the girls to school. The fathers used to say: What is it for? Shall we send our girls to school just so that they can send love letters?" Obviously times are changing, and so are women's abilities to read and understand more than fictional love letters.

time to go to such meetings to get information it should not be a surprise if they are less prone to obtain their titles.

6.3 Women's rights to land in Peru

The second research question asks whether women have the same rights as men to land. This question is answered by the testing of the different hypotheses presented below.

6.3.1 Smaller plots?

H_5: Women have smaller land plots than men.

To test our fifth hypothesis we have used two sets of tests. First we tested it using a t-test to check for the significance of differences in mean sizes in land owned by women and men. Here we show t-tests for comparing mean values.

The result from the t-test is shown below. The test is done using the variable *women_all_land* which is a dummy and takes the value of 1 for women's land, 0 if owned by men. It counts all plots owned by women. The use of this variable leaves all other plots out, thus the test's total observations is only 2,750 plots. As we see from the test statistics in Table 10 the difference in mean sizes between women's and men's plots is significantly different with a p-value of 0.000. The test statistics show there is a considerable difference in the average size of plots owned by men and women, the former being by far larger than those owned by women.

Table 6.9 *T-test of means of size of land plots owned by women*

t-test size , by(women_all_land)
Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	1627	1.671533	0.08367	3.374906	1.507421	1.835644
1	1123	1.0468	0.079134	2.651882	0.891533	1.202068
combined	2750	1.416415	0.059396	3.11475	1.29995	1.53288
diff		0.624733	0.120272		0.388901	0.860564

diff = mean(0) - mean(1) t = 5.1943
Ho: diff = 0 degrees of freedom = 2748
Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

Secondly, we have run three OLS models using the variable size, which is the measured size in hectares of each plot as the dependent variable. Running an OLS regression allows us to control for regional differences using the *dom* dummies, as our chi-square tests for geographical inference on the distribution of rights showed there are regional differences which should be controlled for. Moreover, the mean farm

size is substantially different when making the distinction coast versus highlands. The three OLS models also include the variable *hhhsex* which is a dummy for the sex of the household head and takes the value 0 for male and 1 for female. This allows us to check for household head gender differentials with respect to the size of the plots. As was done in the MNL models we control for age and level of education in the household head, since it might be a determining factor in terms of capacities to acquire more land. In the models we do not include spouse's/cohabitant's level of education and age as the regressions then will only be run for "couple households". As mentioned the amount of land owned by female heads of households, whether they are single or not, is substantial compared to what women as spouses/cohabitants own. We thus hypothesize that there might be a substantial size differential in plots owned by female heads, both as partners and as single. As in our MNL models we control for the number of plots owned by the household as it might serve as an indication of a household's wealth. In the first model we also control for marital status as there might be systematic differences in what plots are owned by the married and the unmarried. Differentials might reflect married and unmarried persons' relative wealth and/or ways of acquiring land. The variable *hhsize* is included in model 2 in order to control for the sizes in terms of persons in a household. The number of persons in a household might be important for how much land a household acquires either via the market, the family or other forms of acquisition. In our last and third model we replace the *hhhsex* variable with *women_all_land* which is another way of controlling for gender differentials with respect to plot sizes. The *women_all_land* variable is a dummy which takes the value 0 if land is owned by men, and 1 if owned by women. As a consequence of that all jointly held plots and plots that are inscribed in the "other" category from the variable *namedoc* are thus not part of the regression and the total number of observations is reduced compared to model 1 and 2. Note that neither model 1 nor model 2 use information from all plots as observations are missing for some of the plots on some of the independent variables included in the models.

The general model we will use is:

$$size_i = \alpha_i + \beta_i x_i + \varepsilon_i$$

Equation 1: General OLS model

The x's, i.e. the independent variables, vary depending on the model. The different variables included in the three models can be seen in the table below along with their expected signs.

Table 6.10 *Key variables and expected signs: 3 OLS models*

Key variables and expected signs on the dependent variable *size* OLS regressions			
Variable	**Model 1**	**Model 2**	**Model 3**
Sex of head of household (1=female)	-	-	not incl.
Marital status	?	not incl.	?
Schooling years of head of household	+	+	+
Age of head of household	+	+	+
dom1=northern coast	+	not incl.	not incl.
dom2= southern and central coast	+	+	+
dom3= northern highlands	-	-	-
dom4= central highlands	not incl.	-	-
dom5= southern highlands	-	-	-
Number of plots in household	?	?	?
Household size	?	?	not incl.
If plot owned by women	not incl.	not incl.	-

The results from the three models revealed that the sex of the owner is an important determinant for how large the plots are. The results are found below in Table 12. Both variables used to control for gender differentials, *hhhsex* and *women_all_land,* turned out to be significant in the different models. The impact of the *hhhsex* variable is quite strong as we can see from the magnitude and the negative sign that corresponds to it in Table 12 below. Its coefficient in model 1 is –0.417 when the sex of the household is female. The effect of that variable is almost the same in model 2 which shows the robustness of the result. This indicates that there is a substantial difference between the sizes in plots owned by female- and male-headed households. In model 3 we see that the effect of the dummy accounting for land owned by women (*women_all_land*) is also substantial, although its coefficient is a bit smaller than the *hhhsex* effect, this time –0.354. There are also two other important findings from the three regressions: All models indicate that the number of plots owned by the household has a negative effect on the dependent variable. The magnitude of the coefficient is nevertheless not very large, but approximately –0.100 in the three models. This might indicate that having more plots also means one has smaller plots. Secondly, several of the regional dummies are significant and with either strong negative or positive signs on the coefficients. In models 2 and 3 the dummies' coefficients for southern highlands have strong and negative effects, -1.026 and –0.887, respectively. The same applies to the dummies for central highlands which

both have strong negative coefficients. These results are as expected as the average plot size in the highlands is smaller than on the coast. See Table 12 for all estimated coefficients and significance levels.

Table 6.11 *Results from OLS regressions on size: whole sample*

Variable	Model 1	Model 2	Model 3
Sex of head of household	-0.417***	-0.400***	
	(-2.92)	(-3.69)	
Marital status	0.0469		-0.0515
	(0.33)		(-0.37)
Schooling years of head of household	-0.0278	-0.0269	0.0124
	(-1.20)	(-1.16)	(0.44)
Age of head of household	0.00783	0.0105**	0.00311
	(1.82)	(2.27)	(0.48)
dominio1= northern coast	1.009***		0.160
	(6.91)		(0.58)
domino2 = south- central coast	0.936***	-0.0920	0.120
	(5.25)	(-0.53)	(0.37)
dominio3= northern highlands	1.144***	0.115	
	(6.22)	(0.61)	
dominio4= central highlands		-1.015***	- 1.052***
		(-6.88)	(-4.02)
dominio5= southern highlands	-0.0312	-1.026***	-0.887***
	(-0.24)	(-7.83)	(-3.32)
Number of plots in household		-0.0991***	-0.0936***
	(-6.97)	(-6.87)	(-4.32)
Household size		0.0608	
		(1.85)	
If plot owned by woman			-0.354**
			(-2.47)
Constant	1.171***	1.789***	2.279***
	(3.77)	(4.79)	(5.12)
Observations	6435	6435	2743

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

6.3.2 Soil quality hypothesis

H_6: Women tend to have land rights to land plots with worse soil qualities, with higher probabilities of erosion and salinization.

We have used a chi-square test to test our sixth hypothesis. We used the dummy variable *women_all_land* which takes the value 1 for the land plot owned by women and 0 for men's land, and the soil characteristics variables which are categorical with up to four categories: *eros, sali* and *soilqual.*

The t-test we perform to check for soil and land qualities gives no evidence that women have land plots of worse quality than men. These results are also supported by the results from the regressions we did for MNLMs. They do not show any clear patterns that could help establish whether there are gender differentials with respect to the soil and plot characteristics.

6.3.3 Irrigation hypothesis

H_7: Women have less access to irrigation than men.

To test the hypothesis on irrigation we ran three logit regressions. We used the dummy variable *irri* as the dependent variable and other independent variables in order to control for gender differences with respect to irrigation; the *women_all_land* variable was used to control for differences with respect to land owned by women and men and *hhhsex* to control for gender differences with respect to the sex of the household head. In the models we also included other variables that we expected could have an effect on the probability of having irrigation on a plot. The variables are *hhsize, marstat, dualhead, head_educ, head_age, pettdoc, size sali, eros, solilqual, dom1-5* and *wom1-5*. Also here we use only *age* and *educ* for the household head in order to include all types of households. Using the spouse/cohabitant variants would exclude the single households from the regressions as the values for the variables mentioned appear as missing observations in the single households. As GRADE (2007a) found that land with irrigation had a larger titling density, we find it appropriate to control for the presence of a title on the plot. Finally, we control for regional differences due to the differences in the agricultural sectors, agro-climatic and economic factors between the coast and highlands. We also make use of the interaction variables *wom1-5* to control for regional and gendered effects at the same time. The three models are as follows:

Table 6.12 *Logit models*

Variable	Model 1	Model 2	Model 3
Irrigation	DV	DV	DV
Household size	IV	IV	IV
Household head sex	IV	IV	
Land owned by women	IV		IV
Marital status	IV	IV	
Couple household	IV	IV	
Number of years of schooling household	IV	IV	
Household head age	IV	IV	
Interaction variable between the variable women_all_land and the different dom variables		IV	
Number of plots held by household			IV
Do you have a PETT doc			IV
Salinization			IV
Erosion			IV
Soil quality			IV
Dummies for sample regions (dominio 1-5)			IV

Note that in models 2 and 3 one of the dummies from the *wom* and *dom* was dropped in order to avoid a dummy trap.

If the hypothesis claiming women are more irrigation scarce than men holds, then there should be significant and negative signs on the *women_all_land* and *hhhsex* variables. The interaction variables *wom* should also have significant and negative signs in order to support our hypothesis. All variables with their expected signs can be seen in the table below:

Table 6.13 *Key variables and their expected signs: 3 logit models*

Key variables and expected signs on the dependent variable irri logit regressions			
Variable	**Model 1**	**Model 2**	**Model 3**
Size of plot	+	+	+
Sex of head of household (1=female)	-	-	
If plot owned by woman (0=man, 1=woman)	-		-
Marital status (1 =married)	?		
Dual-headed household (1= dual)	?	?	
Schooling years of head of household	+	+	
Age of head of household	+	+	
Women's land in dom1 (1=women's land)		+	
Women's land in dom2 (1=women's land)		+	
Women's land in dom3 (1=women's land)		-	
Women's land in dom4 (1=women's land)		-	
Women's land in dom5 (1=women's land)		dropped	
Number of plots in household			+
If PETT title (1=yes)			+
Salinization			?
Erosion			?
Soil quality			?
dominio1=northern coast			+
dominio2= southern and central coast			+
dominio3= northern highlands			-
dominio4= central highlands			-
dominio5= southern highlands		dropped	

The results from the regression are found below in Table 15. The results from the three models show that there appears to be gender differences, but also regional differences as expected. In model 1 we find that land owned by women has a quite large and negative effect on the probability of having irrigation. However, we also get a positive sign on the household sex variable which is 1 for female, although not significant. These two findings can seem contradictory, but when comparing this finding with our previous findings it makes sense that female heads are better off than the female spouses and cohabitants. As the variable *women_all_land* is a dummy for all plots owned by women and the group of female spouses and cohabitants is larger than the group of female heads, the finding is not strange. When including the regional dummies in model 3, we see that much of the strength of the *women_all_land* disappears, something that is an indication that regional differences are an important reason why women seem to have smaller probabilities of having irrigation on their plots. This finding is not surprising because of the differences between the coast and highlands as discussed previously.

Table 6.14 3 *logit regressions on irrigation and gender differentials*

Variable name	Model 1	Model 2	Model 3
Size of plot	-0.0226	-0.0425**	-0.131***
	(-1.44)	(-2.49)	(-4.55)
Household head sex	0.203	0.628**	
	(0.76)	(2.48)	
Land owned by woman	-0.442**		-0.000962
	(-2.22)		(-0.01)
Marital status	0.270	0.333	
	(1.26)	(1.53)	
Couple household	-0.158	-0.148	
	(-0.65)	(-0.60)	
Number of years of schooling household	0.119***	0.104***	
	(3.12)	(2.69)	
Household head age	0.00365	0.000999	
	(0.66)	(0.17)	
Interaction variable between wom1		1.261***	
		(3.46)	
Interaction variable between wom2		1.367**	
		(2.52)	
Interaction variable between wom3		-1.513***	
		(-4.88)	
Interaction variable between wom4		-1.670***	
		(-7.24)	
Number of plots held by household			-0.103***
			(-3.45)
Do you have a PETT doc			0.481**
			(2.27)
Salinization			0.114
			(0.62)
Erosion			-0.00541
			(-0.05)
Soil quality			-0.766***
			(-5.21)
dominio1=northern coast			1.075***
			(3.46)
dominio2=south- central coast			1.393***
			(3.29)
dominio3=northern highlands			-1.508***
			(-5.89)
dominio4=central highlands			-1.913***
			(-7.95)
Constant	-0.0670	0.191	3.595***
	(-0.16)	(0.42)	(7.23)
N	2550	2545	2294

t statistics in parentheses, * p<0.10, ** p<0.05, *** p<0.01

The discrete changes in the variable *hhhsex* indicate that when changing the value of the dummy from male (0) to woman (1), the probability of having irrigation changes by 0.1437, almost 15 per cent. The effect of education is not very large, even when looking at the maximum impact it can give on the probability of having irrigation which is the min->max effect. Interestingly, there is a positive effect of female landownership on the coast and a negative effect on the probability of having irrigation in the highlands. This we believe is a reflection of the very different agricultural sectors in these areas, even though there still seems to be a gendered effect on the access to irrigation as we computed two extra models in order to verify the robustness of the findings. These two models are exactly the same as model 2, but we removed the *hhhsex* variable and created a new model using the interaction variables *wom1-4* while the other one remained exactly the same, but this time using the male interaction variables *man1-4*. They reveal that there is in fact a gender difference when it concerns access to irrigation, despite the regional impacts.

As for the amount of plots owned by women, with or without titles, besides men, there is a great land gap still. The gap in terms of the number of plots owned by women is strengthened by the results we find that support the hypothesis that women's land plots are smaller, and that women own less land than men in general. If in fact PETT mostly *formalizes* land rights, the gender asset gap in size and number of plots is supported by our interviews from Tambo where women have tended to own and inherit land from their mothers and grandmothers mostly. However, compared to men, women have always owned *less* land because the land inherited is smaller in terms of size measured in the local measurement unit *yugadas* which is one fourth of a hectare. What several women told us was that it had been common to say that women should not inherit because they would get land from their future husbands when they married. These findings concerning inheritance are also supported by Trigoso (2007b) which describes some of the different and geographically dependent inheritance patterns from Peru. In Sierra de Lima sons tend to inherit larger plots, in northern highlands women and men inherit 50 per cent each, while in central highlands daughters and sons inherit equal parts except for the family property which will be inherited by the one who takes care of the elderly parents, while a local variety in central highlands in Ayacucho is what we found in Tambo.

The tests used to control for differences in quality in land and soil between men and women do not allow us to maintain our hypothesis. A more thorough analysis would have to be done. As Trigoso (2007b) states there are great regional variations with respect to inheritance and what kind of land women inherit. It should then be no surprise if one finds variations with respect to what kind of land plots women and men own across the country.

The irrigation hypothesis cannot be rejected based on the effects we find on the probabilities of whether the plots owned by women have irrigation. This finding is partly supported by the literature, which is limited at this time, and studies conducted on women and water rights, including irrigation. Oré (1998a) writes in an article published in the Peruvian magazine "Chacarera" about experiences from an irrigation board meeting for women in Lambayeque where the women stated that irrigation is still perceived as a male activity, just as women are not generally

perceived as agriculturalists. Women's responsibilities should be restricted to/entail cooking and taking care of the household tasks.

As irrigation has been perceived as a mostly male activity, women have also been excluded from irrigation boards and organizations where important decisions regarding e.g. maintenance and scope of the systems are taken. Deere and León (1998a) claim that participating in irrigation systems and construction, along with being a landowner, often are requisites, to obtain water rights. If women are excluded from the irrigation organizations, it might not be surprising that women also have fewer rights to water. However, as Deere and León (ibid.) also point out, irrigation and the tasks related to it are quite heterogeneous in the Andes. Only in some regions is irrigation considered to be proper for females, and this might explain the regional differences in the logit regressions even though our division into five different regions might be too wide in terms of showing the differences that Deere and León (1998 p. 362) claim exist.

In addition, as mentioned in the statement of the research questions and hypotheses, it has been claimed that gender inequalities with respect to irrigation water rights can also be products of state-led or NGO-led irrigation projects which direct the projects to men, or as van Koppen (INEI, 1994) argues: "Water users are persistently seen as a homogeneous group. Class, gender, and ethnic characteristics of water users are rarely mentioned in mainstream policy, intervention, and even research. The widespread assumption that rights are vested in households, which is often equivalent to its male head, makes women and youngsters invisible". It might seem that state-led irrigation programmes have something to learn from PETT.

7 Concluding remark

Securing land rights for the rural and urban poor has gained increased focus in the last years due to the implementation of many projects of land regulation and titling in the developing world. Nevertheless, tenure security for the rural households will not necessarily produce the same security for the different individuals inside the household, and research from Africa, Asia and Latin America has shown that land titling of rural lands can have unequal effects on men and women's rights. In Peru heavy criticism was raised towards the national rural land-titling project PETT by civil society in the late nineties. The main objection was that women's rights were neglected, resulting in women losing rights to land which was theirs or was owned by them with their spouse or cohabitant.

With this background we analysed what the effects of PETT have been on women's rights to land. Using both econometric and statistical methods on survey data collected by the GRADE and CUANTO research institutes in Lima, Peru, and adding qualitative data collected in the Municipality of Tambo in Ayacucho, we find no evidence of the discrimination hypothesis. We conduct our analysis at the plot level, as we believe this is the most accurate way of getting a precise understanding of the actual landownership of men and women. This methodological point is also made by Deere & León (2003). We find that overall women are obtaining more land rights when comparing our numbers with previous studies on distribution of land rights by gender in Peru, as well as when we compare the distribution of rights between men and women in the titled and the non-titled plots. Women have gained rights both individually and with their partners as joint titles. However, we find that there still is a great gender land gap, as men own more plots alone than women, as well as men's plots are larger. The distribution of land rights, especially those formalized through PETT are, however, not equally distributed along Peru's geographical main regions as there are relatively more joint titles in the highlands than on the coast. We believe this can be an effect of the timing of the titling, even though we do not control for that in our analysis. The highlands are later beneficiaries of PETT and with the years the land-titling project might have become more gender-sensitive due to, for example, the criticism from civil society and the prescriptions by the IDB who funded the second stage of PETT.

We hypothesized that women who have lower levels of education, speak native languages and live in consensual unions are less likely to obtain land rights with PETT. When controlling for these factors in a multinomial logit model regression, we find that the variable marital status in fact is an important and significant determinant for the probability to acquire a PETT title. Being married has a substantial positive effect on the probability to obtain a joint title, while the effect is negative on the probabilities of men and women individually to acquire a title. The

same is true for women's educational levels, although the effect is considerably lower. Women's mother tongue was found to not be a significant determinant for obtaining a title. This is probably due to the fact that the ethnic component is more accurately captured in the regional differences; in addition, being bilingual is more important than one's own mother tongue. Bilingualism is a capacity gained by education.

We tried to find out whether women have the same rights to land as men, broadening the concept of "rights to land". The ability to use land for productive purposes depends on the characteristics of the land as much as the right itself measured in a title or other kind of property document. If the quality of the land is poor and bad, situated in hilly areas with more problems with erosion and salinization, the right in itself is not worth as much. The same concerns the access to water as irrigation, which in some areas is crucial for the full exploitation of the land. We do not find any evidence of differences in women's and men's land with respect to soil qualities, erosion and salinization. When performing a logit regression to find the probability of having irrigation, we find significant differentials between men and women's plots with the latter having a lower probability of having access to irrigation. Notwithstanding, the effect is small when controlling for regional differences.

As for policy recommendations, we want to emphasize one of our main findings that points to the importance marital status has for women in order to acquire land rights with PETT. If it is in fact stated that joint titles shall be issued to all couples, then a thorough investigation should be conducted to find out why unmarried women tend to obtain less joint titles that their married sisters. However, it is equally relevant to ask why joint and female ownership is higher with PETT title if the gender neutral law just intended to formalize the already existing defacto ownership as perceived by the population itself.

As the rural land titling is moving towards new frontiers in the Amazonian region, the new COFOPRI organization should consider and target unmarried women as well as women with lower levels of education. The extent of rural poverty is also high in this area making women more prone to be illiterate and monolingual and thus more vulnerable. In addition, in order for men and women to benefit from their land on equal terms, irrigation, if provided by the public infrastructure, should be equally distributed. Otherwise, if irrigation is provided by community efforts, it should be encouraged that women also benefit from it.

In order to broaden our knowledge of what role inheritance patterns play in the gender land gap that is still found in Peru, surveys should place more emphasis on the origins of inherited assets such as land. It is clear that the gender differentials with respect to land ownership in Peru are products of inequality in the ways in which land is acquired. Finally, it remains to be seen whether a formal land title serves to guarantee women's rights in case of household breakup, male migration and widowhood. In developing countries with weak state power, there is often a gap between *de jure* and *de facto* rights.

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10 Appendix

Table 10.1 *Frequencies over household types*

Household type	Sex of head of household		
	Male	**Female**	**Total**
Single households	239	356	595
	40.17	59.83	100.00
	14.71	87.90	29.31
Couple households	1,386	49	1,435
	96.59	3.41	100.00
	85.29	12.10	70.69
Total	1,625	405	2,030
	80.05	19.95	100.00
	100,00	100,00	100,00

Table 10.2 *Wald test results (testing individual coefficients).*

Results from Wald tests					
Var. name	***Model info***	***model1***	***model2***	***model3***	***model4***
	Number of obs	3222	3219	3056	3219
	Wald chi2(51)	191.3	208.26	.	134.35
	Prob>chi2	0	0	.	0
hhsize		0.702	0.7858	0.6553	0.7657
marstat		0.0000****	0.0000****	0.0000****	0.0000****
spco_educ		0.0187***	0.0101***	0.0171***	0.0107***
Head_educ		0.1697	0.1722	0.1222*	0.1361*
Spco_age		0.3819	0.3557	0.4798	0.3289
spco_mtong		0.5131	0.8973	0.1963	0.4545
size		0.0049****	0.0086****	0.0029****	0.0054****
no_plots		0.0000****	0.0000****	0.0000****	0.0001****
acq1		0.0287***	0.0012****		
acq2		0.0001****	0.0000****		
acq3		0.1135*	0.0003****		
acq4		0.0030****	0.0000****		
acq5		0.0017****			
acq6			0.0007****		
dom1			0.6745		
dom2			0.1638		0.2907
dom3			0.4955		0.4337
dom4			0.0368***		0.1905
dom5					0.9778
_Isali_1				0.752	
_Isali_2				0.8033	
_Isali_3				0.0000****	
_Ieros_1				0.6538	
_Ieros_2				0.3061	
_Ieros_3				0.3161	
_Islope_2				0.0962	
_Islope_3				0.5018	
_Isoilqual_2				0.0000****	
_Isoilqual_3				0.0000****	
_Isoilqual_4				0.0000****	
_Isoilqual_5				0.0000****	
timedist				0.7729	

* p<0.15 **p<0.1 ***p<0.05 ****p<0.001

Table 10.3 *Distribution of ownership in male headed couple households, by region*

Region	Plot		**Men**	**Women**	**Joint**	**Other**	**Sum**
DOM1-northern coast	PETT	Obs	130	35	195	39	399
		Share (%)	32.6	8.8	48.9	9.8	100.0
	No PETT	Obs	45	8	66	15	134
		Share (%)	33.6	6.0	49.3	11.2	100.0
DOM2-central and southern coast	PETT	Obs	87	20	127	40	274
		Share (%)	31.8	7.3	46.4	14.6	100.0
	No PETT	Obs	34	8	37	11	90
		Share (%)	37.8	8.9	41.1	12.2	100.0
DOM3-northern highlands	PETT	Obs	225	53	510	86	874
		Share (%)	25.7	6.1	58.4	9.8	100.0
	No PETT	Obs	31	3	80	40	154
		Share (%)	20.1	1.9	51.9	26.0	100.0
DOM4-central highlands	PETT	Obs	179	124	671	93	1,067
		Share (%)	16.8	11.6	62.9	8.7	100.0
	No PETT	Obs	38	18	93	41	190
		Share (%)	20.0	9.5	48.9	21.6	100.0
DOM5-southern highlands	PETT	Obs	190	46	325	74	635
		Share (%)	29.9	7.2	51.2	11.7	100.0
	No PETT	Obs	53	9	106	30	198
		Share (%)	26.8	4.5	53.5	15.2	100.0