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Land Titling in Peru: Is it Fulfilling its Promise?

Land titling, the formal registration of land that had previously been used without formal title, is a policy that has been implemented or is under consideration in much of Latin America and the rest of the developing world. As insecurity of tenure is seen to be a significant constraint to development, titling is usually intended to facilitate access to formal credit and encourage investment in the land, thereby increasing farm productivity and production. It is also possible that with secure ownership rights, farmers will become better stewards of the land and be more likely to adopt conservation techniques. Titling could also stimulate and strengthen land markets, which could encourage the transfer of land to more productive producers and/or lead to reconcentration of land ownership. As the beneficiaries of titling are often among the poorest in the countries concerned, understanding the effects of this program is imperative.

The general objective of this paper is to examine the effect of land titling in coastal Peru on the beneficiaries of this program. Specifically, we will examine the effects of land titling on access to credit, on-farm investment, the use of conservation techniques and the functioning of land markets. We will examine if farmers have greater access to credit after receiving titles and how that access may vary depending on farm or farmer characteristics. We intend to determine if farmers change their farming techniques to enhance the long-term viability of production once they have security of tenure. We will also examine if titling improves fluidity in the land market, and if so, if small farmers and tenants are accessing that market.

Theoretical significance

Government-issued land titles are hypothesized to encourage rural development through three avenues. First, land titles are meant to facilitate access to credit (the ‘collateral effect’). Banks value them as collateral, so it is hypothesized that titling increases access to formal credit. Second, by protecting land holders' rights to the land against competing claims, titles are intended to increase landholders' sense of tenure security and therefore make them more likely to be better stewards of the land and to make long-term investments in the land (the ‘security’ or ‘investment effect’). Finally, titles

also facilitate transfers as they show the possessor of the titled land is truly the owner and has the right to transfer this ownership to others. This means that with improved factor mobility, the land is more likely to find its way to the most productive producer (the ‘transaction effect’). We intend to examine each of these three issues.

1. Access to credit

Land has long been used as valuable collateral as it is immobile and relatively immune to damage. Because titles establish clear ownership, banks value them as collateral, as long as there are no social or political restrictions on foreclosure. The lack of title lessens the value of land as collateral because the owner may not have the uncontested ability to transfer the land to the bank in case of default on a loan. Although most developing countries have informal credit markets open to untitled farmers, the interest rates are generally much higher due to greater risk.

As credit is often needed in order to purchase inputs and make productivity-enhancing improvements, understanding restrictions in the credit markets is essential to fostering economic growth and development. Two commonly recognized factors that may limit the access of poor households to credit markets are fixed transaction costs and ‘incomplete information’ (Bradford *et al.*, 1996). Fixed transactions costs are the cost of the loan application that do not vary with the size of the loan, such as preparing the application and assessing the viability of the project. Because these costs are fixed, they are relatively greater for small loans and may therefore make the cost of these small loans prohibitive. ‘Incomplete information’ refers to the difficulty the lender faces in determining the risk of the loan. While incomplete information is a cost to the lender for all types of loans, there could be a bias against the poor if wealth is used to determine the risk of the loan or if social relations and the reputation of the borrower favor wealthier borrowers. Because poor households are especially likely to be credit-constrained, an understanding of the effect of titling on access to credit for these farmers is important for equity considerations.

2. Investment in conservation and improvements

In addition to facilitating access to credit (the ‘collateral effect’ described above), titles are intended to increase landholders’ sense of tenure security and therefore make them more likely to make investments in practices that enhance the long-term viability of agricultural production, such as installing

irrigation systems. If farmers fear eviction and are not certain that they will be able to reap the future rewards of present investment, they will be disinclined to make such investment. This is referred to as the 'security' or 'investment effect.'

The third theory linking property rights and increased investment involves 'gains from trade' (Besley, 1995; Wachter, 1992). If enhanced property rights facilitate land sales, by reducing risk to potential buyers, owners would be encouraged to invest in the land, confident that they will receive compensation for their investment.

3. Functioning land markets

Secure ownership is also required for a fully functioning market in land, which facilitates the transfer of land to the most productive user (the 'transaction effect'). Without clear and definite claims to the land, farmers will have difficulty transferring secure ownership rights to others, increasing transaction costs and limiting land markets. Insecurity similarly reduces the market value of land to buyers because they cannot be sure that a third party does not have claim to the land. In this sense, security of ownership refers not only to the present owner but also to any future owners.

Atwood (1990) explain Johnson's (1972) view of how customary tenure can restrict sales. Under a system of secure property rights in land, more productive farmers buy land from less productive farmers, resulting in a net gain to both. This can happen because 'farmer B,' the more productive farmer, expects to gain more production from the land than 'farmer A,' the less productive farmer, and is therefore willing to pay more for it than 'farmer A' thinks it is worth. The risk and transaction costs of customary transfers reduce the return expected by 'farmer B' who naturally reduces his or her offer price, possibly to the point that the sale does not take place. The results are a loss in total production and a leftward shift in the demand curve for land with lower prices and fewer sales.

As land transfers are facilitated by titling, a concern will be whether the market is actually able to transfer land to more productive users, as hypothesized, and related to that question, if people with few financial resources of their own are able to access that market. It has been hypothesized that poor people, even if more productive, may not be able to purchase land because of imperfections in the markets for land and capital (Carter and Mesbah, 1990; Shearer *et al.*, 1991; Stringer, 1989). Land markets generally violate the criteria for a 'perfect market,' and in the developing world, the violations

are even more pronounced. As with credit, fixed costs for land sales disproportionately affect the sale of small parcels of land. Many transfer costs, such as registering the title, are fixed and are therefore especially onerous for the purchasers of small parcels of land.

In bimodal land ownership systems, as are generally found in Latin America, the market for land is divided into two sub-markets, one for large and another for small units. Typically small farmers sell land to other small farmers and large farmers sell to other large farmers, although the large-unit market controls the majority of the land and is less active than the small. Large units are generally not subdivided, reducing the amount of land within the price range of small producers. Social factors also limit the movement of land from one sub-market to another (Dorner and Saliba, 1981).

There are two competing hypotheses for the effect of an active land market on the structure of land holdings under imperfect market conditions. The first is that the market will promote a more efficient allocation between small and large producers and will gradually transform the agrarian structure by transferring land to the land poor. Due to higher utilization of labor and lower labor costs on small farms, smaller producers will be able to outbid larger producers because of the widely documented inverse relationship between size and land productivity (Barraclough, 1970; Barry and Cline, 1979; DeJanvry and Sadoulet, 1989; Doving, 1970; Griffin, 1976; Thiesenhusen, 1989). The second hypothesis is that with multiple imperfect markets, market activation will shift resources to farms of the scale of production which are best positioned to expand because of advantages in other markets, *i.e.* capital markets.

Carter and Mesbah (1990) explain the Carter-Kalfayan model, which suggests that the second hypothesis is more likely to be true. Although imperfect labor markets favor small farmers, these advantages may be outweighed by imperfect capital markets. The advantage of large farms in capital markets is brought about by several factors. First, this advantage is created by government subsidies for credit, which generally flow to large producers because they have the access to information required to take advantage of these subsidies. Secondly, within the credit market, the perceived risk and relatively higher transaction costs of lending to small farmers make lenders reluctant to offer credit to small producers. When the advantages of the credit market to large producers are greater than those of the labor market to small producers, increased activity in land markets could lead to increased

concentration of land holdings. In addition, fixed transaction costs favor purchases of large units of land because they increase the per unit price of land in small units, thereby providing an additional force toward increased concentration of land ownership.

Previous evaluations of land titling projects

Previous studies of land titling have yielded mixed and tenuous results. Studies from Thailand (Feder, 1987; Feder and Onchan, 1987, 1989; Feder *et al.*, 1988; Feder and Feeny, 1991), comparing farmers squatting on public forest reserve land with farmers producing on privately owned and operated land, indicated that titles did increase access to formal credit and stimulate investment. However, studies of land registration programs in African countries (Atwood, 1990; Barrows and Roth, 1990; Coldham, 1979; Haugerud, 1983; Hunter and Mabbs-Zeno, 1986; Migot-Adholla *et al.*, 1991) have not found a solid link between land titles and the use of credit, as credit markets are weak in these countries. Besely (1995) did find that investment is significantly related to property rights, though it does not seem to be caused by the ‘collateral effect.’

Research from Latin America suggests that titling does not affect all farmers uniformly. Some studies found that titles do facilitate access to credit and encourage investment, but that these results are limited to or most pronounced for mid-sized to larger farms (Carter and Olinto, 1996; Lopez, 1996; Seligson, 1982). Others found positive results only when land titling was combined with access to technical assistance and credit (Larson *et al.*, 1999; Saenz and Knight, 1971; Seligson, 1982). Stanfield (1990) in an evaluation of various titling projects in Latin America and the Caribbean, highlighted the strength of customary systems of land tenure and also emphasized the importance of access to credit, technical assistance and markets.

Peruvian context

The Government of Peru has received funds from the Inter-American Development Bank (IDB) to carry out a land titling and registration project, the Proyecto Especial de Titulación de Tierras y Catastro Rural (PETT). According to the IDB project report, one of the general objectives of this project is to support “the establishment off a rural land market in Peru that operates in an open, flexible

and transparent fashion through conclusive regularization of the ownership of all holdings created under the agrarian reform.” Titling under this project started in September of 1996, primarily in the coastal region.

Peru’s agrarian reform of 1969 granted land under various types of organizational structures, with agricultural production cooperatives (Cooperativas Agrarias de Producción, or CAPs) one of the most common forms of production in the coastal region. Starting in the early 1980s, much of this land was informally divided among the members of the cooperative, or ‘parceled.’ Following parcelization, most CAPs changed to agricultural cooperatives of ‘users’ (Cooperativas Agrarias de Usuarios, or CAUs). While most of the land of CAUs was under individual cultivation, some land and most of the capital assets were still held collectively. These CAPs and CAUs were among the first lands to have received title.

Both parcelization and informal settlement have led to the vast majority of farmers in Peru lacking formal rights of tenure to their land. Data from the 1994 agricultural census indicate that only 24 percent of all landowners had a registered and valid title. The government of Peru has attempted to change this through several measures. A number of laws passed in the early 1990s facilitated and encouraged farmers to title their land. The incentive to register one’s land was increased in 1992 with the closing of the state agrarian bank. The closing of this bank meant that access to formal credit was essentially beyond the reach of those without formal title to their land. The new Constitution of 1993 and the ‘Law of Lands’ of 1995 increased the tenure security of large landholders by eliminating ceilings on the amount of land that can be owned and by restricting expropriation. This also halted the granting of State-owned land, which can now be acquired only through public auction. Finally, the PETT was started in 1996. In 1997, the stakes were increased when a law was passed which allows for the expropriation of idle land held by *campesino* communities on the coast.

The 1995 Censo Agropecuario found that one of the principal limitations to the development of economically productive activities in rural areas is the difficulty of accessing credit (Trivelli, 1997). The lack of financing is so severe that much land lies idle because farmers cannot afford the expense of cultivation. Only 16.4 percent of households in rural areas used credit, and less than three percent used formal sources (Instituto Cuánto, 1995). Land and credit markets in Peru are inter-related – land

ownership facilitates access to credit, and a lack of finance to cultivate the land is one of the main reasons small farmers offer land for sale, rent or share-cropping (Ugaz, 1997). In addition, the limitations of the land market weaken the value of a title as collateral, because the bank will have not be able to sell the land and cancel the debt in a reasonable time period (Barrantes and Trivelli, 1994).

In part because of a lack of credit and in part because less productive farmers without clear titles to their land have been prevented from selling land to more productive farmers, Trivelli and Abler (1997) found substantial differences in land productivity between farms with title and farms without title. Their estimates of the value marginal product of land for both titled irrigated land and titled unirrigated land were positive and statistically significant, while estimates were very close to zero in magnitude and not statistically significant for either untitled irrigated land or untitled unirrigated land.

Description of the study area¹

The Valley of Huaral, one of the richest valleys on the Peruvian coast, is about 80 kilometers north of Lima. The Valley is fairly well integrated into input and output markets, as agricultural inputs are readily available, there are several banks, and Lima provides a market for much of its produce.

With 22,000 hectares appropriate for cultivation, about 78 percent of agricultural land in the Valley is in the hands of small farmers (less than 50 hectares). There are on the order of 1,000 small farms, and their average size is about 5 hectares. Most small farmers acquired their land through the 'parcelization' of cooperatives, while only 5.6 percent purchased their land. Nearly all of the farmers have some sort of document indicating ownership of their land, and roughly 70 percent have received titles through the current titling project.

The land market in Huaral is limited. The index of mobility, which indicates the percentage of the land sold within the year, was 1.8 percent in 1992, while in other parts of rural Latin America, the indices are generally twice that level. Markets for renting and sharecropping are also poorly developed, with the result that much land lies idle. Most of the transactions that do take place are between friends and family members. It is especially significant that land markets have not developed in Huaral, since this region has access to markets and has a high proportion of titled land.

In spite of the presence of banks, there is little formal agricultural credit in Huaral. Banks could be hesitant to make loans to small farmers for a number of reasons. Other sectors are more profitable and have lower lending costs, and, even with titling, there are social restrictions on foreclosure. There are however, informal sources of credit. Merchants and suppliers are the main sources of credit, and most of those who receive credit have a personal or professional relationship with the lender. The loans are short-term (less than nine months), and most of the informal loans had negative real interest rates. However, most loans were usually repaid in kind, and the loaner generally offered a below-market price, pushing up the effective market rate to the borrower. Formal guarantees were rarely used in these loans.

Characteristics of survey farms

In the valley of Huaral, a sample of 304 farms was randomly selected by the Instituto de Estudios Peruanos (IEP) for inclusion in the study. Of these farms, 283 reported they were currently working agricultural land. These farms were surveyed between January and March 1999. The questionnaire included questions on tenure status, agricultural production, conservation practices and other on-farm investments, involvement in land markets and the use of credit, both formal and informal. Farmers were asked about their perceptions of titling and about demographic characteristics of the household. All farms in the study are irrigated, and, as the area study is small, it is assumed there are no significant differences in land quality.

The average age of the farmers was 60 years, and the average household size was 4.5 members. The farmers surveyed have varying levels of formal education. Roughly one-eighth of the farmers (12 percent) have had no formal education, while a further 56 percent have completed primary school. Twenty-five percent of farmers have completed secondary school, and 7 percent of farmers have some post-secondary education. When asked about their primary occupation, 76 percent of respondents listed agriculture, followed by 21 percent who classified themselves primarily as employees.

Similar to other farms in the Valley, the average farm size was 4.2 hectares (6.7 acres), and nearly all the farms had less than 10 hectares. Farms with less than 2 hectares comprised 23 percent of

¹ Unless noted otherwise, the statistics relating to the Valley of Huaral come from Alvarado (1996) and

the sample, while half the farms had 2 to 4.9 hectares. A further 22 percent of farms had 5 to 9.9 hectares and the remaining 5 percent had between 10 and 22 hectares.

Sixty-five percent of farmers had a registered title for their land, and another 7.8 percent were in the process of receiving a title. Seventeen percent of farms had another document indicating ownership of the land, such as a 'certificate of possession' or a 'document of inheritance,' while the remaining ten percent had no document at all. For the purpose of this paper, only the farms that currently possess a registered title will be considered 'titled.' While there were still some group farms in the area, nearly all of the farmers surveyed (96 percent) farmed individually. Rather surprisingly, there was no correlation between tenure status and farm organization. Only a small share of the farmers (8.6 percent) received title to their land through the PETT (since 1996). Nearly 10 percent of the farms were titled before 1970, a further 28 percent received title in the 1970s, 44 percent were titled in the 1980s and 10 percent were titled between 1990 and 1995.

One-twelfth of respondents indicated they had agricultural land that was idle. As previous studies have found, the primary reason the land was not being worked was a lack of finance, cited by 42 percent of those with idle land. Again confirming previous research, there was little rental of agricultural land as only one respondent was farming rented land.

Agriculture was the primary source of these farmers' income, as they received an average of 82 percent of their income from this source. However, titled farmers received a higher proportion of their income from agriculture than did untitled farmers, as some 56 percent of titled farmers received all of their income from agriculture, while only 38 percent of untitled farmers did so. A Chi-square test showed this difference to be statistically significant at 5 percent. In related questions, 42 percent of all households had a member employed off the farm and 20 percent of the households had a member who received a pension.

The survey farms were market-integrated, as they overwhelmingly produce for the market. Twenty-five percent list cotton as the primary crop, 28 percent mentioned fruits and 29 percent raise primarily vegetables. Input use is also widespread. Nearly all farms use chemical fertilizers (97 percent) and pesticides (99 percent). However, statistically significant differences in the rates of use of these

Ugaz (1997).

inputs between farms with and without title were evident. While 99 percent of farms with title used chemical fertilizer, only 95 percent of those without title did so (Table 1). All farmers with title reported using pesticides while only 96 percent of untitled farms did so. While none of the untitled farms used soil analysis, 6 percent of the titled farms did so. Titled farms were also more likely to use the conservation technique of minimum tillage (65 percent compared to 58 percent) and slightly more likely to have waterways (6 percent versus 5 percent). While the difference was not statistically significant, untitled farms were more likely to have some irrigation canals constructed from a material other than dirt than were titled farms, as 7.5 percent of untitled farms had such canals compared to 4.4 percent of titled farms.

As previous research has found, land market activity is limited in Huaral. Only 4.6 percent of the farmers bought land in the previous five years and only 5.3 percent sold land in the same time period. The land involved in these transactions had a higher rate of land titling, as 80 percent of the land sold and 71 percent of the parcels purchased had registered titles, compared to 65 percent of all parcels. All of the land purchases were financed by the buyer's own funds or with the assistance of family members, indicating the lack of commercial bank involvement in financing the purchase of agricultural land.

Survey farmers had greater involvement in the credit market than the national average, as 40 percent of farms received agricultural credit in the previous three years. Of these, 15 percent received loans from a formal bank, 14 percent from an informal commercial source such as a supplier, merchant or processor and 4.6 percent from a government source. The remaining 6 percent received loans from family or friends. While informal commercial sources provided many farmers with credit, the loan amounts were smaller and duration of the loan shorter than those of loans from commercial banks— 6 months compared to 13 months (Table 2). Related to the short time-frame for repayment of the loan, nearly all of the loans regardless of the source were used for inputs (82 percent) or a combination of inputs and farm machinery (13 percent). Interest rates could not be compared as many loans from informal commercial sources were in-kind, and repayment included a reduced price for the commodity. Factors that influence the use of credit from various sources will be explored further in a following section.

The use of credit varied by farm size. Only 17 percent of farms with less than 2 hectares received credit, compared to 52 percent of those with 5 to 9.9 hectares and 47 percent of those with 10 hectares or more. A Chi-square test showed these differences to be statistically significant at 1 percent.

Farmer perceptions of land titling

Farmers' opinions about the value of land titles were assessed through a series of questions. Overall, they believed titles enhance access to credit and increase land values. Nearly all farmers, (87 percent) stated that those with title had greater access to credit in general, and 68 percent said their own access to credit had improved since they received a title to their land. Forty-four percent reported that having a title had allowed them to obtain credit from a formal source that without a title, they could not access, and 27 percent reported that having a title had provided access to informal sources of credit. They were uncertain of the effect of titles on the terms of loans. Twenty-three percent thought title had no effect on the interest rate of loans, while 18 percent thought those with title received higher rates and 18 percent thought the rates would be lower. A plurality of farmers (43 percent) thought a title would increase the amount of credit received, while 16 percent thought it would make no difference. The process of obtaining credit using the title as a guarantee was perceived to be more difficult by 36 percent of respondents, while only 9 percent thought it was easier.

Eighty-two percent of respondents believed titles increase the value of the land. The most commonly cited reasons were that titles enhance access to credit (57 percent) and facilitate selling the land (21 percent). Other reasons included clarification of property rights, facilitating inheritance and simply that titles increase the selling price of land. Of those lacking title to their land, 86 percent were interested in obtaining title. The reasons they gave were to increase security (73 percent), to enhance access to credit (44 percent), to obtain credit from a formal source (30 percent), to sell the land (10 percent) and to facilitate inheritance (5.1 percent)². Interestingly, respondents cited all the theoretical benefits of titling.

² Respondents could give more than one reason.

Given the perceived benefits of titling, one wonders why roughly a third of the parcels remained untitled. Anecdotal evidence suggests the lack of required documents for the land is a hurdle for some who would like to title their land. The difficulty of obtaining formal credit even with a title is a further disincentive to titling. The share of farms titled differed by the amount of land owned. The smallest quarter of farms had a titling rate of 45 percent compared to 70 percent for the largest quarter. It may be that small farms were less likely to have the documentation required for titling, or perhaps owners of these farms perceived less benefit from titles as they were less likely to receive formal credit even with a title.

Analytical Model

Because access to credit is critical for individual farmer's ability to purchase inputs and for rural development more broadly, analysis focused on this issue. To determine the effect of land titling and other farm and farmer characteristics on access to credit, a set of tobit models was estimated. Tobit analysis is used for analysis of censored data, such as the use of credit, censored at zero. Three tobit models were estimated: the first for the total amount of credit received from all sources, the second for the amount of loans received from commercial banks and the third for loans received from informal commercial lenders. The estimated variables were defined as follows:

Dependent Variables:

- Log total credit = the log of the total amount of credit received (in U.S. dollars) from all sources in the previous three years.
- Log bank credit = the log of the amount of credit received (in U.S. dollars) from commercial banks in the previous three years.
- Log informal credit = the log of the amount of credit received (in U.S. dollars) from informal commercial lenders in the previous three years.

Independent Variables:

- Log total land = the log of the total hectares of agricultural land owned.
- Title = 1 if the farmer owns land with a registered title, and 0 otherwise.
- Log % farm income = the log of the proportion of total income from agricultural sources.

Cotton	=	1 if the primary crop grown on the farm was cotton, and 0 otherwise.
Fruit	=	1 if the primary crop grown on the farm was a fruit, and 0 otherwise.
Vegetable	=	1 if the primary crop grown on the farm was a vegetable, and 0 otherwise.
Log age	=	the log of the age of the head of the household.
Log education	=	the log of the level of education completed by the head of the household.

The descriptive statistics for these variables are in Table 3. As many observations lacked data on farmer characteristics, the sample size for the analysis is 135.

The tobit model for total credit received in the previous three years comprises all sources of credit including commercial banks, informal commercial lenders, government sources and other informal sources such as family or friends and non-governmental organizations. The results of this model, shown in Table 4, indicate that farm size and cultivating commercial products, including cotton, fruits and vegetables are all positively associated with the amount of credit received³. Having a registered title is not a significant factor in determining the total amount of credit received from all sources.

A comparison of the models for credit from commercial banks and informal commercial lenders, (Table 5), shows the differing factors considered by these two types of lenders. In the model for commercial banks, both farm size and having a registered title positively affected access to credit, while the coefficients for various commodities were not significant. Conversely, in the regression for credit from informal commercial lenders, only farm size was statistically significant and positive. This shows that while larger farms have access to credit from either source, those with title have greater access to the higher loan amounts and lower interest rates of the commercial banks.

Policy-related significance

The problem of tenure insecurity in Latin America is widespread – it has been estimated that some 70 percent of all farmers in Latin America lack secure legal title to their land. As land titling projects are designed and implemented in other countries, the valleys on the coast of Peru provide an

³ A probit model for access to credit was also fitted, with results similar to those presented in Table 4.

especially significant case to study as farmers in this region are fairly well integrated into markets and use modern production techniques. Because of this market integration, this region could potentially support a dynamic land market and provide information as to how small farmers are able to compete in such a market.

The issues investigated in this paper, access to credit, on-farm investment and the functioning of land markets, are inter-related and play a critical role in rural development. The lack of financing has been clearly identified as a constraint to agricultural production in rural Peru. Several farmers in the study even left land idle because they lacked the financing to cultivate it. While 40 percent of surveyed farmers received agricultural credit (high for rural Peru), less than one-half of these received the loan from a commercial bank. Land titles facilitate access to formal credit, but the process of using land as collateral in commercial banks is arduous and expensive, limiting its use. Small farmers' access to credit is still limited, as only 17 percent of farms with less than 2 hectares received credit.

On-farm investment is essential to improve productivity and maintain the sustainability of production. All farms in the study, titled and untitled, have generally high rates of input use. However, titled farms do exhibit greater use of some inputs and conservation techniques. This may be due to enhanced access to formal credit, the collateral effect, or it may be due to greater feelings of tenure security.

Finally, fully functioning land markets could serve to transfer land to the most productive users. This could provide the land-poor with access to land or it could lead to a reconcentration of land ownership and exacerbate rural poverty and rural-urban migration. Because land markets are limited, there is no widespread movement of land to more efficient producers, nor is there evidence of reconcentration of land ownership. Limitations in the credit market exacerbate sluggishness in the land market.

The analysis of the survey data indicates land titling in the Valley of Huaral is having some of its intended effects. Access to formal credit, especially for larger farms, has been enhanced by titles, and there is a positive correlation between land titling and the use of some inputs and conservation techniques. Fluidity in the land market has not yet been improved, so land titling has not yet had a

significant effect in the transfer of land. However, the smallest farmers have lower rates of titling and, even with titling, more limited access to credit, raising questions about the impact of titling on equity.

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Table 1. Use of Inputs and Conservation Techniques by Titled and Untitled Farms.

Input/Technique	Titled Farms (%)	Untitled Farms (%)
Chemical fertilizer*	98.90	94.85
Pesticide*	100.00	95.83
Herbicide*	56.91	44.79
Fungicide	85.08	85.42
Soil analysis*	28.80	18.00
Minimum tillage	5.98	0.00
Crop rotation	64.8	57.5
Water ways	5.5	0.0

* Indicates a Chi-square significance of 5% or better.

Table 2. Comparison of Agricultural Loans from Commercial Banks and Informal Commercial Lenders.

Source	Number of Farms (%)	Mean Amount (Std. Dev.)
Bank	43 (15.2%)	\$9,137.57 (11,234.28)
Informal	39 (13.8%)	\$2,962.42 (7,373.59)

Table 3. Descriptive Statistics for Dependent and Independent Variables in Tobit Models.

Variable	Mean	Std. Dev.	Min.	Max.
Log total credit	2.8457	3.8696	0.0000	10.6454
Log bank credit	1.4417	3.2177	0.0000	10.6454
Log informal credit	1.0987	2.6166	0.0000	9.6321
Log total land	1.1876	0.6477	0.0000	2.8679
Title	0.6296	0.4847	0.0000	1.0000
Log % farm income	4.4342	0.2781	3.2189	4.6052
Cotton	0.2963	0.4583	0.0000	1.0000
Fruit	0.2444	0.4314	0.0000	1.0000
Vegetable	0.2889	0.4549	0.0000	1.0000
Log age	4.0746	0.2231	3.2958	4.5539
Log education	1.2941	0.5528	0.0000	2.3026

Table 4. Estimated Coefficients for Tobit Model of Total Credit Received.

Variable	Estimated Coefficient	Marginal Effects ^a
Constant	-32.4183 (0.2016)	
Log total land	4.2929*** (0.0047)	1.6288
Title	1.6787 (0.3695)	0.6369
Log % farm income	2.6360 (0.4559)	1.0001
Cotton	8.2637*** (0.0086)	3.1353
Fruit	5.5285* (0.0893)	2.0975
Vegetable	7.9821*** (0.0107)	3.0284
Log age	1.5294 (0.7180)	0.5841
Log education	-0.2262 (0.8938)	-0.0858
σ	8.1045	

Significance levels: * Denotes significance at 10%, ** denotes significance at 5%, and *** denotes significance at 1%. The values in parentheses below the coefficients are the probability $|Z|>z$. Log-L=-217.6005.

^a Marginal effects are calculated at the sample means.

Table 5. Estimated Coefficients for Tobit Model of Credit Received from Commercial Banks and Informal Commercial Lenders.

Variable	Commercial Bank		Informal Commercial Lender	
	Estimated Coefficient	Marginal Effects ^a	Estimated Coefficient	Marginal Effects ^a
Constant	-39.4582 (0.9218)		-55.8868 (0.2037)	
Log total land	6.0456** (0.0413)	0.2940	5.7866** (0.0211)	0.7071
Title	6.4670* (0.0868)	0.3145	-2.1746 (0.4403)	-0.2658
Log % farm income	-7.1038 (0.2365)	-0.3454	9.0561 (0.2085)	1.1067
Cotton	48.8352 (0.9025)	2.3748	-4.9556 (0.2846)	-0.6056
Fruit	36.6991 (0.9267)	1.7846	1.9170 (0.6576)	0.2343
Vegetable	49.7722 (0.900)	2.4204	4.1547 (0.3035)	0.5089
Log age	0.6634 (0.9379)	0.0322	1.0174 (0.8702)	0.1243
Log education	0.7082 (0.8326)	0.0344	-4.2824 (0.1073)	-0.5233
σ	11.0160		9.8101	
Log likelihood	-117.9304		-108.5475	

Significance levels: * Denotes significance at 10%, ** denotes significance at 5%, and *** denotes significance at 1%. The values in parentheses below the coefficients are the probability $|Z| > z$.

^a Marginal effects are calculated at the sample means.