Grain Receipts as Collateral for Agribusiness' Financing

-A Feasibility Study of Grain Receipts for Corn Producers in Jalisco, Mexico.

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-En Fallstudie om Spannmålskvitton för Majsproducenter i Jalisco, Mexiko.

Reportos para el Financiamiento de Agronegocios

- Estudio de Factibilidad de Certificados de Depósito como Colateral para Financiar a Productores de Maíz en Jalisco, México.

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"Gratitude makes sense of our past, brings peace for today, and creates a vision for tomorrow" Melody Beattie (2003)

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Uppsala, 2006

Ivan Garcia

Abstract

Jalisco's corn producers from the Cienega province are locked in a cycle of low profitability. The corn producers have been affected by the lack of access to adequate financial intermediaries such as banks. The cycle of low profitability contributes towards a low quality of life and a lack of competitiveness. Hence, farmers have not been able to adjust to the fierce competition from the US producers. A lack of trustworthy collateral is a major problem in order to get access to credits. The grain receipts system (GRS) provides a method of collateralizing crops for access to credits, using smart cards as a shortcut for cash withdrawals. With the GRS the risk is not intended to be eliminated; instead it is a mechanism where the risk is shared between the corn producers, elevators and banks which are the subject of analysis in this study using the agency theory.

Surveys were employed in order to obtain a broad picture about how farmers finance their activities, to provide knowledge concerning their agricultural and post harvest practices and their perception concerning the GRS and its feasibility. Currently some of the farmers have to wait at least one month for payment after delivery. Furthermore, most of the farmers cannot buy the inputs in advance due to the fact that after they are paid after having paid off their debt obligations. Consequently, farmers just have money to cover their livelihood expenses and not to invest in inputs. Consequently, farmers are not satisfied with their income because of high input prices and low prices of grain at harvest time. In addition, about one fourth of the farmers produces just one crop and faces a portfolio problem. Most of the farmers receive financial support from the informal credit sector such as elevators or suppliers. Therefore the farmers face the control problem due to the fact that they may become unwillingly attached to a specific elevator. The reason is that the farmer cannot freely decide where to deliver their grain because the elevator provides credit. Additionally, in the formal credit sector the farmers have never been able to use grain as collateral. Land is the most desirable collateral for the banks.

Consequently, almost half of the farmers agree with the method of collateralizing their crops after harvest and using smart cards to withdraw cash from automated teller machines. Within a GRS the farmers solve the control problem due to the fact that the farmers can freely decide where to deliver their grain and ensure independent quality measurements. Furthermore, according to the analyses the farmers do not face any horizon problems using the GRS. On the other hand, despite of the fact that the banks view GRS favorably they face horizon problems and are not interested in investing in the required equipment for a GRS system such as developing smart cards to allocate ATMs among elevators' facilities or in rural communities. The banks prefer that the farmers are paid by checks which force them to visit the bank to complete formal procedures, which by farmers are considered as awkward and time-consuming.

Key terms: Grain receipts, Mexico, Agency theory, Rural finance, Warehouse receipts

Sammanfattning

Jaliscos majsproducenter i Cienegaregionen är fast i en cirkel av låg lönsamhet. Majsproducenterna har påverkats av bristen på tillgång till lämpliga finansiella förmedlare såsom banker. Cirkeln av låg lönsamhet bidrar till en sämre livskvalitet och försämrar möjligheterna för jordbrukarna att vara konkurrenskraftiga. Därför har lantbrukarna inte lyckats anpassa sig och svara mot den hårda konkurrensen från USAs producenter. Bristen på en tillförlitlig säkerhet är ett avgörande problem i sökandet att få tillgång till krediter. Systemet med spannmålskvitton (GRS) är en metod som bidrar till möjligheten att använda spannmål som säkerhet vid lån, där bankkort används för att underlätta kontantuttag. Syftet med spannmålskvitton är inte att eliminera risken, istället är det en mekanism där risken fördelas mellan majsproducenter, spannmålsmagasin och banker vilka samtliga är föremål för analys i den här studien med hjälp av agent teorin.

Följaktligen gjordes enkätundersökningar för att få en bred bild av hur lantbrukare i Cienegaregionen finansierar sin verksamhet, förmedla kunskap angående deras jordbrukande och skördevanor samt för att få grepp om deras uppfattning av GRS och dess genomförbarhet. För närvarande får en del av lantbrukarna vänta minst en månad på betalning efter leverans. Dessutom, kan de flesta av lantbrukarna inte köpa investeringsmateriel i förväg, eftersom de får betalningen först efter att de har fullföljt sina skuldförpliktelser. På grund av höga kostnader för investeringsmaterial och låga marknadspriser vid skördetid är lantbrukarna därför inte nöjda med sin inkomst. Dessutom producerar omkring en fjärdedel av jordbrukarna endast en gröda och står därför inför ett portfolioproblem. De flesta av lantbrukarna får finansiellt stöd från den informella kreditsektorn såsom spannmålsmagasin eller leverantörer. Därför ställs lantbrukarna även inför ett kontrollproblem eftersom de ofrivilligt kan komma att binda sig till ett visst spannmålsmagasin. Anledningen är att lantbrukarna inte fritt kan bestämma vart de ska leverera sin spannmål eftersom spannmålsmagasinet bidrar med sin kredit. Vidare har lantbrukarna aldrig haft möjlighet att använda spannmål som säkerhet eftersom mark är den mest åtråvärda säkerheten för bankerna.

Närmare hälften av lantbrukarna stödjer metoden att använda sin gröda som säkerhet för lån efter skörd samt att använda kort för att göra kontantuttag från bankomater. Med hjälp av GRS kan lantbrukarna lösa kontrollproblemet eftersom de kan välja fritt vart de ska leverera sin spannmål samt självständigt säkerhetsställa kvalitetsmätningar. Enligt analyserna ställs lantbrukarna inte heller inför något horisontproblem när de använder GRS. Å andra sidan, trots det faktum att bankerna sympatiserade med GRS-systemet, står de inför ett horisontproblem eftersom de inte är intresserade av att investera i den nödvändiga utrustningen för att implementera ett GRS system, såsom utvecklingen av ett kort för att implementera bankomater bland spannmålsmagasinen eller på landsbygden. Bankerna föredrar att bönderna betalas med check vilket tvingar dem att besöka banken för att fullfölja alla sedvanliga formella procedurer, vilket ofta ses som krångligt och tidskrävande bland lantbrukarna.

Nyckelord: Spannmålskvitton, Mexiko, Agent Teorin, Jordbruksfinansiering, Majs

Resumen

Los productores de maíz de la Cienega de Jalisco están paralizados en un círculo no redituable. Los maiceros han sido afectados por la falta de financiamiento. El círculo de nula o poca redituabilidad los posiciona en un bajo nivel de calidad de vida y sus alrededores están posicionados en un medio ambiente de poca o nula competitividad. Por lo tanto los agricultores no han podido con la competencia descomunal en la producción de maíz por parte de los Estados Unidos. Por otra parte, varios de los productores han sido forzados a dejar sus terrenos y buscar trabajo no calificado en las zonas urbanas o emigrar a los Estados Unidos en busca del "Sueño Americano". Adicionalmente los productores también enfrentan la falta de garantías, lo cual es un problema para acceder a créditos. El sistema de reportos de granos mencionado en este estudio proporciona un método para ofrecer en prenda la cosecha de los agricultores. De esta forma se destruye el círculo de poca redituabilidad y se mejora la competitividad en la zona maicera de la Cienega de Jalisco. Con el sistema de reportos el riesgo no se elimina, sino se administra y comparte entre los productores, almacenadores y bancos los cuales son mencionados en este estudio dentro de la teoría de la agencia.

Por lo tanto se aplicaron encuestas con el propósito de tener una opinión general de como los productores financian sus actividades. Adicionalmente proveer conocimiento en cuanto a sus prácticas agrícolas, de post cosecha y que es lo que opinan del sistema de reportos y su factibilidad. Actualmente una parte considerable de los productores tienen que esperar al menos un mes para que les paguen su cosecha. Además la mayoría no pueden comprar sus insumos en las pre-ventas debido a que en cuanto tienen el pago de sus cosechas tienen que enfrentar el pago de deuda de los insumos utilizados en la previa temporada. Consecuentemente los productores apenas tienen el ingreso para cubrir su sustento y no para invertir en insumos. Por lo tanto los productores no están satisfechos con su ingreso, debido a los altos precios de los insumos y el bajo precio de su maíz al ser cosechado. Casi la mitad de los maiceros y almacenadores están de acuerdo con el sistema de reportos. Una cuarta parte de los productores entrevistados solo tienen como ingreso el cultivo del maíz por lo cual enfrentan un problema de portafolio. La gran parte de los productores reciben financiamiento del sector informal como almacenadores de grano o proveedores de insumos. Por lo que pone a los productores en un problema de control debido a que se ven involuntariamente obligados a entregar al acopio que les provee de crédito. Por lo tanto el productor no tiene la libertad de entregar su grano donde a el le convenga. Adicionalmente, en el sector del crédito formal estos productores no han podido utilizar su grano como colateral, debido a que el colateral más preciado por los bancos es el terreno.

Consecuentemente, casi la mitad de los productores están de acuerdo con el método de utilizar su cosecha como colateral y el utilizar tarjetas inteligentes en los cajeros automáticos sin enfrentar algún problema de horizonte. Por lo contrario, a pesar de que los bancos entrevistados ven favorable el sistema de reportos, presentan un problema de horizonte al no estar dispuestos a invertir en tarjetas inteligentes y distribuir cajeros automáticos en los almacenadores o en las comunidades rurales. Estos bancos prefieren que el pago a los agricultores sea en cheque nominativo y obligar al productor a que vaya a la sucursal del banco para elaborar los procedimientos formales, los cuales son considerados por los productores como complicados y tardados.

Palabras Clave: Reportos, Certificados de depósito, México, Teoría de la agencia, Financiamiento rural, Crédito prendario.

Abbreviations

ASERCA	**Mexican Trading Support Services for Livestock and Agriculture**
ATM	**Automated Teller Machine**
CONASUPO	**The former Popular Subsistence National Company**
FONDEN	**Mexican Natural Disaster Fund Program**
GDP	**Gross Domestic Product**
GR	**Grain Receipt**
GRS	**Grain Receipt System**
NAFTA	**North America Free Trade Agreement**
PROFECO	**Mexican Customer Protection Agency**
SAGARPA	**Mexican Federal Department of Agriculture**
SIAP	**Mexican Information Systems on Agriculture, Food and Fisheries**
SNIIM	**Mexican National Market of Information and Integration System**

1 Introduction

> "*With the advance of globalization and greater integration of agricultural markets, the need for increases in agricultural productivity for family farms is particularly pressing. Raising productivity and output of small farmers would not only increase their incomes and food security, but also stimulate the rest of the economy and contribute to broad-based food security and poverty alleviation.*" (Lipton Michael, 2005, p.V).

Many farmers in developing countries, or economies in transition, are locked in a cycle of poverty due to the lack of credit from financial institutions. Those financial problems do not only affect farmers' livelihoods but also agricultural suppliers, traders and industries as well. Commonly corn producers often have short term cash flow problems, their income remains low and in addition they have to deal with production risk due to weather conditions as well as price risk. Furthermore, the lack of infrastructure to store their grain and the need of money to meet debt obligations and living expenses cause farmers to be in a weak position when negotiating prices (Boehnke, 2003). Farmers are considered as price takers because even if prices fall below production cost, they cannot afford to diversify or to change market prices. They sell their products even knowing that current prices are not favorable, contributing to even worse economic conditions (UNCTAD, 2004). Hence farmers may no longer meet traders or industry's requirements due to the lack of financing and can not afford improved agricultural inputs, production technologies or improvements of agricultural practices, which place farmers in a hazardous position. Before farmers are able to adopt new technologies and make major investments on their farms they need access to inexpensive loans. But cheap loans are not always available, due to the fact that formal credit institutions are not likely to lend to farmers, because corn producers are considered to be a risky business (ASERCA, 2002). Therefore informal credits entities such as traders, large farmers, landlords, elevators, etc. are likely to lend to farmers even knowing that interest rates will be higher in the informal sector compared to formal credit institutions (Sarris, 1996). Farmers need access to credit in order to fulfill their working capital needs. By this way they can invest in new farm assets, technology and post harvest equipment. If not, they will not be able to compete and meet market's needs (UNCTAD, 2004).

In most developing countries the access to credit has been constrained since most of the banks are only willing to lend to certain fixed assets that are easy to sell. However, a farmer who lacks trustworthy collaterals[1], and faces risks regarding price and yields, makes lending to him difficult from the perspective of the banks (Varangis et al. 2003). Furthermore, the traditional agricultural credit scheme amounted to subsidizing interest rates and imposing lending targets by governments. The credits were usually allocated to larger farms and small scale farmers were kept out of reach from any credit program. Often those credits were offered to the wrong

[1] Collateral is a valuable property owned by someone who wants to borrow money which they agree will become the property of the company or person who lends the money if the debt is not paid back

farmers, for instance to those with political connections. Those farmers also became used to receive debt relieves by the government. Therefore farmers were badly affected, thereby contributing towards bad reputation on debt obligations (UNCTAD 2004).

On the one hand financing is important in order to release farmers' potential of growth and poverty alleviation. On the other hand, making access to financing easier is not sufficient to improve farmers' lifestyles or to break the cycle of poverty. Farmers also need access to more modern grain marketing techniques such as grain receipts, new production technologies, better agricultural practices, inputs such as genetically modified or hybrid seeds, environmentally friendly pesticides, fertilizers, and better market and trading conditions (UNCTAD 2004).

1.1 Problem Formulation

How can a Grain Receipt System (GRS) increase access to credits, improve agricultural practices and trading conditions for the Cienega's corn producers and thereby contribute to rural development and enhanced international competitiveness in grain production.

With the GRS the farmer can deposit the grain in a certified elevator which issues a negotiable receipt as proof of quantity, quality and location of the grain. Hence the farmer can pledge the receipt of the grain as collateral when asking for a loan to a bank.

In order to face this problem the following issues are identified:

- What are the benefits and obstacles of grain receipts as collateral for farmers, elevators and banks located in the Cienega?

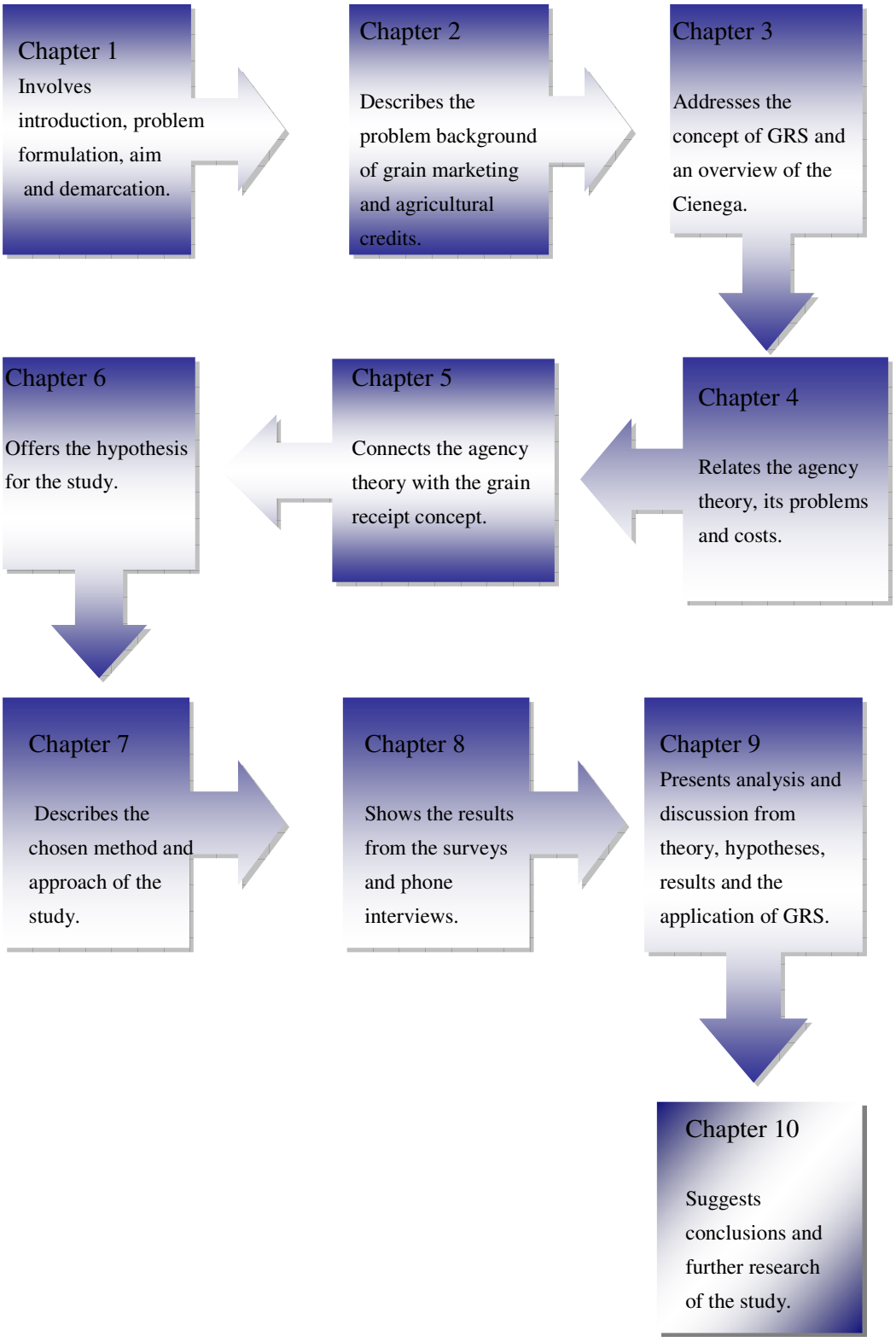
- How a system with grain receipts as collateral could be introduced in the Cienega region.

1.2 Aim and Demarcations

The aim of this research is to examine the feasibility to apply grain receipts as collateral from the perspective of corn producers focusing on the Cienega, a region within the state of Jalisco in Mexico. The objective is to demonstrate how grain receipts may operate and how it can be applied in the region.

This research will focus on the counties of Ocotlan, Tototlan, Zapotlan del Rey and La Barca, counties that all belong to the Cienega region. The farmers of these counties grow corn mainly under rain-fed conditions. Due to rain-fed conditions, corn yields are relatively high compared to the national level (SIAP, 2006). The research involves different stakeholders that are involved in the Grain Receipt System, such as elevators and banks. However the main focus will be on the farmers' perspective.

1.3 Outline


Chapter 1
Involves introduction, problem formulation, aim and demarcation.
Chapter 2
Describes the problem background of grain marketing and agricultural credits.
Chapter 3
Addresses the concept of GRS and an overview of the Cienega.
Chapter 4
Relates the agency theory, its problems and costs.
Chapter 5
Connects the agency theory with the grain receipt concept.
Chapter 6
Offers the hypothesis for the study.
Chapter 7
Describes the chosen method and approach of the study.
Chapter 8
Shows the results from the surveys and phone interviews.
Chapter 9
Presents analysis and discussion from theory, hypotheses, results and the application of GRS.
Chapter 10
Suggests conclusions and further research of the study.

2 Problem Background

> "*Competitiveness in agriculture is through clusters and strategic alliances not through specific products*" (Galarza M. Juan M. et al. 2004 p.101).

Previous to the liberalization of the economies many governments in developing countries were directly involved in the domestic purchasing, handling, transporting, marketing, storage of commodities and inputs' financing. Given these circumstances farmers could be paid fixed prices and be protected from price fluctuations (Boehnke 2003). With the liberalization of trade and the development towards non state-owned companies that are in charge of marketing commodities, such as grains, farmers are forced to fend for themselves and find their own grain merchants. Farmers naturally face a lack of market power therefore they frequently sell their grain to the first buyer at the offered price (Boehnke 2003). Therefore the removal of state-owned companies in charge of grain marketing causes a lack of financial services the rural areas and a lack of infrastructure such as warehouses and elevators for agricultural commodities creating constraints in the grain marketing chain (Boehnke 2003).

Mexico, as an economy in transition, was trade protected until the decade of the eighties. In 1991 Mexico began negotiations towards the North American Free Trade Agreement (NAFTA). In January 1994 it was finally implemented and it was expected to lead to an automatic transformation of the Mexican agriculture (Yunez-Naude & Barceinas, 2002). Agriculture in Mexico is a sensitive sector due to the fact that the rural population is approximately 24.75 million, counting for as much as 25% of the total population (ASERCA, 2004). Commonly the Mexican rural sector consist of many and rather small communities that are scattered all over the country, mostly concentrated to the south of Mexico. Their progress has been constrained due to geographical location and low social impact (ASERCA, 2004). Nowadays, globalization and free trade are vital parts of the entire Mexican economy. Unfortunately free trade has affected to the less developed rural communities negatively. The Mexican trade policies, which opened up the economy, without first supporting the less developed communities, is one of the reasons why these communities still remain uncompetitive toward free trade agreements (Yunez-Naude & Barceinas, 2002). Therefore many farmers of the rural communities have been forced to leave their land and search for a low wage jobs in the urban areas or cross the USA border to find the "American Dream". Hence emigration rates from rural areas are increasing. For instance, approximately 45% and 80% of the rural population has a relative working in the USA or living outside of their communities, respectively (INTERNET, 1, House of Representatives, 2006).

As an economy in transition, Mexico has been implementing changes within agricultural policies in order to accomplish competitiveness. But those changes have had limited success, especially within the grain sector, such as corn for which the majority of the rural population depends on (INTERNET, 1, House of Representatives, 2006). Therefore farmers have not been able to adjust to the fierce competition from the USA within the corn production. The competitiveness of the Mexican farmers has been adversely affected by high production costs,

poor credit systems and the lack of machinery, irrigation systems and agribiotechnology. Hence the corn industry such as starch, fructose, livestock feeders and milling prefer to import corn from the USA rather than buying locally (INTERNET, 2, House of Representatives, 2006).

Mexico is an asymmetric country where the gap between the haves and have-nots has been increasing. There is a wide difference between the urban and the rural areas. The same gap is visible within the agricultural sector, where some farmers are internationally competitive and some others hardly have food to survive. The crop production such as corn is not an exception, where in some places corn is grown by irrigated systems and in other places it is grown under rain-fed conditions. These growth practices do not mean to be the best or the worst. For instance the most productive place for corn in the winter is the state of Sinaloa where the corn is grown mostly under irrigated systems. On the other hand, mainly with rain-fed conditions, Jalisco is considered to be the best corn producer during the spring season. These places are considered to have the highest yield of corn compared to the rest of the country where yields are lower (SIAP, 2006).

Free trade agreements such as NAFTA could affect Mexican corn producers negatively due to the fact that corn will be fully liberalized from tariffs and quotas in the year of 2008. Full liberalization might cause an almost immediate collapse of Mexican grain production and politically dangerous grain dependence from the USA (Yunez-Naude A. 2002). On the other hand Mexico is the world leading exporter of avocado, mango, papaya, strawberry, tomato, asparagus, eggplant, chili and onion (Hallam et al. 2004). Therefore those who could grasp free trade benefits would be fruit and vegetable producers and the ones that are in a hazardous position are the corn producers (Yunez-Naude A. 2002). What should the corn producers do? Should Mexico be totally grain-dependent from the USA and should the 24.75 million people in the rural communities find new ways of living? Or is there perhaps a way to strengthen the corn producers' situation to better be prepare for the future competition?

2.1 Mexican Grain Merchandising

In the sixties the Mexican state-owned industry CONASUPO (Popular Subsistence National Company) was created in order to buy and handle grain (Cebada, Ma del Carmen, 2001). Due to the protection of the economy, CONASUPO was responsible for grain imports, storage, domestic market supply, grain handling and maintaining a stable and seasonally subsidized price (ASERCA, Dec 2004). By the end of the eighties the Mexican Government determined to eliminate the state-owned CONASUPO. Due to the elimination of CONASUPO an important link was now missing in the grain industry. Problems started to appear such as lack of private enterprises in charge of the grain handling, lack of infrastructure and storage, handling, transportation and distribution. Even though CONASUPO'S facilities were transferred to rural communities the lack of knowledge, organization and large self-interest among farmers caused problems that made the use of facilities unfeasible.

Additionally, financial support for farmers and grain merchandisers were insufficient or non-existent for the grain production and marketing. After CONASUPO was banned between 1989 and 1990 the grain market suffered the hardest time in its history. Almost nobody was able to buy, store and handle grain (ASERCA, Dec 2004).

2.2 Mexican Agricultural Credit

The Mexican financial sector believes that agriculture is a risky business with low profitability. Therefore Mexican agricultural credit is risky and considered three times more expensive in Mexico than agricultural credits offered in the USA (ASERCA, 2002). Credit risk is defined as the risk of financial loss as a result of a client or a trading partner failing to meet its contractual obligations. For example a borrower may fail to repay a loan (Roth Benedict 2003). One of the major problems facing the banks within the agricultural sector is the lack of trustworthy collateral since the land that some farmers use for growing crops is leased and the machinery that they use is not well accepted as collateral (ASERCA, 2002).

The access to agricultural credit in Mexico has not been sufficient in order to enhance competitiveness among corn producers. The agricultural credit in Mexico has been reduced, for instance in 1994, 2.72% from the Mexican GDP was destined to agricultural credits and in 2000 only 0.99% of its GDP was destined for the same purposes (INTERNET, 3, House of Representatives, 2006). The Mexican devaluation of 1995 constrained the agricultural credit for at least the next five years. Consequently the informal credit sector such as, moneylenders, elevators and suppliers of agricultural products among others increase their lending to the agricultural sector.

For the peasant farmers it is almost impossible to get credit from the formal credit sector. For instance they have possession of the land through tenancy but not the ownership which causes the lack of trustworthy collateral. But even if they have the ownership of the land[2], the banks are reluctant to accept land as trustworthy collateral because it is not classified as private property. Mexican corn producers have been facing difficulties with credits. A way to cope with the lack of credits might be grain receipts as collateral. Grain receipts provide a method of collateralizing crops and lowering the risk to the lender, therefore decreasing financial charges to the farmer as a borrower (Lacroix & Varangis, 1996). Using grain receipts may mobilize credit to Mexican farmers, facilitate sales of grain throughout the year rather than just after the harvest, improve corn quality and transparency of the storage industry, lower post harvest losses due to better storage conditions and to improve the farmers' competitiveness within the corn industry. Such benefits could also include a regulatory environment for the stakeholders involved such as banks, elevators, processors and farmers.

[2] Land legally classified as "Ejido" or "Comunal" and cannot be used as private property.

3 Grain Receipt System

3.1 What are Grain Receipts?

With the liberalization of trade and the opening of markets for grain receipts, or warehouse receipts as they also are labeled, are becoming more important in the transition to improve agricultural markets (Commodity markets, 1997). A grain receipt is a negotiable document issued by an elevator operator as proof of specific quantity and quality of a commodity such as corn in this case. The corn has been deposited in a particular location by a named depositor (farmer). The elevator is responsible for the grain, providing storage services, ensuring grain quality and has not yet any legal interest to it. The grain receipt can be negotiable, allowing transfer to a new holder (bank) and the grain is pledged as collateral for a loan. The holder of the grain receipt (GR) is allowed to take delivery of the grain presenting the GR at the elevator. The holder of the GR is responsible to cover the services that the elevator has provided (Coulter & Onumah, 2002).

Collateralized lending includes assets or commodities. Commodities may be already produced or might be produced to be collateralized; these commodities will be kept in an elevator which will issue a non-negotiable or negotiable receipt (Figure 1). Non-negotiable receipts can not be used as possession of collaterals. On the other hand negotiable receipts are to possess the collateral which automatically gives the bank possession of the commodity stored in the warehouse. Therefore if the borrower defaults, the bank can make use of the collateral to cover a given loan (UNCTAD, 1996).

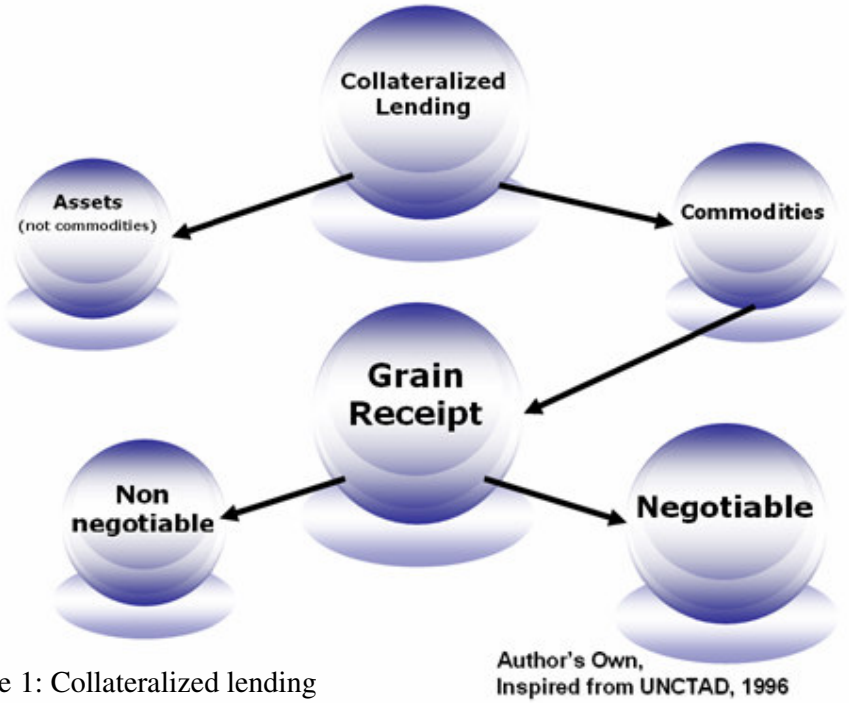


Figure 1: Collateralized lending

The traditional system of agricultural credit is based on taking the risk in regards to the borrower (farmer). With the GR the risk is not intended to be eliminated; instead it is a system where risk managing is shared between the stakeholders. The performance of the system depends on the stakeholders rather than just only on the borrower's risk (farmer). As a result the risk for the bank and the farmer is much lower, so grain receipts for agricultural lending could become a useful tool to enhance agribusiness' competitiveness (UNCTAD 2004).

In developing countries, or economies in transition, financing costs can be very high. The reason for collateralized financing is to reduce the risk to the lender and to make it easier for the borrower. Providing more security to credit providers tends to improve credits in rural communities. Commodities are suitable for providing security to lenders. Using a GR is the same concept as mortgaging a house, whereby a bank can lend against the house that is acting as collateral. Collateralized financing can make credits more accessible and cheaper. Therefore it is important that the quality of the grain meets market requirements. It also makes it easier to sell grain on description rather than by sample due to the fact that the quality is carefully specified and checked by the grain elevators (UNCTAD 1996).

3.2 Grain Receipts Stakeholders

Corn, as most of the commodities, does not go directly from producers to consumers. Middlemen such as traders, brokers or elevators need to be included. Corn is inevitably linked to elevators. Grain receipts are crucial elements for risk mitigation, enabling a financer to lend to a borrower. Banks will lend against grain stored in a reliable elevator. (Figure 2) So grain receipts provide a way of risk mitigation and also the basic structure of futures contracts[3] (Day-Robinson, 2003).

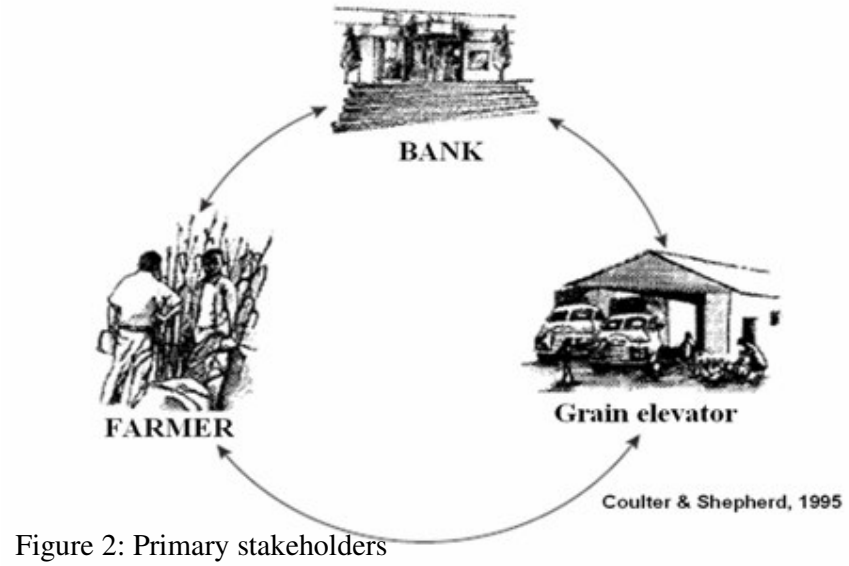


Figure 2: Primary stakeholders

[3] A legal obligation to deliver (a sell) or accept delivery (a buy) of a specific commodity with contract terms standardized (Catlett & Libbin, 1999).

Farmers have to face mainly two kinds of risks. On the one hand the price volatility because it is difficult to forecast the selling price of the commodity that would be produced. On the other hand the physical risk of loss or damage to the crop due to weather conditions, harvesting losses, storage or handling (Day-Robinson, 2003). Therefore, risk management impact farmers' income, productivity and access to credit (Varangis et al. 2003). Farmers are exposed to price fluctuations causing them uncertainty about the price that they will receive for their grain when it is sold. This uncertainty for farmers makes it hard for them to allocate resources efficiently; their access to credit is constrained and leads them to adopt less suitable technologies that affect yields and therefore their income is reduced. Additionally, the lack of skills, information and capital to try to invest in new enterprises makes it difficult for farmers to diversify (Varangis et al. 2003).

Elevators play a key role within the Grain Receipt System (GRS). A licensed elevator must have and fulfill the following requirements: Adequate facilities, capital adequacy, managerial qualities and insurance. Grain handling staff for weighing, sampling and grading should be licensed as well. Elevators' reputation will be determined by its management, operations and financial strength. Therefore a person that owns an elevator must be reliable, somebody that sells the grain and must not disappear with the money (UNCTAD, 1996).

Licensed elevators must be willing to accept official supervision without previous announcement. Those supervisors are authorized to suspend the elevator's license immediately (Coulter & Onumah, 2002). Licensing and inspection of elevators are essential to make sure that grain elevators meet basic standards both physically and financially. If these standards cannot be fulfilled a GRS will not be credible and the grain will not be treated as reliable collateral (Boehnke, 2003).

3.3 How a Grain Receipt System Works

A grain receipt system is illustrated in Figure 3. The following flows are identified:

1. At harvest the farmer delivers his grain into a licensed elevator.
2. The elevator registers the quality, quantity and location of the grain on a smart card, which act as a physical proof of the ownership of the grain and informs the availability of credit, it also can generate data for instance the cost of hedging the grain.
3. To receive the payment in cash, the farmer inserts the smart card in the ATM.
4. Before the due date of the loan or when the buyer needs the grain, the farmer sells the grain consulting with the bank.
5. After the farmer pays for the grain and storage services, the elevator make the transaction to the bank for the value of the grain and the bank pays any exceeding amount as a profit to the farmer.

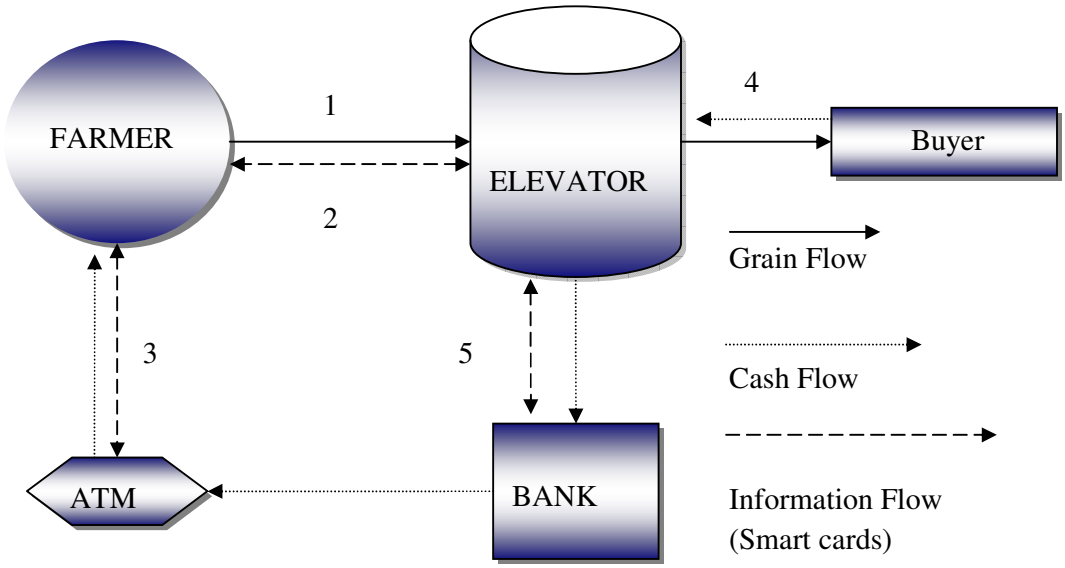


Figure 3: Grain Receipt System (UNCTAD, 2002).

3.4 The Essentials of GRS

3.4.1 A Functional Legislation Environment

Governments ought to be in charge to license the elevators and work with the private sector such as processors or industry to establish viable quality and standards. (Figure 4) Those standards should be specific enough to give a clear description of grain quality (Boehnke, 2003). The grain receipt must specify the quantity, quality and location of the grain stored. Also rights and duties for the stakeholders such as elevator, farmer and bank must be clearly defined. It is important that grain receipts are negotiable and equivalent in cash. The holder of the GR has the right to receive the grain or the equivalent if the farmer fails repayment or if the elevator is defaulting. Furthermore it is mandatory for a well functioning grain receipt system to have a legal environment that gives confidence for stakeholders especially the banks that lend against grain receipts (Martin & Bryde, 1999).

Author's Own

Figure 4: A legal environment for a grain receipt system.

3.4.2 Grain Prices that Reflect Carrying Charges

In order for a grain receipt system to appear of economic interest to the farmer, the elevator and the bank, an increment in prices ought to exist after harvest that cover carrying charges such as, storage, transporting and handling cost of the grain. Storage cost ought to be reasonable so that the farmers can pay the cost through additional income derived from the future sales of grain in lean seasons (Boehnke, 2003). On the other hand, if the market is protected with subsidized grain prices, it is not attractive for the farmer to postpone sales of grain at a prospected higher price since it is unlikely to happen. Furthermore for banks to lend against grain receipts there should exist a market information system where regular grain prices are published. Such a market information system allows for banks and farmers to obtain a useful tool for decision making for various actions regarding the best time to sell or buy the grain (Martin & Bryde, 1999). For instance Mexican historic price from 1998 to 2005 of corn placed in Guadalajara, Mexico at harvest time is usually lower but once carrying charges appear in the lean season, price increases compared to the harvest season. (Figure 5)

Figure 5: Harvest season's prices vs. Lean season's prices, corn placed in Guadalajara, Mexico.

Source Market Information Systems – SNIIM www.economia-sniim.gob.mx

3.4.3 Reliable and Functional Elevators

The location of the elevators should be in close proximity to the harvest areas that allow farmers to easily transport their grain to the elevator. To be able to fulfill procedures for establishing quality standards such as weighing, sampling, drying and sorting, elevators should include well maintained facilities. The elevators' role is essential for the success of a grain receipt system. Hence the elevator should be the first one to recover the payment of its services prior to delivery of the grain. Elevators, as inspected entities and issuers of receipts which are equivalent as cash, must fulfill agreement standards such as financial strength, grain management and administrative competence. Therefore it is important that inspectors have knowledge on grain and financial management, because they will be empowered to eliminate licenses if the elevators do not meet the requirements. In addition the inspections will be conducted without previous announcement and must be accepted by the elevators (Martin & Bryde, 1999).

3.4.4 Backup Plan

It is important to have a backup plan that covers possible fraud or careless behavior from the licensed elevator. If the elevator cannot deliver the grain due to any kind of fatality that is out of reach of the elevator an indemnity fund should be implemented as early as possible to cover the risk (Martin & Bryde, 1999).

3.4.5 Banks' Confidence in the Grain Receipt System

The role of the banks is crucial to the success of the GRS. The banks need to invest in training their staff and monitoring the price of the grain that is used as collateral (Boehnke, 2003). In addition banks should be involved in the process of elevators licensing. Therefore banks will feel self-confident with the process since they are lending the money. Some banks may only lend a proportion of the grain receipt to cover the loan granted in the case that grain prices decrease. Banks usually lend a specific percentage of the commodity's value. This percentage is to hedge the cost that lenders have to incur when selling the commodity in case the borrower fails to meet debt obligations and if the commodity's price fall as well. Moreover, grain receipts can be suitable with hedging programs such as futures, options[4] or forward markets[5] that can be used by farmers, elevators or banks (World Bank, 2005).

3.5 Benefits of Grain Receipts

A grain receipt system provides benefits such as: supporting trade, improving market efficiency, facilitating access to rural finance and price risk management (Coulter & Onumah, 2002).

3.5.1 Supporting Trade

With the GRS the grain is issued with a specific quality, quantity and location. The elevator is able to provide information about inventories available on demand from the industry. The farmers are able to participate in an efficient grain supply chain where quality is reliable. The GRS encourages farmers to fulfill grain standards that the industry demands and the elevators are forced to stop cheating on weight and quality. Furthermore, farmers will no more be forced to sell their grain in close proximity to the harvest, a time when prices usually are the lowest (Coulter & Onumah, 2002).

3.5.2 Improving Market Efficiency

The use of elevators as delivery location allows transparent trade in agricultural commodities between farmers and industry. Furthermore farmers will be able to access to credits using the grain as collateral. Licensed elevators will provide better storage systems and thereby post harvest losses may decrease considerably. Transparency will be enhanced in the storage sector

[4] Options: a contract that gives the buyer the right but not the obligations to obtain an item/service. The seller of the contract has an obligation to perform, should the buyer exercise the right (Catlett & Libbin, 1999).
[5] Forward sell: The act of selling an item for future delivery (Catlett & Libbin, 1999).

due to the presence of continuous and unannounced inspections. The sorting of grain improves quality and the industry reliance on GR making farmers and elevators reliable suppliers (Coulter & Onumah, 2002).

3.5.3 Facilitating Access to Rural Finance

A GRS contribute towards providing accessible financing to rural communities. The risk for banks is reduced when grain is used as collateral, which is more tradable than real estate. The bank does not need to monitor a large number of borrowers (farmers) but just a few elevators to guarantee loan performance. This fact tends to reduce transaction costs and foster lending to the agricultural sector, improve farmers' quality of life and provide a credit environment that raises competitiveness among farmers (Coulter & Onumah, 2002).

3.5.4 Decreasing Price Risk

In transition economies farmers commonly lack a system for decreasing price risk. Therefore their income is affected and the ability to repay the loans decreases. A GRS may be connected with hedging strategies that locks in a floor price. With such strategies bank and farmers are able to adjust to price risk, making credits cheaper for the borrower and perhaps increasing the size of the loan (Coulter & Onumah, 2002).

Table 1 Benefits and Constraints of Grain Receipts[6]	
Benefits	Creating secure collateral and facilitating access to credit in rural communities.
	Improvement of grain quality. Transparency of operations of elevators since they require licensing and inspection.
	Facilitating the creation of commodity markets such as futures and options - contracts that improve competition and market information.
	Since GR are regulated and with a specified quality the farmers tend to become reliable suppliers in the grain marketing chain.
	GR provides an instrument to obtain access to credit at competitive rates for farmers. Also GR provides comfort to banks as the risk of providing loans is reduced since the grain serves as collateral. Therefore the GR contributes to making the grain sector more efficient and transparent.
Constraints	There may be Government interventions in market prices which may decrease.
	A lack of a regulatory environment that ensures confidence in local elevators
	High interest rates that make financing unattractive for farmers
	Low quality infrastructure which make elevators unreliable in terms of grain quality
	Elevators that are not spread throughout production areas by that may cause transportation cost to become exceedingly high for distant farmers. Rough roads that make grain transportation difficult from production zones to the elevators.

[6] Boehnke, 2003

3.6 Overview of the Cienega Region

This study is focused on the Cienega region that is located in the state of Jalisco, near the Chapala Lake and the second largest Mexican city called Guadalajara. (Figure 6) The study is based on counties that belong to the Cienega. Those counties are Ocotlan, Zapotlan del Rey, Tototlan and La Barca.

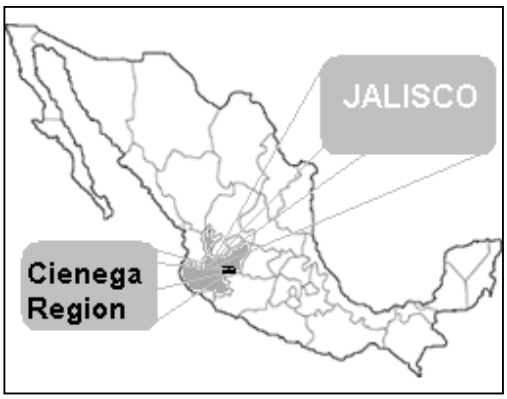


Figure 6: The Cienega Region in Jalisco, Mexico.

The Cienega, as most places in Mexico, is surrounded by inequalities. On the one hand corn is the leading crop on land planted and it is considered to be the most productive region in terms of corn yields within the state of Jalisco (Table 1) (INTERNET, COPLADE, 2006). Corn yields are between 7 and 11 tons per hectare under rain-fed conditions (SIAP, 2006). Besides corn production, livestock is also important such as dairy, beef, poultry, broiler, sheep and swine. On the other hand the Cienega has problems as most of the rural areas in Mexico. Lack of financial resources to fulfill working capital needs, uneducated population, unemployment, poor infrastructure in rural areas and polluted rivers and lakes are some reasons for farmers to feel forced to leave or lease their land. Those are also reasons for high emigration rates in rural communities. People look for better life conditions and opportunities in urban areas or migrate into the USA (INTERNET, COPLADE, 2006).

Table 2 Brief facts of the Cienega

Land size[7]					4,892 Km^2
Temperature average					18-22°C
Population					454, 088
Livestock[8]	Dairy	138, 853	Crops	Corn Spring	137, 198 hectares.
	Beef	151, 786			
	Swine	391, 896		Sorghum Spring	21, 720 hectares.
	Sheep	14, 284			
	Broiler	6, 858, 352		Wheat Winter	21, 345 hectares.
	Poultry	6, 559, 121			
Source: INTERNET Oeidrus (2006) - SIAP (2006)					

[7] Land size represents 6% of the total size of Jalisco and approximately 1 % of the total size of Sweden.
[8] Number of animals.

4 Agency Theory

"*If you want something done right, do it yourself*" (Sappington, 1991, p.45).

According to Jensen and Meckling (1976, p.308) companies are important entities for providing relationships between people. Often society is slightly believing that companies are individuals with motivations or intentions. Companies belong to a concept of legal fiction serving as a framework for contractual relationships.

Within the agency theory developed by Jensen and Meckling (1976) the agency relationship is defined as a "*contract under which one or more persons (the principal) engage another person (the agent) to perform some services on their behalf which involves delegating some decision making authority to the agent*".

One of the most important tasks for the principal is the selection of a competent agent. As an example a company that strives to select the least cost supplier or a bank that is searching for the most reliable loan applicant. Therefore the relationship begins when the principal offers a contract to the agent. Such a contract includes specifications of payments, according to the agent's performance whereupon the agent decides to accept or decline the contract. Thereby the agent decides how much effort he should allocate to fulfill the contract's specifications and also if those specifications are convenient for the agent's interests (Sappington, 1991).

The principal may feel forced to hire an agent when the tasks are too complicated or too costly to conduct himself. Therefore the agent has special skills or knowledge required to perform the task in question. The most important concern is how the principal can best motivate the agent to perform the principal's preferences, considering the difficulties in monitoring the agent's performance, since the principal cannot observe the agent's efforts (Sappington, 1991). The principal and the agent signs a reward contract where the agent chooses an action that the principal cannot control, even events beyond the agent's control might happen. As a result the actions and events establish the agent's performance, and then the agent receives the compensation agreed upon in the contract (Gibbons 2005).

At the beginning of the relationship between the principal and the agent, the same beliefs are shared since conflicting interests and asymmetric information have not yet arisen (Sappington, 1991). However, within the relationship the agent may be risk averse due to the fact that his efforts impact the principal. On the other hand the principal may be risk neutral due to the fact that he has the option to diversify between different agents (Shapiro, 2005). The principal has also the bargaining position of a "take it or leave it" offer to the agent (Sappington, 1991). If the relationship between principal and agent causes them to each maximize their own utility then the agent will not always act and behave according to the best interests of the principal. However, the principal may handle the agent's interests by establishing suitable incentives and information systems (monitoring cost) for the agent. Consequently the agent's irregular actions that could damage the principal's welfare will be

limited. On the other hand the agent will make an effort (bonding cost) to ensure that he will not take actions that could damage the principal. Most of the times the principal and the agent's relationship will not occur at zero cost, because in someway monitoring and bonding costs cannot be eliminated (Jensen & Meckling 1976).

Frequently in the agency relationship the principal and the agent will acquire a positive monitoring and bonding cost. Additionally, there will be some differences with unconventional events out of the agent's control which would increase or decrease the principal's welfare. If those differences experience a reduction of the principal's welfare then there is a cost. This latter cost is labeled by Jensen and Meckling (1976) as the "residual loss". Consequently the incentives, monitoring, bonding and other ways of social control represent the essentials of the contract between the principal and the agent's relationship (Shapiro, 2005).

4.1 Agency Problems

At the beginning of the relationship the shared believes avoid any asymmetric information between the principal and the agent (Sappington, 1991). But through the time or when the relationship is becoming more complicated the existence of problems such as horizon, portfolio, decision making and control will arise.

4.1.1 Horizon Problem

Horizon problems occur when an individual's objectives are fulfilled the net income generated by an asset and that fulfillment is shorter than the remaining productive life span of that asset. Therefore the horizon problem creates a disincentive environment for members' investments that may contribute to growth opportunities (Cook, 1995). Consequently problems arise since the principal could have a short term perspective and only focus on what benefits he/she may perceive in a short period of time. This could mitigate long term prospect for growth opportunities.

4.1.2 Portfolio Problem

A portfolio problem is risk-oriented. Asymmetries of preferences between the principal and the agent may arise due to disparities in risk preferences and how incentives are handled in order to reduce asymmetries between the agents and the principal. The agency theory usually takes for granted that principals are risk neutral and agents risk averse. Furthermore agents prefer more wealth to less, but the marginal utility decreases as more wealth is accumulated (Anthony & Govindarajan, 1998).

4.1.3 Decision Making Problem

Decision making may affect the principal's wealth. This problem is enhanced when there is a wide variety of interests and the potential gains are greater among principals that rely on one agent (Sykuta & Cook, 2001). Therefore the agent may not know how to cope with such a diversity of wishes and interests from the principals.

4.1.4 Control Problem

A control problem arises due to asymmetric information between the principal and the agent. Asymmetric information implies a lack of data from the principal's side regarding how the agent intends to develop its services, which the principal cannot control. On the one hand the principal is bearing the risk due to a lack of information regarding the agent's behavior. But on the other hand the agent might take advantage of his position as the controller of the information and might act according to his own interest. Hence, the agent may prefer to maximize his own utility rather than maximizing the principal's utility (Jensen & Meckling 1976).

To reduce the various problems mentioned above the principal can apply information systems to monitor and control the agent's performance. Incentives are other ways to manage agency problems. Some incentives could be penalizing the agent for his worst performance instead of rewarding for a good performance (Sappington, 1991). As a result monitoring and incentives becomes the base for the contract between the agent and the principal (Shapiro 2005). Competition also plays an important role among principal and agent. The threat of competition may serve to improve the agent's performance and result in providing additional incentives from the principal to the agent (Sappington, 1991).

Jensen and Meckling (1976) point out that the problem of inducing an agent to behave as if he was maximizing the principal's utility exists in all kind of organizations such as universities, companies, cooperatives, governments and unions. But for Shapiro (2005) the main actors which are the principal and the agent have an interchangeable role which means that they could be both at the same time, according to the situation that they face.

4.2 Agency Costs

The agency costs are defined as the sum of monitoring cost, bonding cost and residual loss (Jensen & Meckling, 1976).

4.2.1 Monitoring

Monitoring is the implementation of a system by the principal designed to control the agent's behavior and interests that could potentially damage the principal's welfare or utility in some way.

4.2.2 Bonding

Bonding is the effort made by the agent in order to reduce all types of behavior that could damage the principal's utility or to behave in such a manner that the principal is able to improve his utility.

4.2.3 Residual Loss

Residual loss is a monetary loss for the principal due to unusual events or decisions made by the agent that could cause the avoidance of utility maximization of the principal. For Shapiro (2005) the agency costs do not only arise from monitoring or bonding. Additionally, costs increase due to recruitment, specific preferences, providing incentives, moral vulnerability, self dealing, corruption and insurance. Furthermore costs also increase due to the principal's fear that the agents might act in their self interests. Therefore procedures or protocols that limit the agent's discretion tend to raise agency cost. On the one hand the cost will increase if cooperative efforts are involved, but on the other hand, if strong incentives exist for the agent, then the agency costs will decrease (Jensen and Meckling, 1976). For Jensen (1986) incentives are important in order to decrease the agency costs and increase the agent's performance.

"*Rational individuals always choose the option that makes them better off as they see it*". In other words they decide the action that best fits a better outcome. Since primitive men self interests exist, for instance the land was not equally fertile and they faced incentives to cultivate one piece of land rather than another. That reveals that incentives exist in all cases where individuals have choices, and this happens in companies as well as in nature. Monetary incentives are not always the best method to motivate the agent's performance because people are also motivated by other things. But money is essential when individuals are best motivated financially rather than through other methods (Jensen, 1994).

Agents care about success and failure, they have emotions and care about honor or even have altruistic motives and therefore they also feel shame and pride. The perfect agent is the one who makes decisions with no concern for his own preferences, and only cares about other individuals along with the principal. Therefore, for Jensen (1994), the perfect agent does not exist, for instance not even Mother Teresa was a perfect agent because her preferences evidenced a strong desire to help the poor of Calcutta over other alternatives. For that reason she was self-interested exhibiting her own preferences (Jensen, 1994).

The agency theory suggests that since people are self-interested in some way, they will face conflicts of interests causing problems for both sides of the relationship between the principal and the agent. Therefore a strong motivation to reduce the differences between the principal and the agent is needed in order to decrease agency costs. Moreover the two parties are interdependent and are cooperatively acting as a cluster even knowing that both sides have different goals (Lassar & Kerr, 1996).

Another way to improve the agent's performance and to reduce the agency cost is suggested by Jensen (1986). Jensen claims that is a reason for agents to become more efficient due to the threat of failing debt obligations. Jensen and Meckling (1976) mention that it is difficult to find a company that is almost totally financed with debt due to the fact that lenders are unlikely to lend to a company where more than ninety-nine percent of the capital is composed by debt. Since the borrower has too little to lose, or even if the borrower has a very low probability to succeed, the borrower captures most of the prospective gains. On the other hand if the borrower cannot fulfill payment obligations the lender assumes most of the cost.

Agency costs increase or decrease according to the level of monitoring. For instance the existence of a number of principals and agents might increase information asymmetries therefore monitoring will be more difficult and cause agency costs to increase. On the other hand long relationships between the principal and the agent lead to a partnership through the time, where the principal and the agent know each other better. Therefore reputation and trust are developed, then the agency cost decreases and the principal and agent's utility will be maximized (Shapiro 2005).

5 Agency Theory and Grain Receipts

According to the agency theory in Jensen and Meckling (1976, p.308) a relationship is described as: "*a contract under which one person (the principal) engages another person (the agent) to perform some services on their behalf which involves delegating some decision making authority to the agent*". An individual can be principal and agent at the same time but in different relationships (Shapiro 2005). For this study, where farmer, elevator and bank play a key role, within the grain receipt system, the principal and the agent are an exchangeable process. In this study two scenarios will be presented: A and B. (Figure 7)

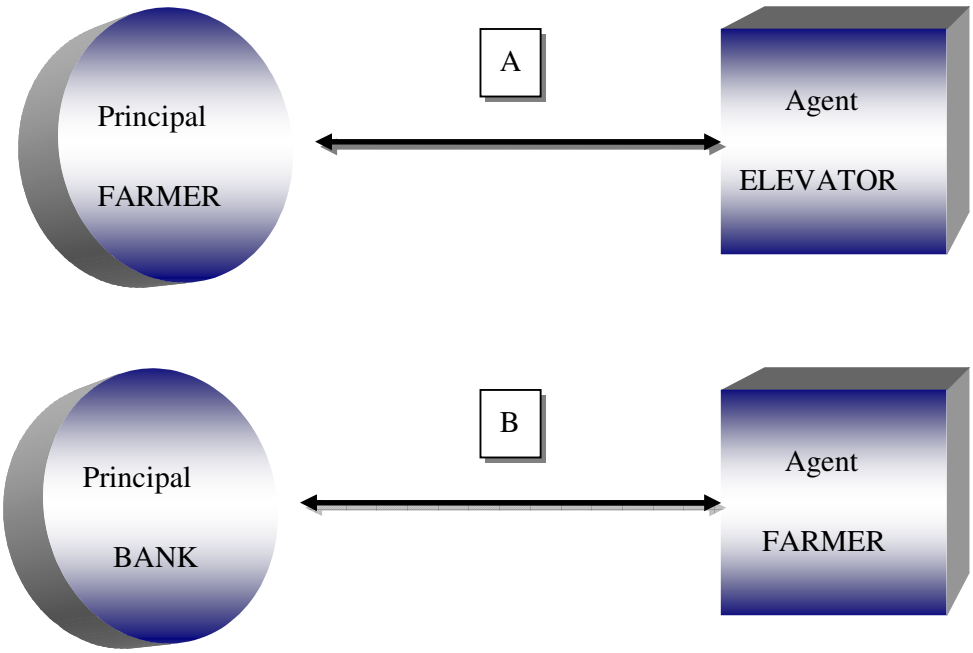


Figure 7: Principal and Agent Relationship between Farmer – Elevator (A) and Bank – Farmer (B)

On the one hand the relationship between the farmer as the principal and the elevator as the agent (A). On the other hand the farmer is the agent and the bank is the principal (B). For scenario A the farmer is acting as the principal because he has the option to diversify the location of his grain through elevators. The elevator is willing to accept delivery of the farmer's grain that fulfills quality standards. Hence an agreement is conducted between the agent and the principal. Consequently for scenario B the principal (bank) can accept or deny the farmer's credit request. The agent is willing to accept the bank's announcement if he does or does not fulfill the bank's credit requirements. Those relationships involve the agency problems and cost concepts.

5.1 Agency Problems and Grain Receipts

Endeavors from the stakeholders should be done for the well functioning of a grain receipt system. However during the process problems might arise such as horizon, portfolio, decision making and control problems.

5.1.1 Horizon Problem

Given the relationship between farmer and elevator some investments may be carried through on both sides. The farmer that has to improve his agricultural practices should invest in machinery and improve inputs such as environmentally friendly pesticides and seeds that improve yields and grain quality. Therefore, if the farmer is used to grow a certain kind of variety that does not yield a good quality grain but he still can place it in the market, then is not worth for him to invest in a costly hybrid seed with higher yield. Other options are disease resistance and better grain quality or to invest in environmental friendly pesticides. The elevator may invest in equipment for improved grain management and information systems in order to gather information from farmers. Such investments may be expensive for the elevator. Therefore the manager of the elevator may not be willing to invest when he currently can sell the grain to livestock feeders. The bank should invest in information technology such as smart cards and ATMs. Furthermore there should be a well trained staff for rural lending. Hence the bank may not be willing to invest in the above mentioned, since rural lending is considered a risky business compared to urban lending which is more attractive for banks. Therefore such improvements may be viewed as an overinvestment by the stakeholders.

5.1.2 Portfolio Problem

As a risk-oriented problem, a portfolio problem emerges facing the stakeholders such as farmer, elevator and bank. With a grain receipt system the risk of default is not expected to be eliminated but it is expected to be shared by the stakeholders. The farmer may reduce the risk by utilizing hedging strategies such as options, futures and forward contracts as well. By these methods the farmer is assured that grain prices will be at least at the same price level as when he placed his hedge while asking for the loan. The elevator may receive assurance on facilities that protect grain inventories maintains grain quality. The bank as a lender may use grain as secure collateral in case the farmer fails to meet his debt obligations. Therefore the banks may be willing to increase lending to rural areas.

5.1.3 Decision Making Problem

With a grain receipt system rights and duties are clearly specified for the stakeholders. Clear rules are formed to avoid misunderstandings. The electronic receipt formalizes the contract between the farmer and the elevator. The contract between the bank and the farmer is formalized when the loan and the collateral are provided. However decision making problems may arise within the relationship between farmer and elevator since the elevator has to deal with many farmers and to accommodate their different interests. For instance some farmers may not use all grain as collateral. Therefore the elevator has to allocate grain that will be used as collateral and grain that will be used for other purposes according to the farmers' interests. If the grain quality is standardized, the elevator may find it easier to allocate the grain within the storage facilities.

5.1.4 Control Problem

Asymmetric information may cause control problems. The relationship between the farmer as a principal and the elevator as an agent is characterized by the farmer's lack of information about how the elevator is managing grain weight measurement and sampling procedures. Therefore, within a grain receipt system the elevator faces the separation of ownership between various grains and incentives may apply in terms of paying for storage and handling services. On the other hand the relationship between the bank as a principal and the farmer as an agent is characterized by a reduction of asymmetric information due to the fact that the principal is provided with information by the elevator as well as the smart cards. Therefore the bank only has a few elevators to control rather than hundreds of farmers. For the farmer the being granted a loan applies as an incentive due to the threat of failing debt obligations (Jensen, 1986).

5.2 Agency Costs Mitigated by Grain Receipts

The agency theory mentions the existence of asymmetric information between the principal and the agent. Grain receipts may mitigate asymmetric information problems. For instance in scenario **B** (figure 7) the bank without a grain receipt system has to monitor a tremendous amount of farmers that enhance monitoring cost. Therefore credit will be expensive for the borrowers since the monitoring costs will be reflected on the farmer's credit. With a grain receipt system the asymmetries of information may decrease considerably due to the fact that the bank has to monitor a few elevators instead of a large number of farmers. Hence the credit will be cheaper for farmers since the bank decreases its monitoring cost, thereby also making credit more accessible for farmers. In addition, bank lending may increase due to the fact that the credit is guaranteed with the grain as collateral.

For scenario **A** (figure 7) the elevator decreases its advantage of controlling information, because it will be forced to stop cheating on weight and sampling procedures due to the unexpected visits of supervisors and fear of lose the license. On the other hand without a grain receipt system the elevator has complete information in order to take advantage according to its own interests in detriment to principal's (farmers) interests. Grain receipts also involve incentives for the agents. For instance in scenario **A,** the elevator has the incentive of being the first to recover the payments of its services before the grain is delivered, building reputation as a reliable elevator, showing financial strength, marketing the elevators operations and being a good supplier to industries and livestock feeders. The principal (farmers) can increase his utility if, within the lean season, corn prices increase while corn is stored. Access to credit is another incentive for the principal. Therefore the farmer can use grain as collateral and sell corn in the lean season instead of being forced to sell immediately after harvest.

Given scenario **B** the principal's lending increases with a grain receipt system since secure collateral is provided. The agent has the incentive to solve his working capital needs and an incentive to repay which forces the farmer to become more efficient due to the threat of failing debt obligations (Jensen 1986). Therefore a farmer that wants to use grain as collateral be planning in advance in order to prepare his field, acquire better hybrid seeds, use environmentally friendly pesticides, fertilizers and apply better agricultural practices in order to be able to deliver grain with good quality.

5.3 The Relationship between the Farmer as the Principal and the Elevator as the Agent.

Referring to scenario "A" in figure 7 for Mexican farmers, being the owner of a grain elevator is too costly. Therefore they may feel forced to hire an elevator to store their grain using a grain receipt concept. Hence the principal pays to the agent for his services of storing and handling the grain. The agent puts effort to guarantee that he will not take actions that could affect the principal such as cheating on weight and sampling. The grain receipt formalizes the contract between the relationship of the principal and the agent. Therefore, for the principal the grain receipt provides information, such as weight, location and quality of the grain. The elevator may feel pressure by knowing that the grain does not belong to him. The separation of ownership induces the elevator to work more efficiently due to the threat of losing his license or failing to meet the principal's interest (Fama & Jensen, 1983). The relationship farmer-elevator is based on trust and likely to share similar interest for the corn supply chain. Consequently, the agency costs may decrease since they share the same beliefs. On the other hand, asymmetric information may occur at the delivery of the grain since the farmer has little information about grain quality measurement methods. The elevator may take advantage of that, fulfilling its own interest and not to the principal's interests.

5.3.1 Monitoring

The use of the grain receipt decreases the need for monitoring the agent since the information that the principal requires is specified on the receipt. Monitoring the agent's operations such as weight and grading will be done by the authorities thereby decreasing the principal's monitoring cost. By this method, the principal does not have to assume the monitoring cost.

5.3.2 Bonding

The agent makes an effort to guarantee that he will not take actions that could affect the principal negatively, such as cheating on weight and sampling. Additionally, the elevator should acquire a license to be able to participate in the grain receipt system. The staff should be licensed as well. The elevator staff may keep records of the farmers such as their yield per hectare, costs per hectare, and the variety of corn seeds planted. Moreover, investing in information technology in order to be synchronized with the bank increases the bonding costs for the agent. For the agent bonding costs increase considerably since without a grain receipt system since the elevator is not forced to invest. On the other hand, without a grain receipt system the elevator may become more passive and lose market share in a competitive local market where efficiency and truthful operations are important for being a reliable corn supplier.

5.3.3 Residual Loss

Residual loss may appear in the relationship between the elevator and the farmer. Unusual events could happen to the elevator, for instance a warehouse explosion, earthquakes and extreme weather conditions such as strong winds, thunder and lighting and storms that could damage the elevator facilities. Moreover, extreme weather conditions may affect the principal's utility considerably since yield expectations are based on weather conditions because corn production in the area takes place mainly under rain-fed conditions. Therefore low yields will be obtained and the quality of grain decreases considerably.

5.3.4 Partnering for Competitiveness

Problems in business relationships occur due to the partners attempt to avoid being cheated by each other (Ford et al. 2000). For instance, farmers mix dry grain with moist grain in the trucks in order to get average moisture content. By this method they are cheating with the elevator and affecting its grain management. On the other hand, the elevator may be cheating on weight and rising moisture contents as well (Per. Com. Garcia, 2006). The relationship in which the farmer and the elevator cheat each other will affect their economic returns as well as the incentives. Therefore farmer and elevator should work together for mutual benefits. The

development of trust can is an important way of reducing agency cost within the principal and the agent relationship (Shapiro, 2005).

The relations between farmer and elevator do not just happen. Those relations require efforts on both parties to develop. Therefore efforts include costs of monitoring and bonding according to the agency theory. The farmer has to grow his corn in the best way possible in order to fulfill market requirements. Furthermore if the farmer is planning to use the grain as collateral then he must fulfill the elevator's requirements in order to be accepted by the bank for loan eligibility. The elevator has to make efforts as well, such as to employ a qualified staff, functional facilities and sufficient financial records in order to be licensed in a grain receipt system. This license can be used by the elevator as a marketing strategy for acquiring more grain from farmers and to create a reliable elevator reputation.

Farmers and elevators belong to the corn supply chain. Both are suppliers to the corn processor industry. Therefore they should be partnering and committed to each other in order to decrease the agency cost as much as possible. Partnering means working together for mutual benefits, it involves pooling resources, sharing costs and cooperating in ways that mutually benefit all parties involved in the partnership. The partnering requires an understanding of elevators and farmers needs and capabilities to establish a clear goal. This goal is to create and maintain a loyal, trustworthy and reliable relationship that will allow the principal and the agent to maximize their economic returns, while promoting improvements in grain quality, storage techniques and competitiveness (Goetsch & Stanley, 2000).

Competitiveness is defined as "*the ability to profitably create and deliver value through cost leadership or product differentiation*" (Kennedy et al. 1997). Commonly competitiveness of agribusiness such as production and grain elevators has been commodity based; therefore the focus has mainly been on price competitiveness. On the other hand, the food industry has focused on product differentiation and adding value such as functional foods[9]. Corn as a commodity is price based because its attributes are fixed (Kennedy et al. 1997). However, if a farmer is efficient and competitive is largely determined by linkages between elevators and industry. Individuals that work in a cooperative way, instead of working independently may be in a stronger competitive position (O'Keeffe, 1994).

A market of non-differentiated products such as corn causes agribusiness firms to compete through cost leadership. For instance economies of size are important for cost reduction. Farmers can join forces in order to increase their purchasing power and get price discounts on inputs such as fertilizers, seeds and pesticides. In addition, proximity between farmers and elevators is important since they develop a close interaction where the transaction costs such as transportation is reduced (O'Keeffe, 1994). Even though corn is treated as a commodity within agribiotechnological sector may change. Added value may be given through attributes

[9] A food with ingredients either naturally occurring or added that provides a health benefit beyond the traditional nutrient value of the food. (Wildman, 2001)

of corn therefore the competitiveness might change from a cost leadership to value added competitiveness (Kennedy et al. 1997).

A grain receipt system requires endeavors from all the players. Hence, sooner or later those endeavors will pay off when farmer and elevator become reliable suppliers for the corn industry. In addition, farmers' access to credit will be easier, therefore their working capital needs will be fulfilled.

5.4 The Relationship between the Bank as the Principal and the Farmer as the Agent.

Banks lend money to reliable farmers that satisfied the grain quality standards. Credit is important for the economic performance of corn producers. Regarding scenario "B" from figure 7 the relationship between corn producers and the bank is due to that credit helps to solve the working capital problems. Limited access to credits decreases the competitiveness of corn producers. Agency costs mention the benefits of debt as an incentive due to the threat of failing debt repayment obligations (Jensen, 1986). For the Cienega corn producers this theory may be applicable because if they are indebted they might feel the pressure to meet the repayments. Therefore they, improve their competitiveness due to the threat of failing the repayment and not to be labeled by the bank as "defaulters".

Banks prefer to finance more reliable farmers because those borrowers are characterized by lower credit risk. For the bank, monitoring involves observation on the farmer's progress in order to get information about repayment of the loan. It may also include monitoring variables such as cost per hectare and yield per hectare (Nasr et al. 1998). The bank's cost of the agent's monitoring will be transferred to the agent through the credit cost, making the credit more expensive for the farmer. This type of credit has a high probability to be obtained by farmers' cooperatives compared to individual farmers due to the fact that cooperatives have more collateral to offer to the bank. Individual farmers are expected to be credit constrained due to high monitoring costs since they are scattered in rural areas and sometimes without a credit history. Monitoring is costly; therefore credit will be costly for farmers. A grain receipt model may smooth the agency costs described by Jensen and Meckling (1976).

5.4.1 Monitoring

The principal's (bank) monitoring cost includes yield per hectare among others. Within a grain receipt system the principal's monitoring cost decreases considerably since the monitoring cost can be provided by the licensed elevator. Therefore the principal only has to monitor a few elevators rather than monitoring hundreds of farmers. By this method the agency costs decrease and make credit less expensive and affordable for individual farmers and cooperatives solving their credit needs. (Figure 8) Banks may invest in information

technologies to be synchronized with the elevators and also train its staff for the grain receipt system.

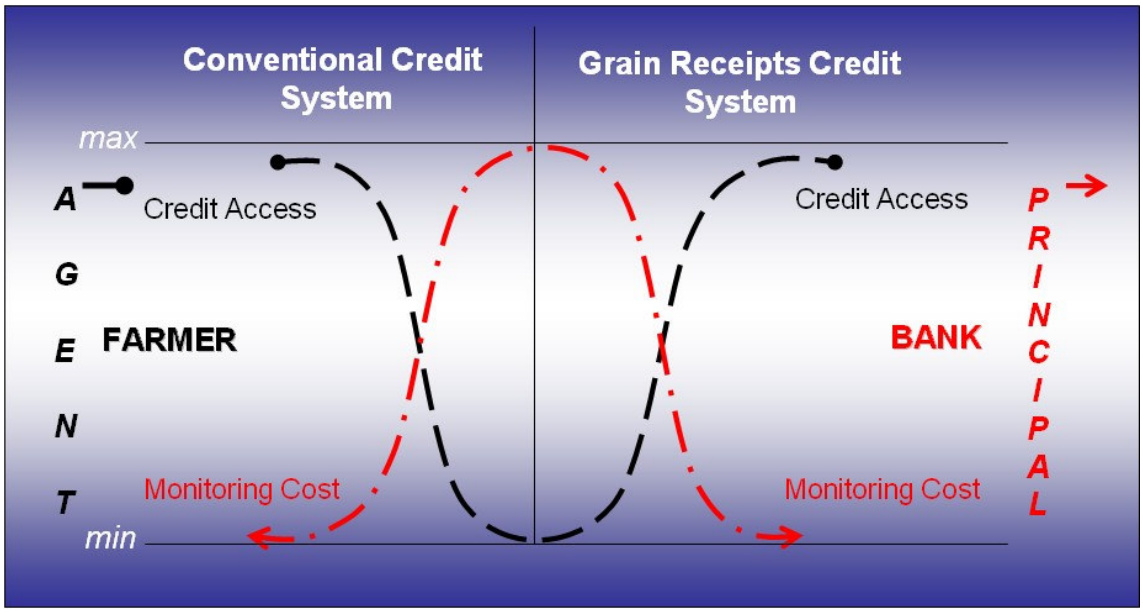


Figure 8: Conventional Credit System vs. Grain Receipts Credit for Scenario "B" Author's Own

5.4.2 Bonding

The farmer that uses grain as collateral is preparing in advance to fulfill grain quality standards, to be able to receive credit from the bank and to formalize the relationship. Those preparations represent a bonding cost to the farmer. Prior to guaranteeing the credit and after receiving the credit there will be a bonding cost due to repayment of the loan. Farmers have to improve their agricultural practices when producing corn. At harvest time they have to be aware of the operator of the combine in order to ensure that good quality grain is being harvested.

6 Hypotheses

After the concepts of grain receipt and agency theory have been described the hypothesis will be developed. The hypotheses are based on grain receipts and the agency theory for the relationship between the principal and the agent. These hypotheses will lead to the analysis of the results and to clarify the prospective benefits and obstacles of grain receipts. The hypotheses are classified according to the agency problems which are, control, horizon, portfolio and decision making.

- **Control Problem**

A grain receipt system reduces the control problem. The asymmetric information among the bank as the principal and the farmers as the agents is reduced (scenario B). The bank decreases the monitoring costs because it only has to monitor a few elevators instead of hundreds of farmers. In the event of the farmer as the principal and the elevator as the agent (scenario A) the asymmetric information problem is reduced as well, due to the fact that the elevator has to operate transparently making it more difficult to cheat.

- **Horizon Problem**

Diversity among the farmers in terms of age, hectares planted of corn, years growing corn and financial satisfaction may induce a horizon problem for the grain receipt system. The stakeholders of a grain receipt system have to conduct some investments. Farmers should invest in better agricultural inputs and improve their agricultural practices to improve grain quality and higher yields. Investments in facilities, training staff and grain handling equipment should be made by the elevator. Banks should train their staff and invest in information technology systems and distribute ATMs to the elevators in order to facilitate the access to cash for farmers.

- **Portfolio Problem**

A grain receipt system decreases the portfolio problem for both farmers and banks. The reason is that grain receipts foster the use of hedging strategies designed to reduce price risk while making the access of financial support easier and more affordable for farmers. In addition the banks will be willing to lend against secure collaterals, such as grain receipts.

- **Decision making Problem**

Criteria for delivering the grain into the elevators may affect the decision making of the farmers. For instance, the selection of a reliable elevator where farmers feel confident or satisfied with grain quality measurements becomes important. In addition, the elevators may face difficulties to fulfill the farmers' interests, because some of them may only use a fraction of the grain as collateral while others may not be interested in grain receipts at all.

7 Method

To fulfill the aim the thesis it is written using an abductive approach and with both qualitative and quantitative methods. A survey method is applied in order to obtain a broad picture about their agricultural and post harvest practices and how farmers finance their agricultural activities, and who they perceive the grain receipt system and its feasibility. Such methods consist of surveys with fixed-alternative questions to farmers and elevators from the Cienega region, also phone interviews with fixed-alternative questions to banks. (Appendix 1)

The study is initialized by using internet, available literature and other sources regarding previous research on the area of interest. The structure of the thesis is based on the agency theory, where the competitiveness and partnership issues associated with grain receipts and its applications are described. Moreover a schematic model of grain receipts system for the Cienega region is developed.

A survey is a flexible way of obtaining data from people about motives, attitudes, awareness, lifestyle and preferences. In addition a variety of questions may be asked verbally, in writing, or via computer. Moreover the surveys have a structure that their answers can be fixed-alternative questions which require that the respondents select from a predetermined set of alternatives. This structure has several advantages such that those questions are simple to administrate, the data is reliable because the responses are limited to the alternatives stated, and the interpretation of data is relatively simple. On the other hand the disadvantages are that the respondents may be unable or unwilling to provide the desired information. For instance, respondents may be unwilling to respond if the information requested is sensitive or personal (Malhotra, 1999). For this study the surveys for the farmers, banks and elevators are mainly structured in fixed-alternative questions such as, multiple choice, rank-order scale and likert scale.

Multiple-choice questions are provided by the researcher and the respondents are asked to select one or more of the alternatives. The rank-order scaling is a technique where respondents are presented with several objects simultaneously and asked to order or rank them according to some criterion. The Likert scale is a rating scale that requires the respondents to indicate a degree of agreement or disagreement, satisfaction or dissatisfaction, with each of a series of statements about the stimulus objects. Moreover the decision to use an odd or even number within the scale such as, Likert scale depends on whether some of the respondents may be neutral on the response being measured. If a neutral or indifferent response is desired an odd number scale should be used. On the other hand if the researcher would like to force a response or believes that no neutral or indifferent responses exist, an even number scale should be used (Malhotra, 1999).

The surveys are statistically analyzed with PHSTAT2 (2003). Such analysis consists of contingency tables and a hypothesis test of independence and homogeneity with χ^2 (chi-square). A contingency table, or cross-tabulation, is a cross classification of attributes between

categories, where the hypothesis to be tested is of no association, dependence or homogeneity between the categories (Newbold et al. 2003). According to Mann (2004) a test of independence or no association includes the test of null hypothesis (H_0) where the attributes of the categories of a given population are not related against an alternative hypothesis (H_1) where the attributes of the categories are related or dependent. Such test is made by using the χ^2 (chi-square) distribution. Within a test of independence the degrees of freedom are as follow; $df = (R-1)(C-1)$ where R and C are the number of rows and columns, respectively in the given contingency table. The value of the test statistic χ^2 (chi-square) for a test of independence is calculated as: $\chi^2 = \sum \frac{(O-E)^2}{E}$ where O and E are the observed and expected frequencies, respectively for a cell. In addition for the fulfillment of the expected frequencies in this study a combination of categories is applied. The homogeneity test involves the null hypothesis (H_0) that the proportions with certain characteristics in two or more different populations are the same.

7.1 Avoiding Pitfalls

When doing research it is important to consider the socio-cultural environment such as, values, literacy, religion, communications patterns and family. Due to the fact that in many developing countries a considerably number of people only has elementary school education. A sophisticated interview method may not be useful (Malhotra, 1999). Therefore for this study an easy to follow survey was developed. The questionnaire was intended to engage the farmers and the elevators and to stimulate their interest in providing complete and accurate answers. Even though a structure of fixed-alternative questions is used the respondents may be unable or unwilling to provide the desired information, such as motives, beliefs, feelings and information that may be considered as sensitive or personal. Despite of these disadvantages these surveys are by far the most common method of primary data collection (Malhotra, 1999). In addition as a Mexican, cultural barriers will not be a problem with the application of the survey due to the fact that I as a researcher share the same cultural background.

There is always a slight risk of fallacy when a researcher realizes on other people to perform surveys. But due to the geographical distance it has been necessary to use assistants that can distribute and perform the surveys according to my directions. In order to minimize the risk of inaccuracies with regards to the surveys, reliable people have been chosen to perform the surveys and send them to me. The people in charge to apply the surveys posses a high level of reliability since they are people within the agricultural industry and well known to me. Therefore I am convinced that no biased behavior will occur to the detriment of the results.

After all the information was processed, both qualitative and quantitative, the results from the surveys are collected. Thereafter an analysis of the information is conducted on the basis of the chosen theories and the stated hypotheses. Finally a discussion and conclusion is enacted in order to answer the questions into problem formulation and fulfill the aim of the research.

8 Results

In the following chapter results from the farmers, elevators and banks are presented. The farmers' surveys present results of agricultural, post harvest and financing practices, also their perception of the grain receipt system. Thereafter results from the elevators present their storage capacity, equipment installed, grain management, their relevance as financial intermediaries and their perception of the grain receipt system. In addition the results from the banks present the loan portfolio destined to agricultural lending, their perception of the grain receipt system and repayment rate among farmers.

8.1 Farmers

This study is based on surveys answered by 52 farmers located in the Cienega region. The farmers that cooperated to answer the survey are residents as follow; 84% are from Ocotlan, 7% from Zapotlan del Rey, 7% from Tototlan and 2% from La Barca. (Figure 9) Their ages range from 30 to more than 60 years old. 15% of the farmers are between 30 to 40 years old, 33% are between 41 to 50 years old, 31% are between 51 to 60 years old and 21% are older than 60 years old. (Figure 10)

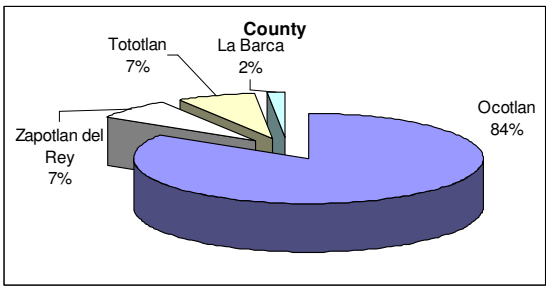


Figure 9: Farmers' County

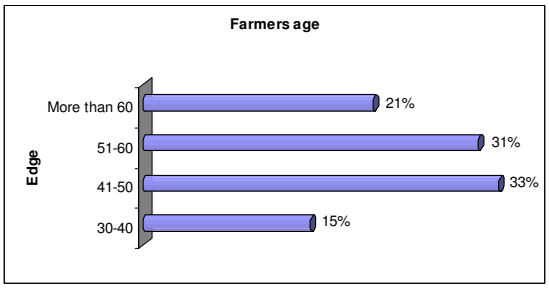


Figure 10: Farmers' Age

8.1.1 Agricultural Practices

The study reveals that the farmers have been growing corn for many decades. 45% of the farmers have been growing corn for more than 30 years. (Figure 11) Most of those farmers can be classified as small farmers since they grow corn in small pieces of land. 38% of the respondents grow corn in between 5 to 15 hectares. While only 2% grow corn in more than 100 hectares. (Figure 12)

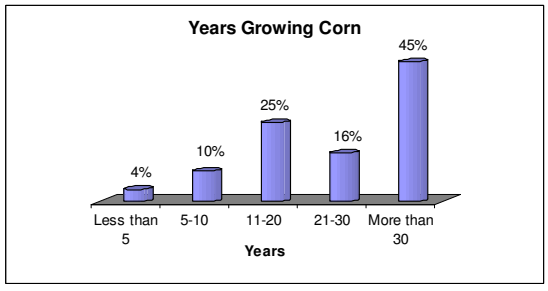


Figure 11: Farmers experience in growing corn

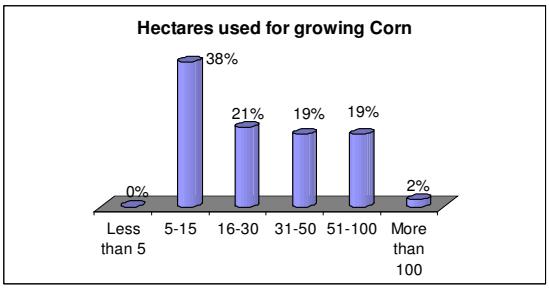


Figure 12: Farmers' Land Size

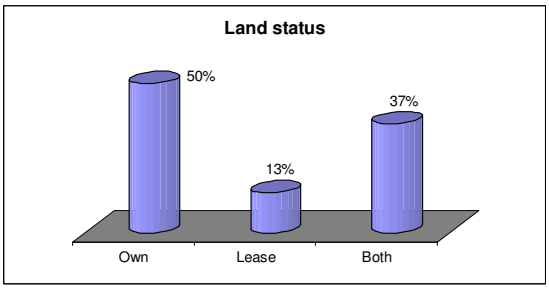


Figure 13: Farmers' Land Status

50% of the farmers grow corn on their own land while 13% of the farmers do not own any land at all, but they lease land for growing corn. (Figure 13) According to the results from the surveys the systems for growing corn are to 71% based on rain-fed conditions while 29% is a combination of irrigated systems and rain-fed conditions. (Figure 14) Therefore not a single farmer grows corn with only irrigated systems. Moreover the yields are based on tonnes per hectare, even knowing that corn's growing systems are mainly under rain-fed conditions in the Cienega region yields are grater than national yields which are 2.8 tonnes per hectare (45 bushels/acre) (SIAP, 2006). 49% of their yields in the Cienega region are between 6 to 8 tonnes per hectare (96 bushels/acre to 127 bushels/acre), while 47% are among 8.1 to 10 tonnes per hectare (129 bushels/acre to 160 bushels/acre) and only 2% have yields greater than 10 tonnes per hectare (160 bushels/acre). (Figure 15)

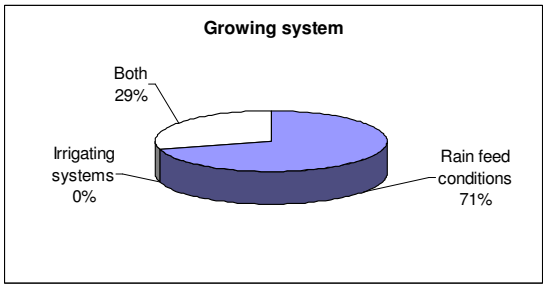


Figure 14: Farmers' Growing Systems

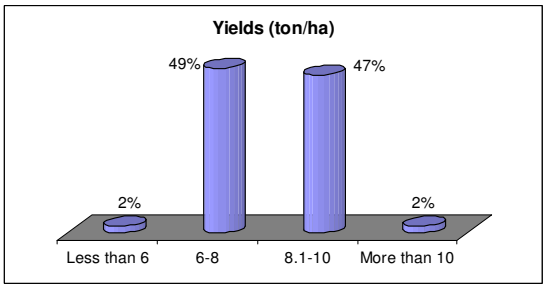


Figure 15: Corn Yields

In addition, 73% of the farmers have livestock while the remaining 27% only grow crops which may place them in a hazardous position for no being able to diversify. (Fig. 16) Furthermore the hectares used for grazing are small. Among the farmers that have livestock only 42% destined less than 5 hectares for grazing while 21% of the farmers destined 16 to 30 hectares for grazing. (Fig. 17)

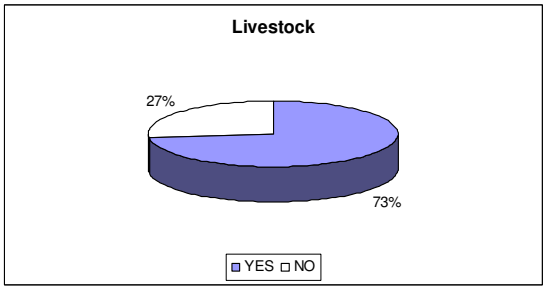


Figure 16: Farmers that have livestock

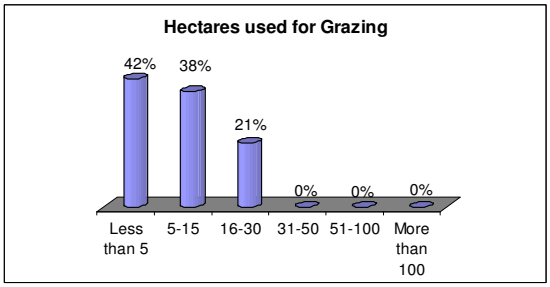


Figure 17: Hectares used for grazing

8.1.2 Post Harvest Practices

Regarding post harvest practices 93% of the farmers deliver their grain to elevators while only 7% store the grain for own purposes such as livestock feeding. Hence most of the farm operations grow corn for cash market (Figure 18) The elevators are spread all over the areas but 8% of the respondents do not have an elevator in close proximity of their farm. However 79% of the farmers answered that they have four elevators close to the production areas. (Figure 19)

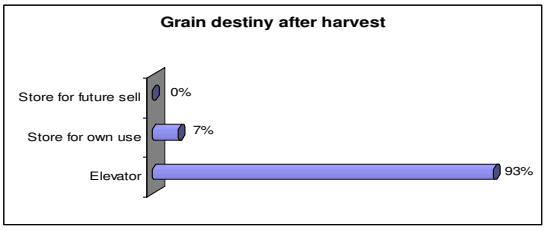


Figure 18: Grain allocation after harvest

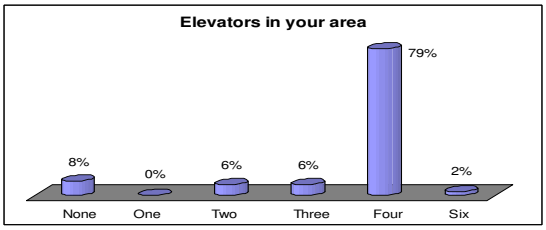


Figure 19: Elevators in farmers' area

The most common criterion to market the grain to an elevator is based on price and business relations, representing 54% and 19% respectively. (Fig. 20) Among those farmers that have business relations, 60% answered that the business relation is based on financing of inputs by the elevators. (Fig. 21)

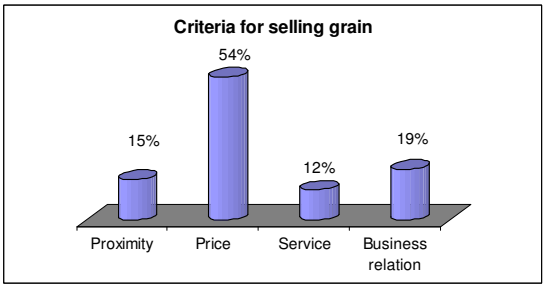


Figure 20: Farmers' criteria for delivering the grain

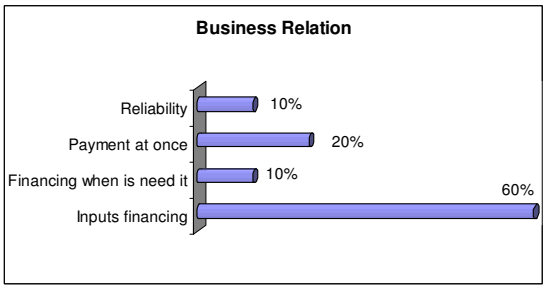


Figure 21: Business relations between farmers and elevators

Furthermore, the most important factor for farmers when they deliver their grain to the elevator is based on price per ton, the time to get paid and the financing of inputs, representing 44%, 23% and 21% respectively. Evidently the financing used is crucial to many of the farmers (Figure 22)

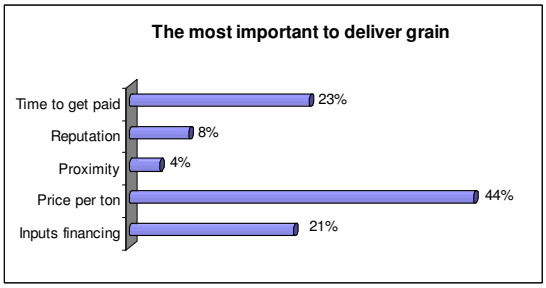


Figure 22: The most important to consider for delivering the grain

In addition, almost the half of the farmers deliver grain to the same elevator each harvest season, which means that the farmers have a strong dependency of those elevators due to the fact that they receive financing from them. (Figure 23)

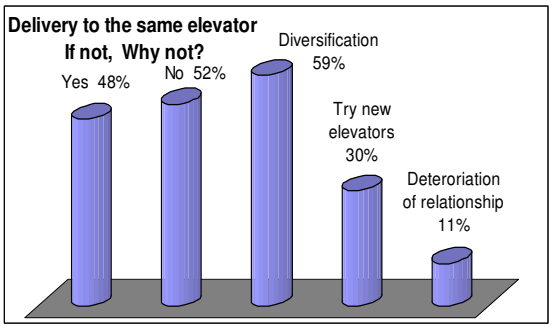


Figure 23: Delivering the grain to the same elevator

Regarding elevators' reputation from the following scale "disappointed, indifferent and exceptional" 79% of the farmers are indifferent. While 8% are disappointed and only 10% feel that the reputation is exceptional. (Figure 24) In addition when the farmers where asked about the reputation of the elevator where they deliver their grain 52% answered that they are mostly satisfied while 6% are not satisfied and 13% are very satisfied. (Figure 25)

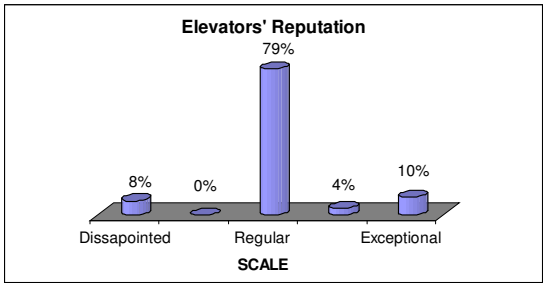


Figure 24: Elevators' Reputation

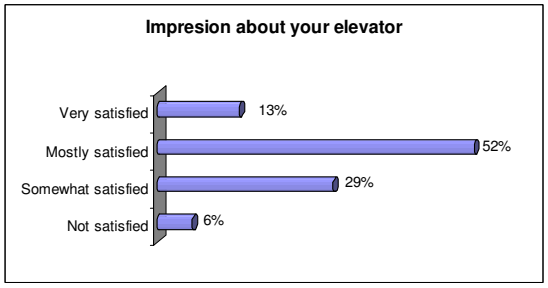


Figure 25: Impression of your elevators' reputation

The study reveals that the main problems that farmers face once they have delivered grain to elevators are; low prices and cheating, representing 37% and 28% respectively. (Figure 26) Moreover farmers' satisfaction with the elevators' quality measurements show that only 8% are very satisfied, 35% are mostly satisfied, 47% are somewhat satisfied and 10% are not satisfied. (Figure 27)

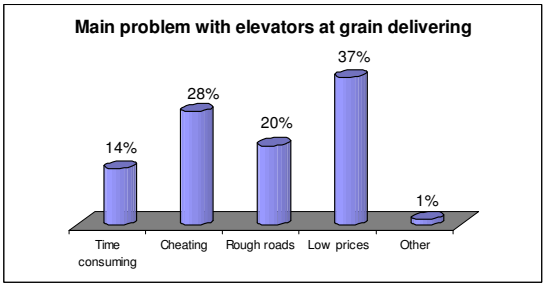


Figure 26: Farmers' main problem after the grain is delivered

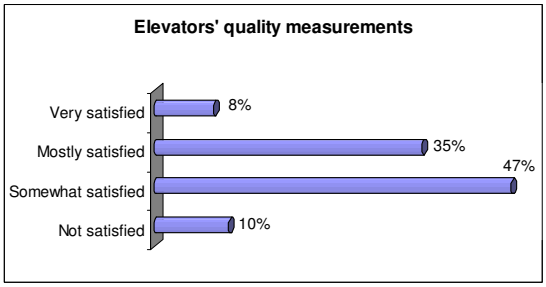


Figure 27: Farmers' satisfaction of elevators' quality measurements

Furthermore, after the farmers delivered the grain, 6% of the farmers receive the payment after 2 working days, 27% have to wait between 1 to less than 2 weeks to get paid, 13% wait between 3 to 4 weeks, 21% have to wait between 1 to 2 months to receive the payment, and finally 6% have to wait more than 2 months to get paid. (Figure 28) Regarding the long period of time until payment 60% of the farmers have at least once experienced one month or more of delay to receive their payment. (Figure 29)

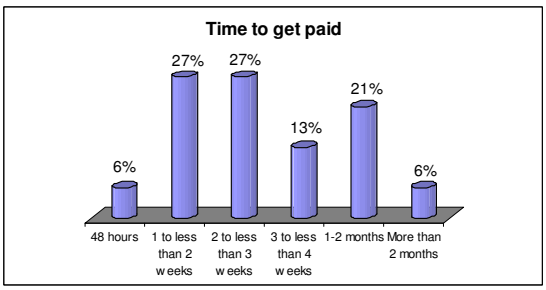


Figure 28: Time that farmers' payment is delayed

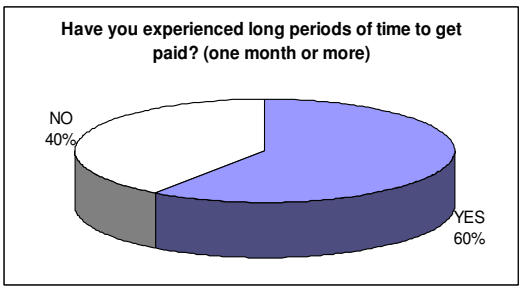


Figure 29: Have farmers ever experienced delayed payments?

Once the farmers are paid, 75% answered that they receive the payment all at once, while 25% receive partial payments. (Figure 30) In addition, farmers were asked about how they allocate their cash after being paid. 51% destined their cash income to pay debt obligations, 37% use their cash for livelihood and only 12% use their cash to buy inputs for the next growing season. (Figure 31) Moreover when farmers were asked if they were satisfied with their financial income, 56% answered that they are not satisfied while only 2% are very satisfied. (Figure 32)

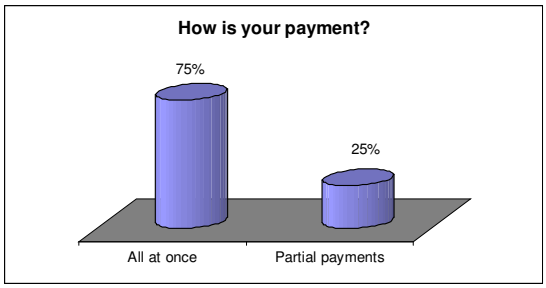


Figure 30: Farmers' payment method

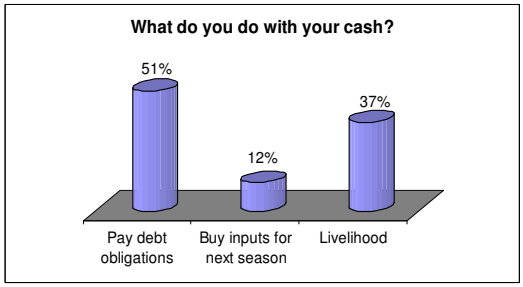


Figure 31: Cash allocation after being paid

When farmers were asked what is affecting their satisfaction of the financial outcome, 43% answered high input prices, 38% answered low grain prices at harvest time and 18% answered high interest rates on loans. (Figure 33) Therefore they were asked when they buy their inputs and 85% buy the inputs when they really need them and only 15% buy them in advance. (Figure 34)

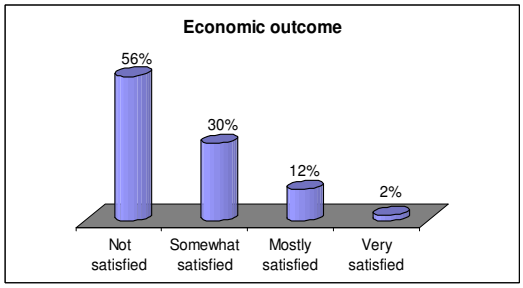


Figure 32: Farmers perception in financial income

The fact that farmers have to wait a long period of time to be paid and low grain prices after harvest are some of the reasons that farmers are adversely affected in their profits and financial satisfaction. Farmers are not able to buy inputs in advance because as soon as they have an income they have to allocate that income first paying debt obligations, secondly livelihood and last, if is money left buy inputs in advance which may be unlikely to happen. Hence farmers face high input prices and low grain prices which place them in a cycle of low profitability.

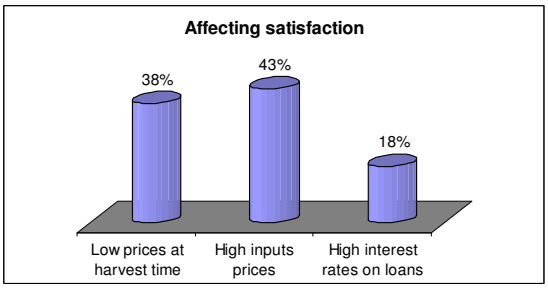


Figure 33: Affecting income satisfaction

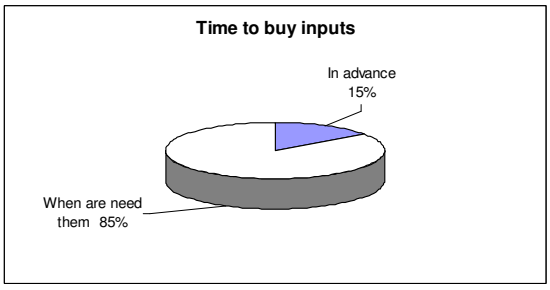


Figure 34: Farmers' decision to buy agricultural inputs

8.1.3 Financing Practices

Concerning financing practices 77% of the farmers indicated that they have a need for external financing while 23% answered that they are not in need of external financing. (Figure 35) Therefore, for the ones that are in need of external financing, they were asked how they solve their working capital needs. The answers were that 83% solve their working capital needs from the informal credit sector such as friends, family or elevator, while only 18% are able to solve their working capital needs through the formal sector such as banks. (Figure 36)

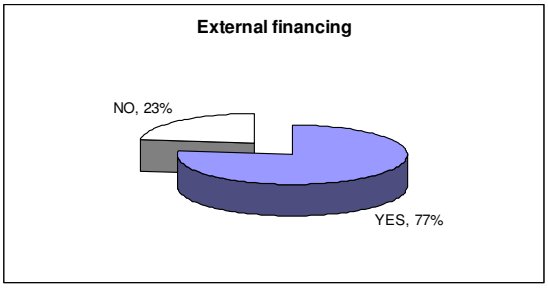


Figure 35: Farmers' need of external financing

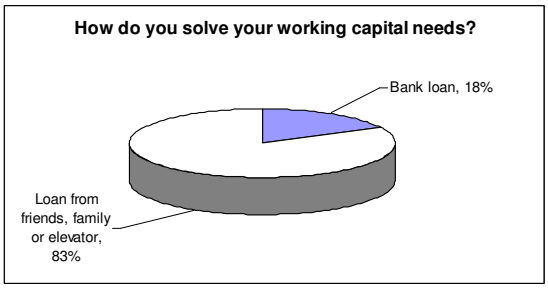


Figure 36: How farmers solve their working capital needs

Furthermore, when were asked if they have received credit from the Rural Financial Bank[10] then 71% reveal that they never received credit from the Rural Financial Bank while only 8% answered that they always have been receiving credit from that bank. (Figure 37) Besides that credit to the agricultural sector is restricted the Rural Financial Bank is fairly new that may be a reason of why farmers have not receive credit from that bank. Moreover farmers have experienced problems when applying for a loan from formal institutions. Those problems were awkward procedures, lack of collateral, high interest rates and previously indebted, with 44%, 29%, 25% and 1% respectively. (Figure 38) In addition, 47% of the farmers answered that they do not have enough collateral to offer to the bank, while 43% have plenty collateral to offer to the bank when applying asking for a loan.

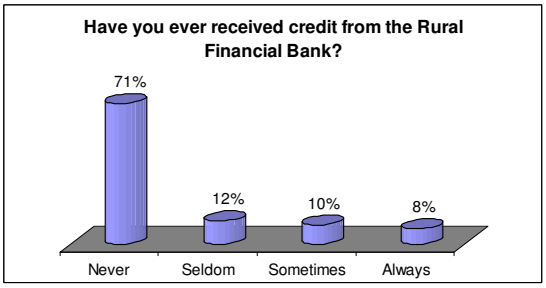


Figure 37: Farmers receiving credit from the Rural Financial Bank

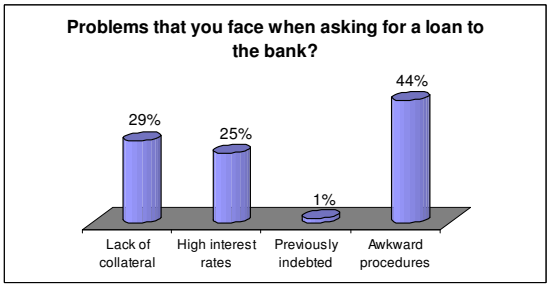


Figure 38: Problems faced by farmers when asking for a loan to the bank

Concerning collaterals, 96% of the farmers have never used their grain as collateral. (Figure 39) This fact may provide an interest for farmers to use a grain receipt system Therefore the 61% answered that the most desirable collateral for banks is the land were farmers grow their crops. (Figure 40) On the other hand some farmers are not able to use their land as collateral due legal constraints.

[10] The Rural Financial Bank is a well known bank in Mexico as "Financiera Rural" www.financierarural.gob.mx

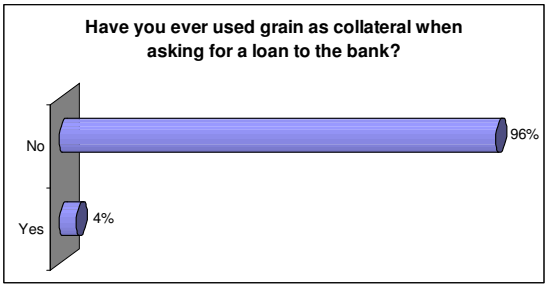


Figure 39: Have farmers ever used your grain as collateral?

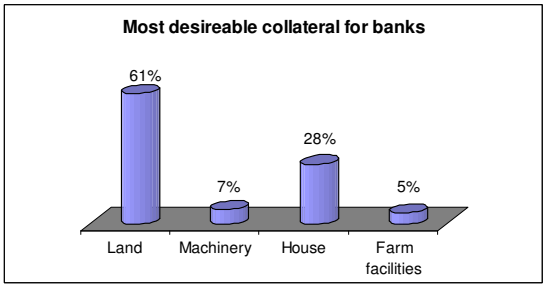


Figure 40: Desirable collateral for banks

Furthermore 49% of the farmers have to visit the bank more than 5 times before the loan is granted, while only 4% have to visit the bank only once. (Figure 41) When farmers where asked about an assessment of their assets value and the percentage of debt compared with their assets value, hence the maximum assets value was 12,000,000 Mexican pesos (MXN) (1,101,827 USD – 7,865,503 SEK – *FX rate Aug/05/2006*), the minimum was 40, 000 MXN (3,673 USD – 26,218 SEK) and the average was 3, 567, 000 MXN (327, 518 USD – 2,338,020 SEK). (Figure 42)

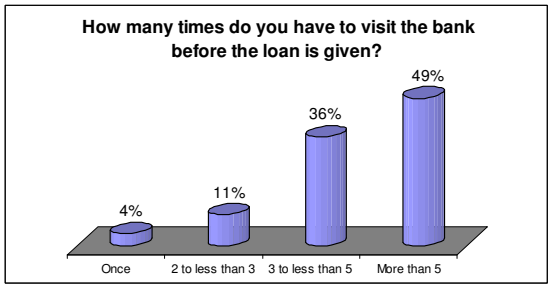


Figure 41: Times that farmers have to visit the bank before the loan is granted

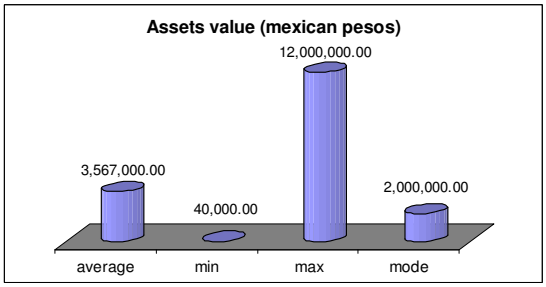


Figure 42: Farmers' estimated assets value

The percentage of debt obligation in relation to asset value indicated a maximum of 33%. The average was estimated to 24% with a minimum of was no debt at all. Hence the farmers are not over indebted compared to the estimated value of their assets. Moreover 85% of the farmers have always succeeded in fulfilling their debt obligations while the 10% have never repaid their loans and the remaining 5% sometimes have defaulted. In order to fulfill their working capital needs the farmers were asked if they are interested in using grain as collateral. Surprisingly 56% of the farmers are not interested while 46% showed some kind of interest. (Figure 43) In addition 42% of the farmers revealed a reasonable level of interest for hedging prices. (Figure 44)

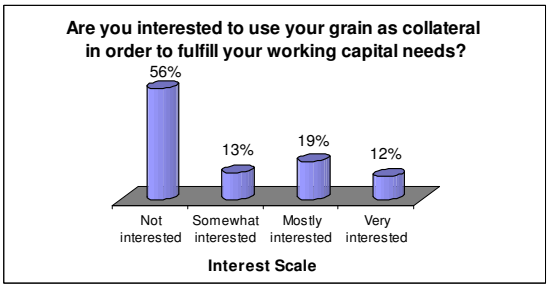


Figure 43: Farmers' interest in using their grain as collateral

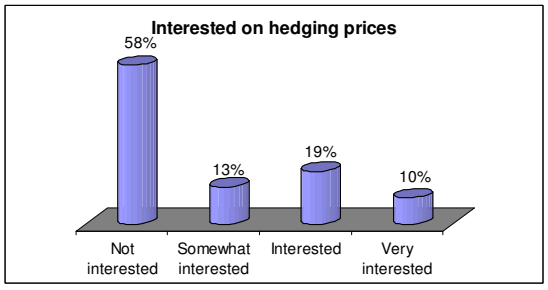


Figure 44: Farmers' interest in hedging

8.1.4 Perceptions of Grain Receipts

Regarding grain receipts and the associated mechanisms, 62% of the farmers are not interested in using different elevators, while 48% are somewhat interested. (Figure 45) The same behavior is observed in terms of paying storage cost and interest in hedging. (Figure 46)

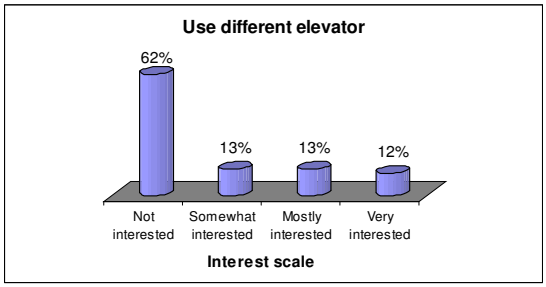


Figure 45: Farmers' perception in using different elevator

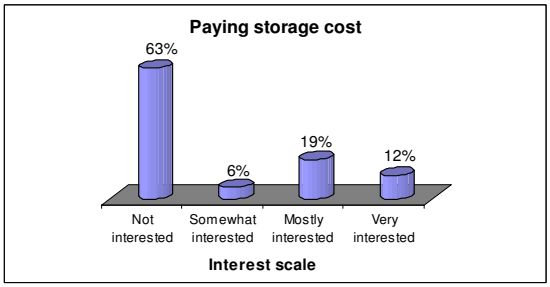


Figure 46: Farmers' interest in paying storage

Consequently, the farmers' interest in a Grain Receipt System is divided where 56% are not interested at all while 44% showed some level of interest. (Figure 47) On the other hand when farmers where asked if they were interested to improve their agricultural practices to improve grain quality, knowing that their grain could be used as collateral, 83% of the farmers are in someway interested while only 17% are not interested at all. (Figure 48)

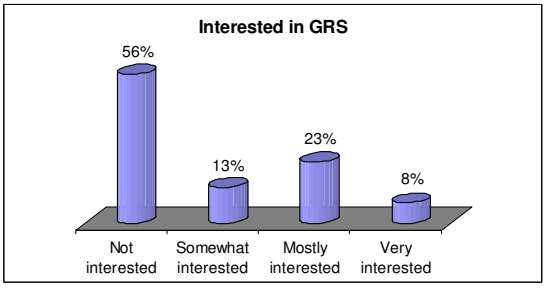


Figure 47: Farmers' interest in grain receipts

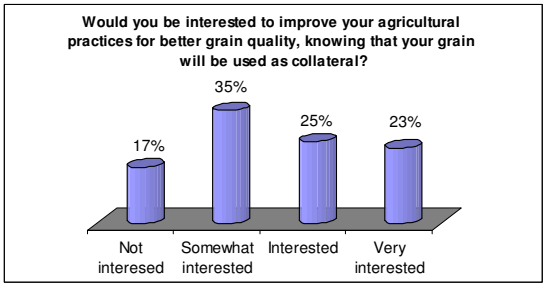


Figure 48: Farmers' interest to improve your agricultural practices

Moreover the farmers have to some extent foreseen some of the problems in a Grain Receipt System. The 31% perceived the problem of interest rates, a 30% awkward procedures, 26% risk of falling prices while 9% storage cost and 3% long distance for carry the grain. (Figure 49) Consequently 56% of the farmers do not consider a GRS as a risk management strategy but 52% of the farmers acknowledge that a GRS has benefits in the long run. (Figures 50, 51)

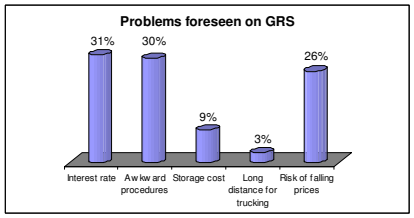


Figure 49: Problems that farmers foreseen on grain receipts

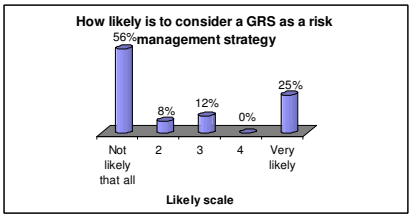


Figure 50: Farmers' perception of GRS as a grain management strategy

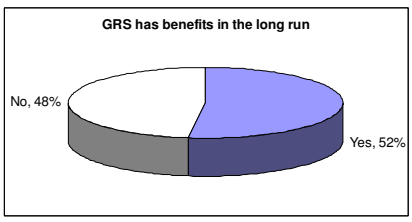


Figure 51: Farmers' perception on the benefits of GRS in the long run

8.2 Elevators

The elevators are located in the counties where the interviewed farmers come from. The answers are based on five counties 7 interviewed elevators out of 20 that are scattered into the areas of where corn is produced. Their storage capacity differs according to their capabilities. The storage capacity is on average 18,000 metric tons unit a minimum 8,000 and a maximum 45,000 metric tons capacity. The elevators represent a storage capacity of 126,000 metric tons. (Figure 52) Counting the storage capacity of the elevators with the corn yields of 7 tons per hectare, the elevators may have the capability to cover 18,000 hectares approximately which approximately is 4% of the total size of the Cienega region. The elevators play an important role among farmers due to the fact that most of them offer credit to the farmers. This may be the reason that some farmers do not have the willingness to select a new elevator due to the fact that the current elevator is providing him with financing (Figure 53)

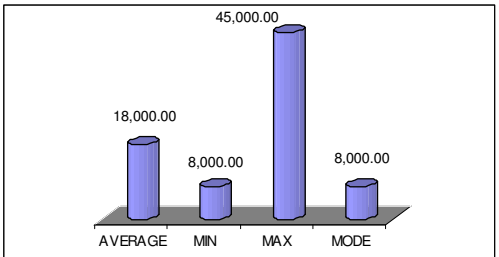


Figure 52: Elevators' Storage Capacity (metric tons)

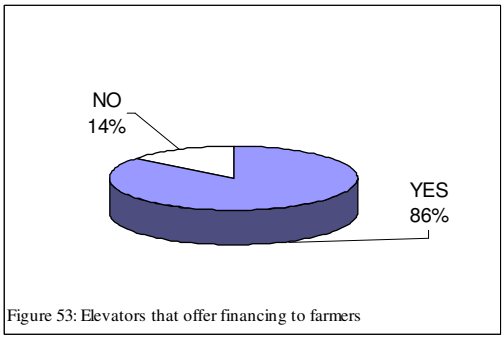


Figure 53: Elevators that offer financing to farmers

The elevators are indifferent to receive grain either from bigger scale farmers or from small scale farmers. Hence no decision making problem appears to affect to the selection of bigger or small scale farmers. On the other hand when the elevators are asked if they are interested in a GRS 57% are not interested at all while the remaining 43% are at to some extend level interested. (Figure: 54) This perception may be because the elevator currently has the bargaining power of take it or leave it to the farmers. In addition the elevator as a financial intermediary has the knowledge of the farmers that are more reliable. Therefore the elevator may not have the willingness to end the business relation with those farmers.

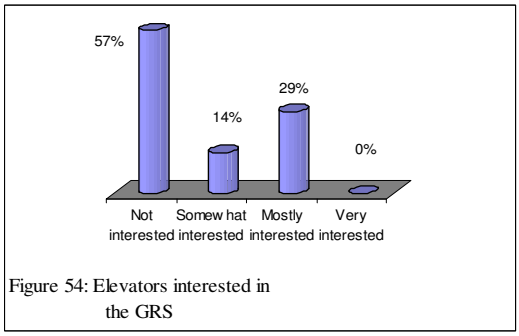


Figure 54: Elevators interested in the GRS

Of the elevators that express an interest in GRS most of them are interested to obtain a license to become a part of the GRS. (Figure 55) In addition 71% of the elevators are at some point interested in offering hedging services. (Figure 56) All the elevators are interested in issuing receipts that specify quality, quantity and place. Surprisingly all the elevators are interested in receiving inspections without previous announcement. The willingness of the elevators to be

inspected without previous announcement may show that currently the interviewed elevators may operate transparently. Besides all the elevators always apply quality standards, such as 14% of moisture in the grain at harvest time and corn with broken kernels or with foreign material is accepted but with penalties.

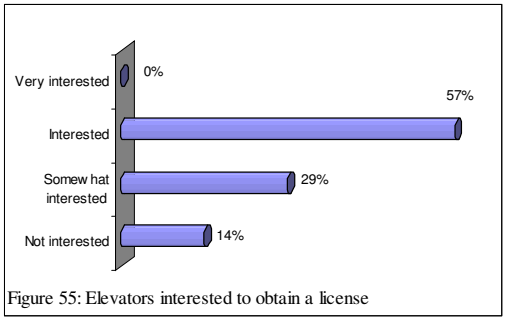


Figure 55: Elevators interested to obtain a license

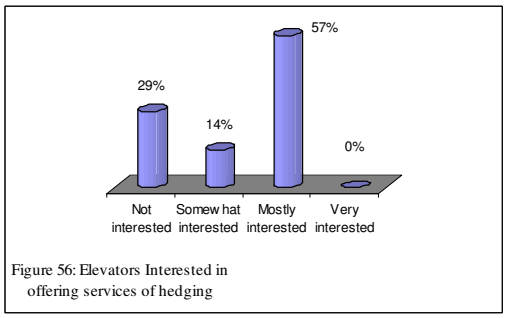


Figure 56: Elevators Interested in offering services of hedging

Regarding facilities and grain management, all the elevators store the grain in warehouses and besides 14% employ a temporal grain management in outdoor piles. All of the elevators have telephone, computers and moisture detector. (Figure 57) In addition, are interested to develop a database of farmers with information such as, yield per hectare, inputs used, and agricultural practices. Moreover 86% are likely to improve their grain management skills with a GRS and are interested to invest in the required equipment and also interested in being synchronized with the bank in order to provide information from farmers. In addition, all the elevators manifested at some point that is likely that farmers improve their agricultural practices within a GRS. (Figure 58)

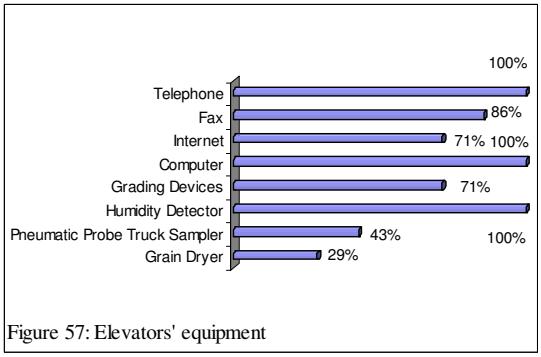


Figure 57: Elevators' equipment

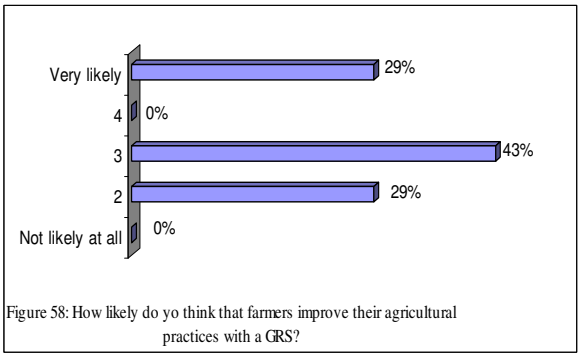


Figure 58: How likely do yo think that farmers improve their agricultural practices with a GRS?

8.3 Banks

The interviewed banks belong to the private and public sector which provides a broad picture on how financial intermediaries view a GRS. The public bank mainly focuses on development and as the principal it strives to accomplish the financial support for the agricultural sector and its financial support system that may be replicated by the private banks.

The private banks plan to increase lending to the agricultural sector, due to the facts provided by the interviewed banks the agricultural sector represents an important share for it income.

Out of the total of loan portfolio of the banks, only between 20% and 30% is destined to agricultural lending. However the repayment rate among farmers to banks is estimated between 90% and 100%. Therefore the banks label the farmers a moderate level of risk.

Regarding the GRS all of the banks are interested or very interested in participating in a GRS. In addition all of them are very satisfied with the grain as collateral. Moreover if the banks realize that is likely that the farmer defaults then the banks are owners of the grain. Hence for that case the banks are interested in hedging. It is more convenient that farmers hedge since they are the owners of the grain before due date of repayment and may have the commitment to meet their debt obligations. Hence if the bank plays the hedge, but the farmer does not default, then the bank is not hedging anymore is speculating which may not be convenient for the banks. Concerning the cost of monitoring the banks perceive that monitoring of farmers is likely to decrease within a GRS. In terms of establishing relationships with elevators in order to receive complete information regarding farmers' grain, the banks were at some point likely to consider this option. On the other hand when the banks were asked if they would like to invest in smart cards and install ATMs at the elevators to make it easier for farmers to get access to cash, none of the banks were willing to do it.

In addition, the banks view that with a GRS their skills in providing inventory credits will improve, because their staff becomes familiar with the system and enhances their knowledge by practicing. More importantly, the banks considered it as likely that with a GRS credits for farmers become more affordable since collateral is easy to trade and monitoring cost decrease. Moreover the banks are willing to lend 80% of the total value of the corn within a GRS keeping the remaining 20% as warranty to cover administrative cost or falling corn prices in case the farmer fail in meeting debt obligation. In addition the banks answered that the frequently imposed informational requirements from farmers when they borrow at the bank are; yields per hectare, not being previously indebted, inputs used and agricultural practices.

9 Analysis and Discussion

The following chapter addresses the questions stated in the problem formulation from chapter 1. Additionally the results and the theory will be connected and also applying the hypothesis mentioned in chapter 6.

9.1 Farmers

When farmers act as principals they are likely to accomplish improved access to financial support and to enhance their quality of life and financial perception. Hence it is important to examine if the farmers from the Cienega are a homogenous group regarding their financial perception, of the net income that they receive after marketing their crops. Therefore a test of homogeneity with a 5% of significance level was performed in order to test the null hypothesis (H_0) of the distribution of farmers with respect than financial perception, such as satisfaction or dissatisfaction, is similar across the counties of Ocotlan, Tototlan, Zapotlan de Rey and La Barca. The test is intended to examines the perception among farmers (Table 3)

The statements of hypothesis are; (H_0) the proportions of farmers that belong to each financial perception are the same in all counties. (H_1) The proportions of farmers that belong to each financial perception are not the same in all counties.

Table 3: Financial perception among the counties

	COUNTIES				
FINANCIAL SATISFACTION	**Ocotlan**	**Tototlan**	**Zapotlan del Rey**	**La Barca**	**Total**
Not satisfied	24	2	1	1	28
Satisfied	18	2	3	1	24
Total	42	4	4	2	52

Results	
Critical Value	7.814724703
Chi-Square Test Statistic	1.558673469
Degrees of Freedom	3
Level of Significance	0.05

The value of test statistics $\chi_2 = 1.5$ is less than the critical value of $\chi_2 = 7.8$ and falls in the non-rejection region. Hence we fail to reject the null hypothesis (H_0) and conclude that the distribution of farmers with respect to financial perceptions seems to be similar across the counties of Ocotlan, Tototlan, Zapotlan del Rey and La Barca. Therefore the farmers in the Cienega may be considered a homogenous group regarding financial satisfaction or dissatisfaction, according to the net income received.

9.1.1 Control Problem

The farmers' decision making of choosing an elevator for delivering the grain is mainly based on the highest offered price or be granted of financial support. Moreover the farmers face the problem of cheating, considered as one of the main problems when the grain is delivered. Even thought cheating is one of the main problems, 62% of the farmers are not interested to change elevator. In addition to the problem, only 6% of the farmers are not satisfied with the reputation of their current elevator. This behavior may be related with the fact that if a higher price is paid or if financial support is granted then cheating is forgiven. Thereby the farmers have the control problem due to the fact that they may become unwillingly attached to a specific elevator. The reason is that the farmers cannot freely decide where to deliver their grain because the elevator provides credit. Therefore the farmers feel forced to deliver their grain to that elevator even knowing that its reputation is not as good as they ideally would expect. Hence a hypothesis test is applied in order to examine if there is any association between the perceptions that farmers have concerning the elevators' reputation and the willingness to try new elevators. (Table 4)

Table 4: Relationship between elevators' reputation and willingness of try new elevator

	TRY NEW ELEVATOR		
ELEVATORS' REPUTATION	**Not Interested**	**Interested**	**Total**
Disappointed	2	2	4
Indifferent	27	14	41
Exceptional	3	4	7
Total	32	20	52

Results	
Critical Value	5.991476357
Chi-Square Test Statistic	1.579703833
Degrees of Freedom	2
Level of Significance	0.05

The null hypothesis (H_0) can not be rejected with a 5% level of significance. Consequently there is not statistically significant evidence since the value of test statistic $\chi_2 = 1.5$ is less than the critical value $\chi_2 = 5.9$ Hence, the result indicates that among farmers there is no association between the elevators' reputation and the tendency to try new elevators. Thereby the farmers are indifferent regarding elevators' reputation and may consider the business relation of financial support more important than elevators' reputation. Therefore the lack of financial support places the farmers in a vulnerable position where they are unwillingly accepting cheating in order to be granted of financial support. With a GRS the farmers may be unattached to a specific elevator since they can freely choose the most reliable elevator for delivering the grain.

9.1.2 Horizon Problem

The surveys reveal no horizon problem among the farmers. For instance 87% of the farmers are willing to improve their agricultural practices with a grain receipt system. Therefore a test of independence is conducted in order to examine if is any relation between years of experience and the willingness to invest in improvements of agricultural practices. (Table 5)

Table 5: Relationship between years growing corn and improving agricultural practices

	IMPROVING AGRICULTURAL PRACTICES		
YEARS GROWING CORN	**Not Interested**	**Interested**	**Total**
< 10	2	5	7
11 - 20	1	12	13
21 - 30	3	7	10
> 30	4	18	22
Total	10	42	52

Results	
Critical Value	7.814724703
Chi-Square Test Statistic	2.269734075
Degrees of Freedom	3
Level of Significance	0.05

There is no statistically significant evidence since the value of test statistic $\chi_2 = 2.2$ is less than the critical value $\chi_2 = 7.8$ Hence the null hypothesis is not rejected. Consequently there is no relation between years of growing corn and the willingness of improving agricultural practices. Hence for farmers the age is not a problem for improvements. Furthermore, no association is found between farmers' age and the financial needs. Either young or old farmers face financial needs. Moreover no association was found either between farmers' age and the perception of financial satisfaction according to the net income criterion.(Appendix 2)

Among the Cienega corn producers their financial satisfaction is adversely affected due to low corn prices at harvest time and high input prices. In terms of farmers' perception 46% are interested on using grain as collateral. Therefore, in order to analyze the impact of age diversity among farmers a test of statistical independence between age and interest expressed to use grain as collateral was conducted. The test reveals no association as well due to the fact that the value of test statistic $\chi_2 = 0.87$ is less than the critical value $\chi_2 = 7.8$ Hence the null hypothesis could not be rejected. Therefore for farmers their age not affect the willingness of using grain as collateral, thereby no horizon problem is present for farmers. (Table 6)

Table 6: Relationship between farmers' age and interest of using grain as collateral			
	GRAIN AS COLLATERAL		
FARMERS' AGE	**Not Interested**	**Interested**	**Total**
30 - 40	4	4	8
41 - 50	8	8	16
51 - 60	10	6	16
> 60	7	4	11
Total	29	22	51
Results			
Critical Value	7.814724703		
Chi-Square Test Statistic	0.873860074		
Degrees of Freedom	3		
Level of Significance	0.05		

In terms of the elevators as agents 86% of them indicate that they are likely to improve their grain management with a grain receipt system. In addition all of the interviewed elevators are willing to build a farmers database with information concerning, yields per hectare and inputs used since these information is required from banks to provide credit to farmers. Moreover 86% of the elevators are willing to be synchronized with a bank, providing information from farmers, and to conduct required investments in order to be a part of a grain receipt system. Therefore the elevators that agree with the concept of GRS are not facing horizon problem. Hence, for 46% of the farmers and for 43% of the elevators that that indicate that they are interested in a grain receipt system, the horizon problem does not appear to affect the feasibility of a GRS. On the other hand the remaining part of farmers and elevators are simply not being interested in joining the system. The lack of interest of using the grain as collateral may be related to the desperate need of cash after harvest and receiving the total market value of the corn and not a percentage as is mentioned in the GRS.

9.1.3 Portfolio Problem

Most of the farmers are involved in the cash market since 93% of the farmers deliver the grain right after harvest to the elevators. Furthermore besides growing corn 73% of the farmers diversify their agricultural activities with livestock and the remaining 27% produce only corn. Hence the farmers that produce only one crop are facing more risk since they only depend of the income of growing corn and are not able to diversify. Regarding the farmers that operate livestock, 42% allocate less than 5 hectares for grazing but only 7% store grain for livestock feeding. The reason that most of the farmers are involved in the cash market and delivering the grain right after harvest may be related to the desperate need of cash. Since most of the farmers allocate their income to pay debt obligations, therefore they are not able to buy inputs in advance. Therefore the farmers are not satisfied since the inputs are too costly and grain prices are low.

Despite the fact that most of the farmers diversify their agricultural activities through livestock it is not enough to improve their income due to the fact that they usually sell the grain when prices usually are the lowest. Therefore when they need grain to feed their livestock they may have to buy the grain at a higher price compared to when they sold it. This situation causes the farmers to either buy the grain at a higher price or to feed their livestock with a poor feed ration. Therefore irrespectively of the selection the farmers are adversely affected. Hence the current situation of lack of facilities to store the grain and not being able manage price risk place the farmers in a portfolio problem.

A way to mitigate risk is with a grain receipt system since 46% of the farmers consider the GRS as a risk management strategy and 42% are interested in hedging while the grain is stored. Therefore a test is conducted between farmers that have livestock and express an interest in hedging. (Table 7)

Table 7: Relationship between farmers' interest in hedging and having livestock

	LIVESTOCK		
HEDGING	**No**	**Yes**	**Total**
Not Interested	5	25	30
Interested	10	12	22
Total	15	37	52
Results			
Critical Value	3.841455338		
Chi-Square Test Statistic	5.124761125		
Degrees of Freedom	1		
Level of Significance	0.05		

According to the results the test statistic of $\chi_2 = 5.12$ exceeds the critical value of $\chi_2 = 3.84$ Hence the null hypothesis is rejected and there appears to exist an association between farmers that have livestock and the interest in hedging. This may be related because farmers that have livestock face the future need to buy grain to feed their livestock at higher price. In addition, a positive relationship is found in the interest in hedging and interest in using grain as collateral (Table 8)

Table 8: Relationship between interested in hedging and interested in using grain as collateral

	GRAIN AS COLLATERAL		
HEDGING	**Not Interested**	**Interested**	**Total**
Not Interested	21	9	30
Interested	8	14	22
Total	29	23	52
Results			
Critical Value	*3.841455338*		
Chi-Square Test Statistic	*5.821561946*		
Degrees of Freedom	*1*		
Level of Significance	*0.05*		

The results from the test statistic of $\chi_2 = 5.82$ exceeds the critical value of $\chi_2 = 3.84$ Hence the null hypothesis is rejected and there appears to exist an association between the interest of hedging and using grain as collateral. This may be explained because the farmers that want to use their grain as collateral are interested in hedging corn prices to mitigate the risk of falling prices and being able to fulfill debt obligations from the loan granted. In addition a positive relation between interested in hedging and willingness to pay storage costs. (Table 9)

Table 9: Relationship between hedging and willingness to pay storage cost

	STORAGE COST		
HEDGING	**Not Interested**	**Interested**	**Total**
Not Interested	28	2	30
Interested	6	16	22
Total	34	18	52
Results			
Critical Value	*3.841455338*		
Chi-Square Test Statistic	*24.47264805*		
Degrees of Freedom	*1*		
Level of Significance	*0.05*		

According to the results the test statistic of $\chi_2 = 24.47$ exceeds the critical value of $\chi_2 = 3.84$ Hence the null hypothesis is rejected and there appears to exist an association between interest of hedging and willingness to pay storage cost. Hence the farmers that are interested in hedging are willing to pay storage cost which means that farmers are acquainted with the carrying charges involved in the grain receipt system. Consequently a positive relation between hedging and considering GRS as a risk management strategy. (Table 10)

Table 10: Relationship between GRS as a risk management strategy and interested in hedging

	Interested in Hedging		
Grain Receipts as a Risk Strategy	**Not Interested**	**Interested**	**Total**
Not Considered	25	3	28
Considered	5	19	24
Total	30	22	52
Results			
Critical Value	*3.841455338*		
Chi-Square Test Statistic	*24.80880231*		
Degrees of Freedom	*1*		
Level of Significance	*0.05*		

According to the results the test statistic of $\chi_2 = 24.80$ exceeds the critical value of $\chi_2 = 3.84$ Hence the null hypothesis is rejected and there appears to exist an association between the consideration of GRS as a risk management strategy and interest in hedging. Hence the farmers that are interested in hedging are acquainted with the GRS as a method of manage the

risk of falling prices. Furthermore the interest in hedging may be related to the uncertainty that farmers face each season when they do not know the price of the corn. These positive relations may be related because farmers face the need to cover risk exposure on corn prices since low prices is one of the problems that affect adversely their financial perception.

On the other hand no association was found between financial satisfactions and yields. (Appendix 3) For these farmers the desire yield level does not have an impact on financial satisfaction due to the fact that the Cienega province is considered the most productive area in the state of Jalisco regarding corn production. Therefore the farmers are more concerned of the price of the corn and high input prices rather than yields since they know that their yields are higher compared to other areas of Mexico. Another reason could be that they may be previously indebted from the informal sector which locks them in a low profitability cycle. Moreover no association was found either between financial satisfaction and paying storage services. The financial perception and interest in paying storage services are not related may be because farmers may be convinced about the benefits of the GRS. Therefore their financial dissatisfaction is not a constraint to cover the storage cost.

In addition a test is conducted between size of the farm and farmers' interest in hedging. According to the results the test statistic $\chi_2 = 1.46$ is less than the critical value $\chi_2 = 3.84$ Hence, the null hypothesis can not be rejected. Therefore the size of the farm and farmers' interest in hedging appears not to be related. Even though big size farmers are commonly taken for granted to use risk management strategies more extensively, since they are exposed to big losses. For big size corn producers from the Cienega province, the fact that they are not related with the interest of hedging may be because currently hedging is not generally used. Therefore large farms have not been able to grasp hedging benefits. On the other hand the farmers interested in the GRS are also interested in hedging since with a GRS the farmers become aware of cover price risk exposure. (Table 11)

Table 11: Relationship between the size of the farm and farmers' interest in hedging

Observed Frequencies			
	Interested in Hedging		
Hectares planted	**No interested**	**Interested**	**Total**
< 15	20	11	31
> 15	10	11	21
Total	30	22	52
Results			
Critical Value	3.841455338		
Chi-Square Test Statistic	1.464413722		
Degrees of Freedom	1		
Level of Significance	0.05		

Therefore the portfolio problem seems to be reduced when introducing the grain receipt system since the system fosters the use of hedging strategies when corn is stored. Furthermore, 71% of the elevators are interested at some point in offering hedging services or information about hedging methods. It is important to notice that with a grain receipt system

the risk is not eliminated. Instead, the risk is just to be shared to a larger extent between the stakeholders in order to facilitate financing to farmers and to reduce income variation.

9.1.4 Decision Making Problem

Farmers face low prices as price takers since they sell grain at the offered price. Cheating is one of the major problems they face when they deliver the grain to an elevator. Low price is an effect of surplus of corn at harvest time and low international prices among others. Cheating is difficult to control by the farmers. Although cheating is mentioned as one of the main problems, only 10% of the farmers are not satisfied with elevators' quality measurements. The decision by farmers to deliver their grain appears to be mainly based on the fact that the elevator is able to provide financial support. Therefore, if financial support is granted then cheating seems to be forgiven to some extent. Hence a grain receipt system may release the farmers from a cycle of financial support and forgiveness of cheating. One explanation is that with a GRS the elevator will only provide storage services and grain handling and has no legal interest in the grain unless it is actually sold to the elevator at a subsequent period of time. Consequently, with a GRS the farmers' decision problem in selecting an elevator is reduced and therefore they are able to move freely to choose an elevator that appears reliable.

9.2 Banks

The banks play a crucial role for the success of a GRS. They integrate the farmers into the formal credit sector where the need for a functioning legal environment is obvious. Therefore, farmers steadily decrease the dependency on the informal credit sector such as landlords, elevators, moneylenders, processors or friends.

9.2.1 Control Problem

Currently 83% of the interviewed corn producers, receive financial support from the informal credit sector. Moreover 71% of the corn producers have never received credit from the Rural Financial Bank, even though this bank is commonly known as the major provider of financial support for the agricultural sector. Consequently many corn producers lack credit history, hence the monitoring costs for the banks increase once the bank granted a credit to the corn producers. Therefore the banks face a control problem due to the asymmetric information among the bank and the corn producers. Additionally the farmers consider the credit procedures in the formal credit sector as awkward and time consuming. This may be related to the fact that they have to visit the bank several times before the loan is granted accentuates the control problem. Hence from data from farmers a test is conducted in order to examine if there exists an association between the size of the farm and the number of times that they have to visit the bank. (Table 12)

Table 12: Hectares used to grow corn & Visit the Bank				
	VISIT THE BANK			
HECTARES FOR GROWING CORN	**< 3 Times**	**3 - 5**	**> 5 Times**	**Total**
5 - 15	2	8	9	19
16 - 30	3	3	4	10
> 30	2	6	10	18
Total	7	17	23	47
Results				
Critical Value	9.487728465			
Chi-Square Test Statistic	2.61268773			
Degrees of Freedom	4			
Level of Significance	0.05			

According to the results the test statistic of $\chi^2 = 2.61$ is less than the critical value of $\chi^2 = 9.48$ therefore the null hypothesis cannot be rejected. Consequently, no relationship appears to exist between the size of the farm and the number of times that the farmers are required to visit the bank. This result may be explained by the fact that for the bank the size is not a critical criterion. Instead the size of the farm, the bank may focus on legal tenancy of the land and other legal procedures. Moreover, the frequently asked requirements by the banks are; yields per hectare, not being previously indebted, agricultural inputs used and agricultural practices. In addition, legal tenancy of the land represents information required by the farmer who may not be able to keep record of their agricultural practices. Besides, the farmers obviously have to fill in the official documents such as contract and legal forms. Considering that most of the farmers only have elementary education it is not likely that they feel motivated to visit the bank and fill in all the legal documents that are required for a loan. For these reasons the farmers consider the procedures as awkward and time-consuming.

Hence the GRS provides a more friendly way to stimulate farmers to integrate into to the formal credit sector. Moreover the banks consider at some point of time to work together with elevators, who will provide the information that the banks require. Since elevators are well acquainted with the farmers, therefore it is easier for them to process the legal documents. This is one of the reasons why it is relatively easy for the elevator to get information from farmers. Therefore a test is conducted between elevators reputation and interest in the GRS from the farmers' perspective since elevators may gather the required information for the banks and to notice if the reputation of the elevators is affecting the farmers' interest of the GRS. (Table 13)

Table 13: Elevators Reputation & Interested in GRS			
	Interested in GRS		
Elevators Reputation	**Not Interested**	**Interested**	**Total**
Not Satisfied	1	3	4
Satisfied	28	20	48
Total	29	23	52
Results			
Critical Value	3.841455338		
Chi-Square Test Statistic	1.663168416		
Degrees of Freedom	1		
Level of Significance	0.05		

According to the results the test statistic of $\chi_2 = 1.66$ is less than the critical value of $\chi_2 = 3.84$ therefore the null hypothesis cannot be rejected. Consequently, no relationship appears to exist between the reputation of the elevators and the interest of GRS. Hence for farmers the reputation of the elevators not affect their interest in the GRS. Therefore the farmers may be indifferent with the elevators regarding the joint forces between the bank and the elevators.

Hence, the banks perceive that monitoring costs will decrease with the grain receipt concept. Additionally, the banks expect that their skills in managing credits will improve with a GRS since its staff will become familiar with grain as collateral. Therefore the grain receipt system seems to mitigate the control problem. Because the asymmetric information with the bank as the principal and the farmers as the agents will be reduced, since that the bank only has to monitor a few elevators instead of hundreds of farmers.

9.2.2 Portfolio Problem

Currently the interviewed banks face 10% of the farmers that default on repayments. Moreover the banks are constrained to provide credit due to the lack of trustworthy collaterals. Hence the banks have a portfolio problem due to the fact that farmers default on their loans granted. The grain receipts provide a foundation for using the grain as secure collateral and tools such as hedging of price risk and facilitating access to loans for farmers. Moreover the interviewed banks are satisfied with grain as collateral. Therefore, tests of possible dependence are conducted to notice if farmers with livestock have an influence on the tendency to use grain as collateral. However, data from farmers suggest that no statistically significant relationship is found between the interest in using grain as collateral and having livestock. Therefore the fact that farmers have livestock or not is not related to their view on using grain as collateral. Also, no association was found between the variables of using grain as collateral and yields. Therefore the variability in yields that farmers face each growing season is not associated with the interest in using grain as collateral. Irrespecitve of high or low yields farmers may be interested in using grain as collateral. (Appendix 4)

Furthermore the respondents perceive that with a GRS the credits to farmers are more affordable because the collateral is easy to trade and the monitoring costs decrease. Consequently, the interviewed banks are interested in stimulating hedging during the period that the corn is stored due to the fact that they are the virtual owners until the loan is paid. The fact that the respondents appear to be interested in hedging until the loan is paid may place the banks in a position as speculators, because if farmers meet debt obligations the bank is no longer the owner of the grain. Therefore it is more convenient that the farmers hedge. Therefore hedging may become a requirement for farmers. Regarding the amount of credit to be granted, the banks are willing to lend 80% of the market value of the corn and the remaining 20% to handle the risk of falling corn prices the banks. On the other hand a loan may be granted for the 100% of the market value of the grain, because the price of the grain is already locked in through hedging. Thereby, the GRS tend to enhance the percentage of the loan granted since secure collateral is offered and the bank knows by certainty that the repayment of the loan will be fulfilled even if the farmer fails. Hence the GRS mitigate the portfolio and the bank may decrease the percentage of default on loan repayments and increase their loan portfolio to agricultural lending since secure collateral is provided.

9.2.3 Horizon Problem

With the GRS the banks require trained staff, invest in information technology systems and distribute ATMs to the elevators in order to make access to cash easier. Such investments cause a horizon problem. Because the bank as the principal has less incentives in investing in smart cards and to distribute ATMs among elevators for the benefit of the farmers. For banks agricultural lending just represents the 20% to 30% of their total lending. Moreover, the banks consider the farmers at some point as risky in terms of fulfilling debt obligations. Therefore, all the banks considered the allocation of ATMs among elevators as an overinvestment. The development of smart cards and the lack of internet services within elevators is another constraint for the GRS. Hence the horizon problem adversely affects the feasibility of grain receipts considerably given the resistance towards the smart card concept and allocation of ATMs at elevators. The banks prefer to pay by check instead of using the smart cards concept.

9.3 Benefits of the Grain Receipts for the Cienega

The corn producers from the province of the Cienega share the perception that their finances are adversely affected by high production costs and low corn prices. Hence the farmers face the cycle of low profitability and agency problems. (Figure 59)

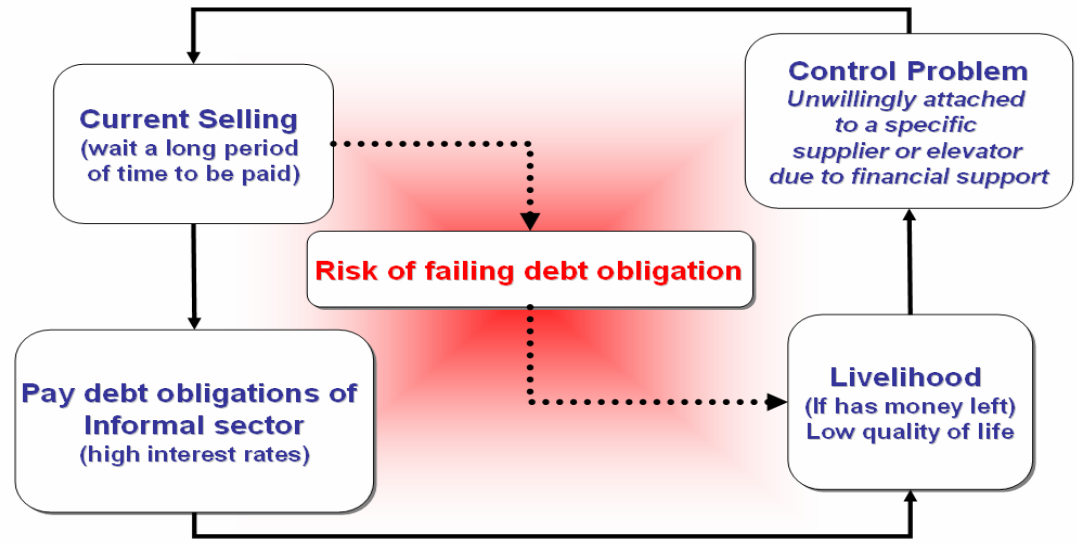


Figure 59: The Cycle of Low Profitability Author's Own

The GRS provides a method to unlock the farmers from the low profitability cycle and mitigate agency problems. The control problem of the farmers is reduced since the operations of the elevator become more transparent and they are less able to cheat thereby reducing the asymmetric information between the relationship of farmer and elevator. Although the farmers are indifferent to elevators reputation since they are more concern to be provided of financial support. Moreover, the willingness of issue receipts with the information required reduces the control problem. In addition all the elevators agree to receive inspections without previous announcement. Regarding the monitoring costs, the banks perceive a decrease in monitoring since with a GRS the banks have to monitor a few elevators instead of hundreds of farmers. Therefore the grain receipt system appears to mitigate the control problem that farmers face with the elevators and providing freedom to the farmer to select different elevators. Moreover the control problem of the bank is reduced as well since the asymmetric information between the relationship with the bank and the farmers is reduced due to the interaction of sharing information from the elevator to the bank.

For the farmers, horizon problem do not exist. This may contribute to the acceptance of the GRS due to the fact that diversity among farmers in terms of age and size of the farm may not affect the attitude towards a grain receipt system. Moreover, farmers have willingness to invest and innovate considering that they have been growing corn since 30 years or more. Hence these farmers may be disposed to do what is necessary in order to improve their economic situation. On the other hand the interviewed banks face the horizon problem due to

the fact that they consider as an overinvestment new information technology systems. Therefore the GRS is at some point affected by the horizon problem of the banks.

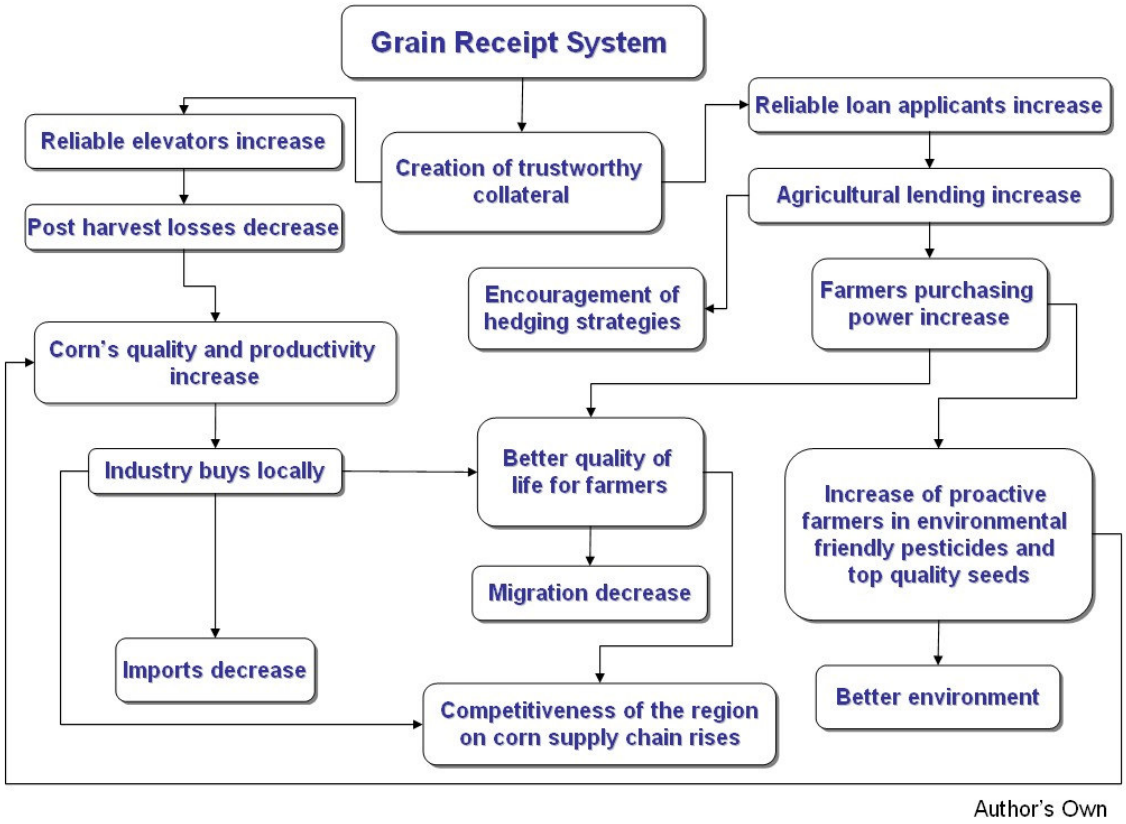
The grain receipt system appears to mitigate portfolio problem. The system fosters the use of hedging strategies for price risk when corn is stored. Farmers that only grow one crop and do not posses livestock are able to manage the risk in a better way. In addition, the GRS provides a more friendly way to engage farmers to integrate into to the formal credit sector since the banks are satisfy with the grain as collateral.

The surveys reveal how the farmers are adversely affected because of the lack of purchasing power, since they are not able to buy inputs in advance. Consequently they cannot afford high quality inputs such as, environmentally friendly pesticides and top quality hybrid seeds. Consequently, the farmers feel forced to ask for credit to the informal credit sector. This places the farmers in a hazardous position with high interest rates, weak legislation in the informal credit sector and the untrustworthy relationship between the farmers and the elevator.

Suppliers of agricultural inputs such as pesticides, seeds and fertilizers are affected in their sales because of the lack of purchasing power from the farmers. Therefore the suppliers feel forced to market cheaper inputs that the farmers can afford even if their yields and the environment are negatively affected. Moreover, the suppliers may become a financial intermediary to the farmers by providing them credits that should be repaid when farmers harvest the crop. These credits include high interest rates, which increase the prices of pesticides, seeds and fertilizers. On the other hand the supplier should wait until the farmer receives the payment for the crop to fulfill debt obligations. But if the farmer has to wait until he is paid for his grain, then high interest rates affect the returns negatively. This places the suppliers in risk because the farmer may not fulfill his debt obligation. The farmer may prefer to allocate the income for his livelihood rather than to fulfill debt obligations. Hence, a cycle of debt is enacted which ultimately may end in a cycle of low profitability or poverty.

Elevators are negatively affected since grain may be poor quality because of low quality seeds or poor agricultural practices. In addition, elevators become financial intermediaries to the farmer. The elevator can cover a given loan with grain that the farmer delivers to the facilities. But if the grain is of poor quality the elevator has to find an alternative market which considerably decreases the value of the grain. In addition the farmer may wait long periods of time in order to be paid because the elevator may be short of cash. Hence, the income of the farmer is negatively affected because the price he receives is when he delivered the grain and not when he is paid. The buyers or processors of grain are affected due to a lack of reliable suppliers, low productivity or low quality of the grain. Therefore the processors may have to find an alternative way to fulfill its demand and may import the grain which may increase production costs. The demand for corn is covered by supplies from the international market and not by the local farmer, who needs a livelihood.

Moreover the quality of corn improves and the processors and livestock feeders will buy the grain locally. Hence, imports decreases and competitiveness within the corn supply chain is enhanced. In addition the farmer will improve his quality of life. Consequently the farmers may feel less forced to migrate to the USA or move to urban areas. Farmers also have a better position to adjust with the full liberalization of corn market due to NAFTA. For the elevators the problems of being short of cash will be reduced, because they will not buy the grain at the time of harvest. They will only provide storage and handling services within the concept of GRS. Furthermore the storage infrastructure improves, and post harvest losses decrease. Licensed elevators have to operate transparently therefore, becoming reliable elevators in the region for the corn supply chain. (Figure 60)



Author's Own

Figure 60: Grain Receipt System Effects on the Cienega Region

The cycle of low profitability place the farmer in a low quality of life and their surroundings are placed in an uncompetitive environment. Therefore the GRS contributes towards unlocking the farmers from the cycle of low profitability and mitigate agency problems. (Figure 61)

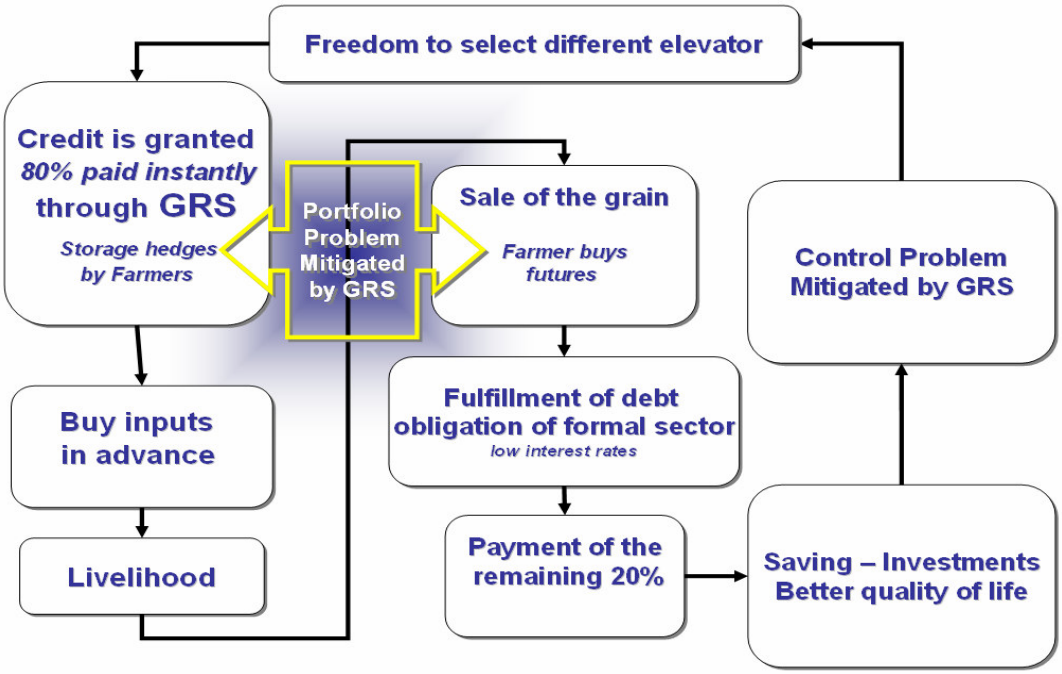


Figure 61: Breaking the Cycle of Low Profitability

The farmer wants a reliable elevator where he can deliver grain. The bank desires a reliable loan applicant that is able to fulfill debt obligations. The effects of the GRS in the Cienega province integrate the farmers that lack credit history in the formal credit sector. The risk of lending to farmers decreases due to the fact that the corn acts as trustworthy collateral. The competitiveness improves due to cost reduction, since the farmers are able to buy top quality inputs at lower prices. Hence, the farmer may become proactive and search for environmentally friendly pesticides.

9.4 Application of Grain Receipts in the Cienega

Access to financing for the agricultural firm is often difficult. Particularly for small farmers the credit procedures are both time-consuming and awkward. Therefore many farmers are not able to provide the documents that the banks require. Hence it is important to have an easy credit system to follow in the Cienega where farmers can get access to credit without awkward and time-consuming procedures. Nowadays, information technology (IT) systems, such as internet and smart cards, may help to decrease transaction costs and together with governments as providers of legislative environments. In the Cienega region about 95% of the corn producers have smart cards[11] such as DIESEL[12] and PROCAMPO[13]. However such a

[11] Smart cards are used to get subsidizes from the Mexican Government.
[12] Diesel Smart card is used in gas stations to receive discounts on diesel

credit system is not constrained only for the use of DIESEL or PROCAMPO's smart cards. The banks together with the elevators may produce a new kind of smart card to the farmers, for the use of the grain receipt system. With a new kind of smart card the farmers will not be constrained to DIESEL or PROCAMPO cards.

9.4.1 Backup Plan

A backup plan should be implemented by the government since weather fatalities may happen or situations that are out of reach for the banks, farmers, elevators or industry. The Mexican Government may use the Natural Disaster Fund Program (FONDEN) to protect the scheme of financing by grain receipts.

9.4.2 Monitoring

Monitoring licensed elevators may be conducted by the Mexican government authorities, such as ASERCA[14], PROFECO[15], SAGARPA[16], or Jalisco's Agricultural Department. Those departments may monitor the elevator that is acting as the agent. Consequently the farmer as the principal will not have to monitor the agent's behavior, which reduces the principal's agency cost.

9.4.3 Information System

Governmental agencies such as ASERCA, SIAP[17] and SNIIM[18] may provide the information about grain prices for a better decision making among farmers, elevators and banks.

9.4.4 Grain Elevators

Those elevators should be licensed for the grain receipt system, advised and certified on grain management by private companies such as ALMER[19]. Currently there are in the Cienega region 50 elevators spread all over the region providing a bridge between corn producers and processors. (Appendix 5)

9.4.5 How the Hypothetical Model may Operate

The involvement of the banks in the elevators' licensing process is important and previous agreements between the elevator and the bank should be accommodated. Therefore the bank provides the proper technology to the elevator for data collection and registration with the help of smart cards (Figure 62)

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[13] Smart card used to receive cash subsidizes based on hectares planted www.procampo.gob.mx
[14] Trading Support Services for Livestock and Agriculture – ASERCA www.infoaserca.gob.mx
[15] Customer Protection Agency – PROFECO www.profeco.gob.mx
[16] Agricultural, Livestock, Rural Development, Food and Fisheries Department - SAGARPA
[17] Information System on Agriculture, Food and Fisheries – SIAP www.siap.sagarpa.gob.mx
[18] Market Information Systems – SNIIM www.economia-sniim.gob.mx
[19] ALMER private company specialized on grain management www.almer.com.mx

1. The bank installs the ATM either in the elevator facilities or near to farmers, i.e. in rural communities.

2. The farmer delivers the grain to the licensed elevator. The elevator registers information details of the grain on the smart card (PROCAMPO or DIESEL) such as quality, quantity, location and the quantity of money that the farmer is able to withdraw from the ATM, which could be 80% of the total estimated market value of the grain, according to the bank's policy.

3. The farmer goes to the ATM to withdraw money. The smart card is inserted and the ATM informs the farmer about the maximum credit that he may receive.

4. Prior to selling grain, the farmer consults with the bank. The farmer sells the grain to processors or livestock feeders at the most suitable time or at due date of the repayment. The buyer makes an electronic transaction to the elevator; hence the elevator covers its storage services and makes a transfer of the remaining amount to the bank.

5. Once the loan is paid the bank transfer the remaining amount to the farmer. This cash may be taken out from the ATM.

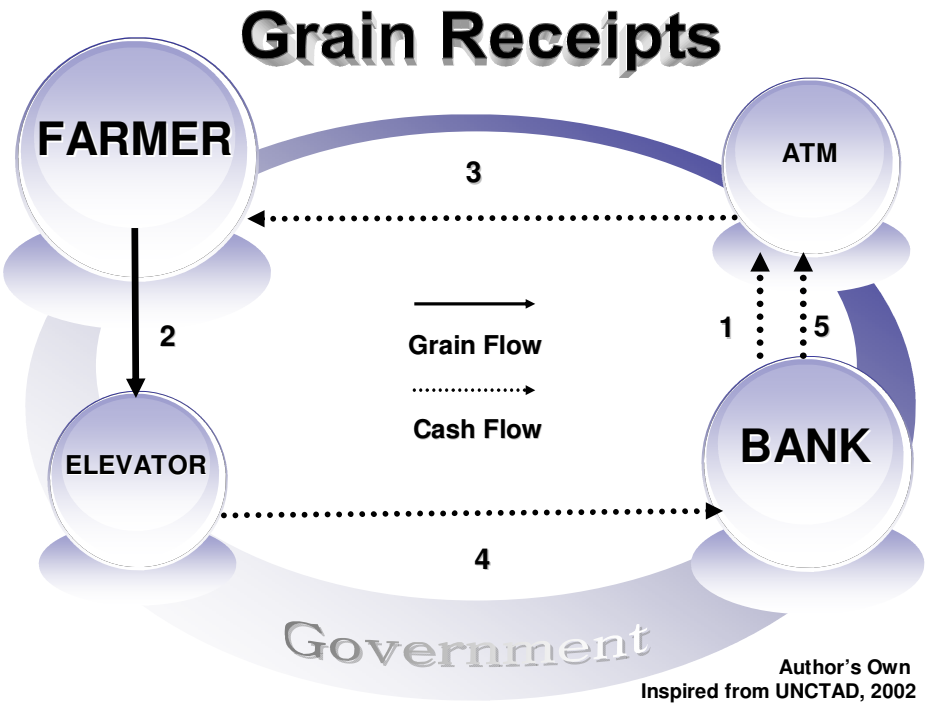

Figure 62: Grain Receipts Model for the Cienega

10 Conclusions

In the Cienega region corn producers are a homogenous group regarding their subjective perception of their net income from grain. The majority of the farmers are not satisfied with their income. Their explanations are high inputs prices, low corn prices, lack of credit and high interest rates. The GRS is likely to reduce several of those problems due to the fact that credits will be provided, inputs could be purchased in advance and corn prices could be hedged. Moreover awkward lending procedures will be eliminated, engaging the farmers to be a part of the formal credit sector.

The GRS is feasible for the Cienega region but perhaps not in the way originally proposed. One reason is the banks as principal are exposed to the horizon problem and are not willing to invest in smart cards and/or allocate ATMs among the elevators facilities. The banks perceive that such investments do not pay off. Hence the banks prefer that the farmers are paid by check and force them to visit the bank to complete the formal procedures, which are considered as awkward by farmers. Thereby, it remains a strong disincentive in the short run, since according to the interviewed banks; the farmers and elevators will not be familiar with the system which may contribute towards operational problems. More importantly is that 44% and 43% of the farmers and the elevators respectively, agree with the idea of the GRS in the way it was proposed. In addition, farmers do not face horizon problems and portfolio and control problems are mitigated by the GRS. For the interviewed banks, even if all of them favor the proposal of the GRS, they disagreed with the smart card and the ATM concept. The bank may have a short term perspective and do not realize that if this concept is replicated in the rural areas, the rural communities represent close to 25 million people. Those people need the access to financial support without awkward procedures in order to improve their quality of life. But private banks are profit oriented. Therefore social development may not be their most important priority.

Besides the need of financial credit the Cienga's corn producers face the opening of markets. The ones that grasp the benefits from the free trade agreements are mainly the Mexican producers of fruits and vegetables. Hence, the Cienega's corn producers nowadays are fending for themselves when exposed to fierce competition from the USA. For the Cienega's corn producers a switch from corn to fruits and vegetables is complicated since most of those farmers have been growing corn for more than 30 years. The production of corn is part of their specialization and lifestyle. Therefore it is not likely that the region with the highest yields on corn in Mexico during the spring, will change of agricultural practices from one day to another, or era be feasible. In addition, the Cienega is a region where production is mainly under rain-fed conditions. Therefore the lack of irrigation systems and infrastructure are evident and represent a constraint for the production of fruits and vegetables. Consequently what is more feasible for Cienega's corn producers: providing the irrigation systems, infrastructure and training to fruits and vegetables production or to facilitate financial support to specialized corn producers and their current infrastructure to the benefit of the corn supply chain?

The results of this study reveal that there is a need for the development of a strong financial support program for Cienega corn producers. Such program should include information technologies that decrease the transaction costs and improve the data management. Thereby, farmers just need to get access to new technologies such as smart cards in this case. It may be just a matter of time before the farmers get used to such a new system. Nowadays the Cienega's corn producers are quite familiar with smart cards, which are used to receive a price discount on diesel. Therefore the real challenge is not really the farmers' familiarization with information technology. The real challenge is to find banks that are interested in developing a system which is easy to accommodate by the farmers of the Cienega.

10.1 Suggestions for Further Studies

There is a need to conduct a study that examines to what extent the application of the GRS is financially feasible. The study ought to include: the impact on corn production cost, storage cost, forecasting of corn prices, interest rates and the cost of hedging. Furthermore an analysis could be made of welfare economic effects of the Mexican government providing subsidies to the Cienega's corn producers. These subsidies may cover the storage cost and hedging, thereby making the GRS more affordable and profitable for corn producers. Hence a financial study should include two scenarios with and without subsidies. Moreover a financial study could be made in order for the banks to realize that the investment in smart cards and allocation of ATMs may actually pay off in the long run and be justified privately as well as from a social economic perspective. This could be of interest since the proposed grain receipt system is constrained by a horizon problem originating in the banks.

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Appendix 1

FARMERS' SURVEY

Date: *month* _____ *day*_____ *year* _____ **Survey code:**_____

Name: (*optional*)

How old are you?

- ☐ 30 – 40
- ☐ 41 – 50
- ☐ 51 – 60
- ☐ above of 60

How long have you been growing corn?

- ☐ less than 5 years
- ☐ 5 – 10 years
- ☐ 11 – 20 years
- ☐ 21 – 30 years
- ☐ more than 30 years

Besides growing corn do you have livestock?

- ☐ Yes
- ☐ No

If previous is answered as "**YES**" what kind of livestock do you have and how many?

- ☐ Cattle
  - _____Beef
  - _____Dairy
- ☐ Chicken
  - _____Hen
  - _____Broiler
- ☐ Pigs
  - _____Porker
  - _____Piglets
- ☐ Sheep

How many hectares do you use for grazing?

- ☐ less than 5
- ☐ 5 – 15
- ☐ 16 – 30
- ☐ 31 – 50
- ☐ 51 – 100
- ☐ more than 100

How many hectares do you use for growing corn?

- ☐ less than 5
- ☐ 5 – 15
- ☐ 16 – 30
- ☐ 31 – 50
- ☐ 51 – 100
- ☐ more than 100

Where do you grown corn?

- ☐ Ocotlán
- ☐ Zapotlán del Rey
- ☐ Tototlán
- ☐ Jamay
- ☐ La Barca

Do you own or lease the land?

- ☐ Own
  If both, how many?
  _____
- ☐ Lease
  If both, how many?
  _____

How do you grow the corn?

- ☐ Irrigated system
  How many?
  _____
- ☐ Rain feed condition
  How many
  _____

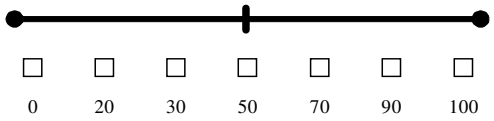
What is your yield per hectare (average) (tons/ha)?

- ☐ less than 6
- ☐ 6 – 8
- ☐ 8 – 10
- ☐ more than 10

What do you do with your grain after harvest?

- ☐ Sell it to a grain elevator or processor
- ☐ Store for own use
- ☐ Store and wait for higher prices

What percentage of your grain do you sell?



Which criteria do you use to deliver the grain to an elevator? (*mark only one*)

- ☐ Proximity
- ☐ Price
- ☐ Service
- ☐ Business relation

If your grain is delivered in business relationship criteria, what kind of relationship is it?

- ☐ Inputs financing
- ☐ Financing when is need it
- ☐ Payment at once
- ☐ Reliability
- ☐ Tradition

What would you consider as the most important to deliver your grain to an elevator? *(classify from 1 as the most important to 5 as the less important)*

- ___ Inputs financing
- ___ Price per ton
- ___ Proximity
- ___ Reputation
- ___ Time to get paid

How many grain elevators do you have near to your production area (1/2 hour driving loaded)?

_____

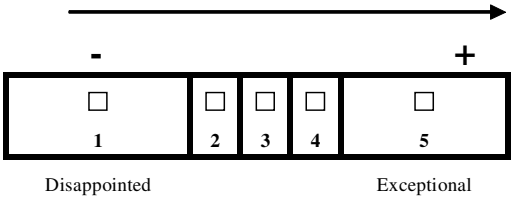
Do you deliver your grain to the same elevator every season?

- ☐ yes
- ☐ no

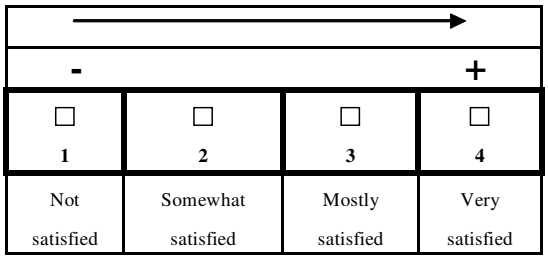
If **NOT**, why?

- ☐ *Diversification*
- ☐ *Try new elevators*
- ☐ *Deterioration of the relationship*

How is the general reputation of the grain elevators in your area? (***1 as the less to 5 as the most***)



What is your general impression of **<u>your grain elevator's service</u>**? (***1 as the less to 4 as the most***)



After you deliver the grain, normally how long it takes to get paid for?

- ☐ 48 hours
- ☐ 1 – 2 weeks
- ☐ 2 – 3 weeks
- ☐ 3 – 4 weeks
- ☐ 1 – 2 months
- ☐ more than 2 months

Have you ever experienced long periods of time to get paid for your grain? (one month or more)

- ☐ No
- ☐ Yes

How long?

_____

How do you receive your payment?

- ☐ All at once
- ☐ Partial payments

What are the main problems that you face when deliver the grain to an elevator? (*mark as many as needed*)

- ☐ Time-consuming unloading the trucks

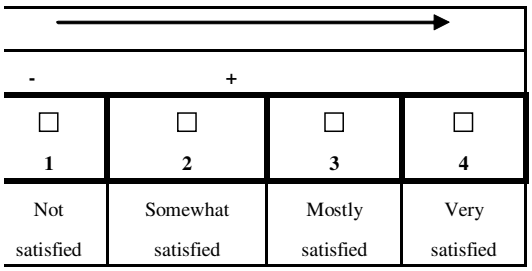
☐Cheating on weighing and sampling
☐Rough roads
☐Low prices
☐Other

How is your perception on warehouses' quality measurements?

After you get paid for your grain, what do you do with your cash? (***classify from 1 as the most to 4 as the less***)

___Pay debt obligations
___Buy inputs for next season
___Livelihood
___Other

Are you satisfied of the economic outcome of growing corn? (***1 as the less to 4 as the most***)



What it is affecting your satisfaction? (***classify from 1 as the most to 3 as the less***)

___Low corn prices at harvest time
___High inputs prices
___High interest on loans

Do you buy your inputs (seeds, pesticides and fertilizers) in advance or when are needed?

☐In advance
☐When are needed

Have you ever faced a situation when external financing is needed for working capital?

☐Yes
☐No

How do you solve your working capital needs?

☐Asking for a loan to the bank
Financial sources different than banks (what types)

_____

What is the main constraint that you face when ask for a loan to the bank? (*mark more than one if needed*)

☐Lack of collateral
☐High interest rates
☐Previously indebted
☐Highly bureaucratic procedures

How much is the total value of your assets (approximately)?

_____

Do you have enough collateral to offer to the bank?

☐Yes, plenty
☐Yes, but most of them are already used as collateral for different activities
☐Yes, but they are not trustworthy collaterals according to the bank
☐No, I have not

What is the most desirable collateral for banks in your area?

- ☐ Land
- ☐ House
- ☐ Machinery
- ☐ Farm facilities
- ☐ Other

_____

What kind of collateral do you normally use for a loan?

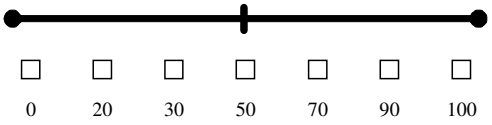
- ☐ Land
- ☐ Machinery
- ☐ House
- ☐ Farm facilities
- ☐ Other

_____

How many times do you have to visit the bank before the loan is given?

- ☐ once
- ☐ 2 – 3 times
- ☐ 3 – 5 times
- ☐ more than 5

What is the percentage of your debt obligations compare to your total assets?



Have you ever used grain as collateral when asking for a loan to the bank?

- ☐ Yes
- ☐ No

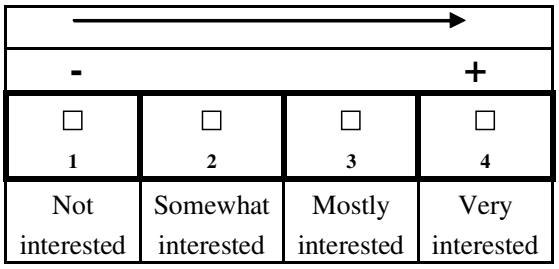
If previous question is answered as "YES", have you had problems using grain as collateral?

- ☐ No
- ☐ Yes

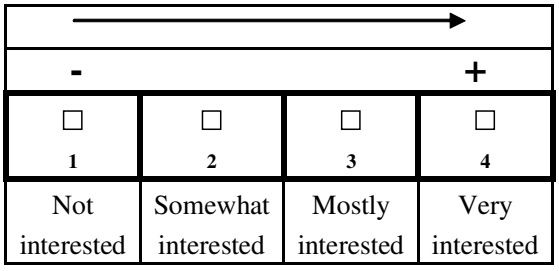
If yes, specify

_____

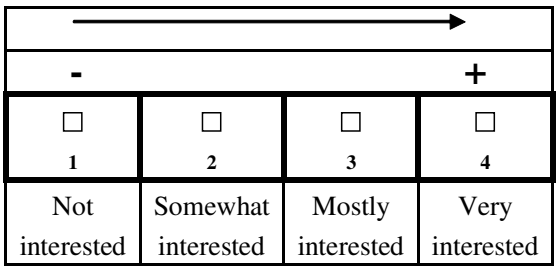
Are you interested to use your grain as collateral in order to fulfill your working capital needs? (***1 as the less to 4 as the most***)



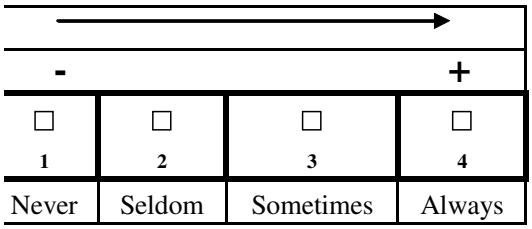
Are you interested to deliver your grain to an elevator, that have you never used or that is **not,** near to your production area in order to use your grain as collateral and that elevator will issue a receipt specifying quality, quantity and location of your grain? (***1 as the less to 4 as the most***)



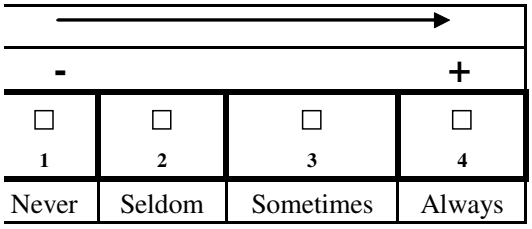
Are you interested to store your grain, pay storage cost, in order to wait for higher prices and decide in what point in time is best for sell it? (***1 as the less to 4 as the most***)



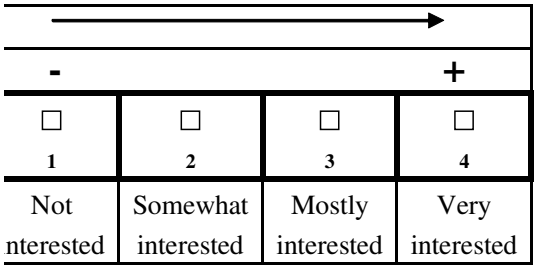
Have you ever received credit from the Banks?



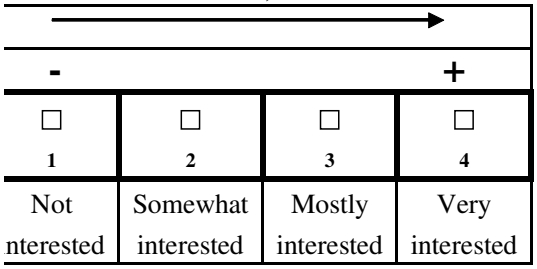
Have you succeeded fulfilling your debt obligations?



Are you interested in a system where you can use your grain as collateral to fulfill your working capital needs and at the same time store your grain for higher prices and paying storage cost? (***1 as the less to 4 as the most***)



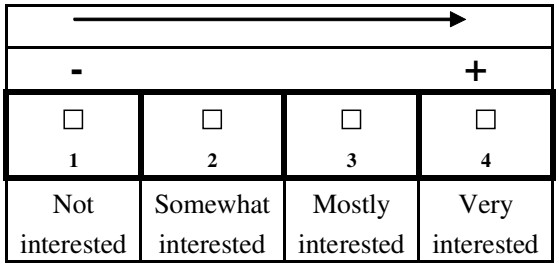
Would you be interested to improve your agricultural practices for better grain quality, knowing that your grain will be used as collateral? (***1 as the less to 4 as the most***)



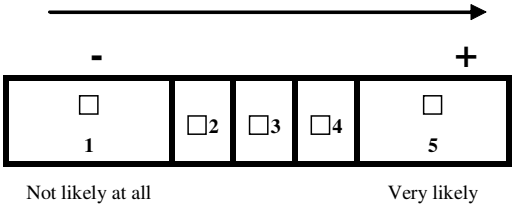
What problems do you foresee in a system where you can use your grain as collateral with the Rural Financial Bank and store for higher prices with a private elevator? (*Relevance classification, 1 as the most to 5 as the less*)

___Interest rate of the loan
___Bureaucratic procedures from bank and elevators
___Storage cost
___The trucking to a faraway elevator
___Risk of falling prices

Are you interested to pay hedging to lock a floor price to cope with risk while the grain is stored? (***1 as the less to 4 as the most***)



How likely is to consider a grain receipt system as a helpful tool for risk management strategy?



Do you believe that a grain receipt system will be beneficial in the long run?

☐Yes, I do
☐No, I do not

Information that you would like to add

_____

ELEVATORS' SURVEY

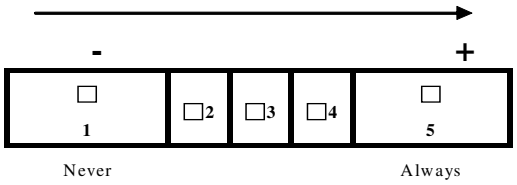
Date: *month* _____ *day*_____ *year* _____ **Survey code:**_____

Bank name: (*optional*)

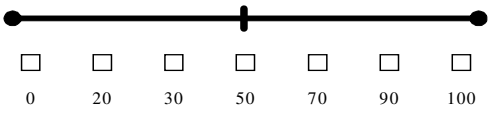
How many tons could you store in your warehouse?

_____

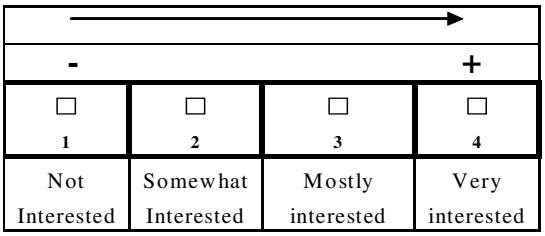
Do you financing inputs to your local farmers?



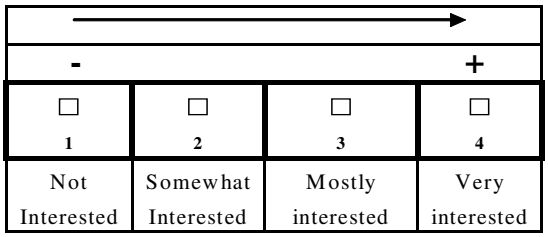
From the grain that you get from farmers near to you, what is the percentage of farmers that you offer financing?



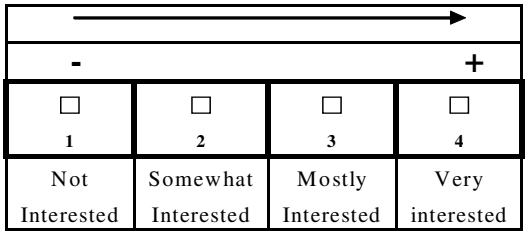
Are you interested in a grain receipt system where farmers can store their grain at harvest time in your warehouse and keep it until the lean season paying you a monthly fee for store, load and unload also knowing that, that grain will be used as collateral to a bank?



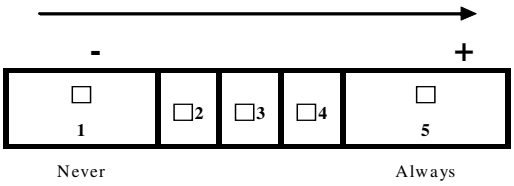
Are you interested to store any kind of amount of tons even for small (5 hectares or less) farmers?



Would you be interested to offer a service for hedging to lock a floor price to cope with risk while the grain is store, once the credit was offered to the farmer and now the bank is the virtual owner of the grain?



Do you use quality standards for the grain, for instance grading? (Ex. humidity, impurity or dust)



How is your grain management? (mark more than once if needed)

- ☐ Warehouse
- ☐ Silo
- ☐ Outdoor pile

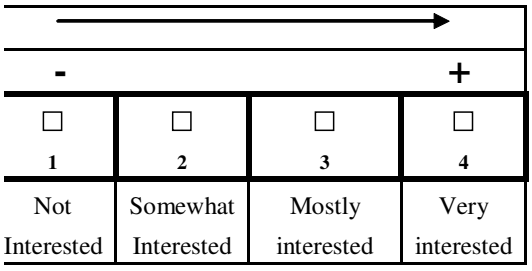
Dou you have the following equipment in your warehouse?

- ☐ Grain dryer
- ☐ Pneumatic truck probe sampler
- ☐ Humidity detector
- ☐ Grading devices
- ☐ Computer
- ☐ Internet
- ☐ Fax
- ☐ Telephone

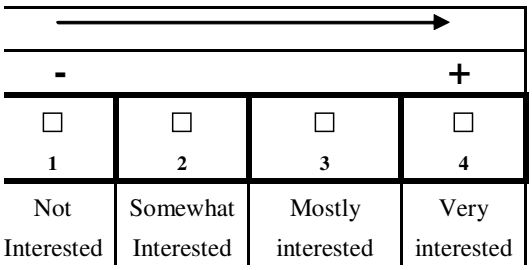
What are your minimum requirements to receive grain from farmers in your normal operations?

_____

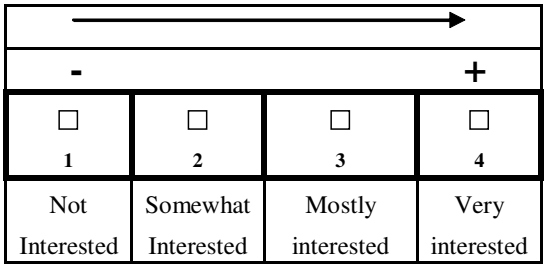
Would you be interested to get a license in order to be a part of the GRS?



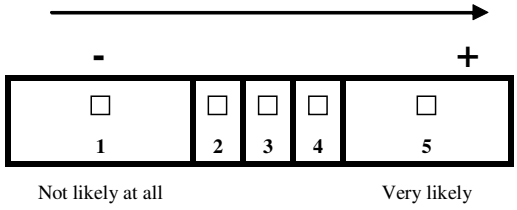
Would you be interested to issue receipts to farmers that have been storing their grain in your warehouse with the following description; quality, quantity and place?



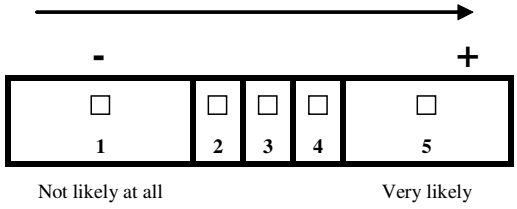
Would you be interested to receive inspectors without previous announcement to check the receipts that you are issuing against the tons stored and your grain management operations?



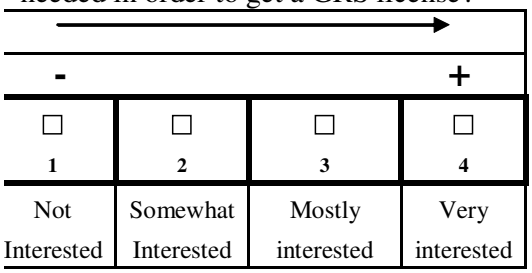
How likely is that your skills in grain management and operations will improve with a GRS?



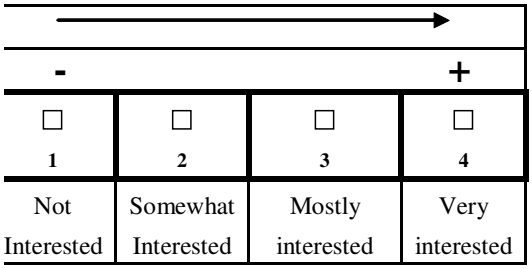
Would you be interested to build a database (yield per hectare, inputs used and agricultural practices used) of the farmers that decide to store their grain in your warehouse?



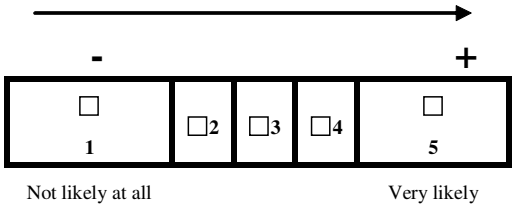
Are you interested to invest in what is needed in order to get a GRS license?



Are you interested to be synchronized with any bank in order to provide it farmers' information that is needed?



How likely do you believe that farmers will improve their agricultural practices of growing corn when grain will be used as collateral?

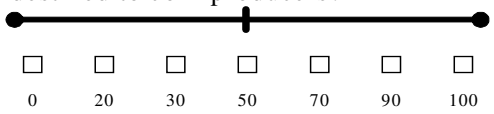


BANKS' SURVEY

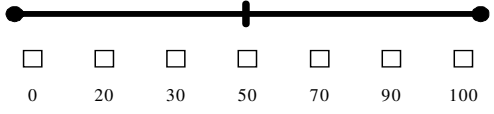
Date: *month* _____ *day*_____ *year* _____ **Survey code:**_____

Bank name: (*optional*)

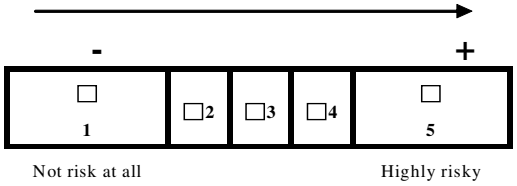
From the total lends that the bank offers, what it is the percentage that is destined to corn producers?



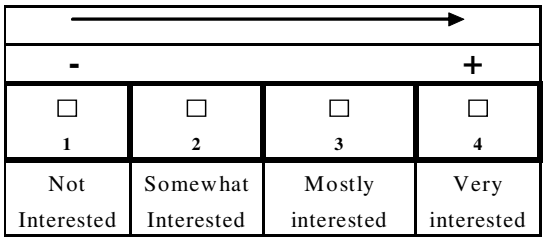
What it is the percentage of farmers that fulfill debt obligations?



According to the repayment of debt obligations, how do you consider the level of risk of lending to corn producers?

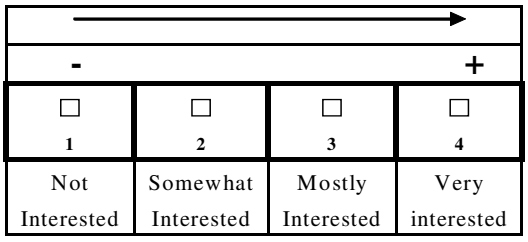


Are you interested in a grain receipt system where farmers offer their grain as collateral to fulfill their working capital needs when asking for a loan and at the same time the grain is store in a reliable warehouse and this grain can be used as a repayment if farmers fail debt obligation?

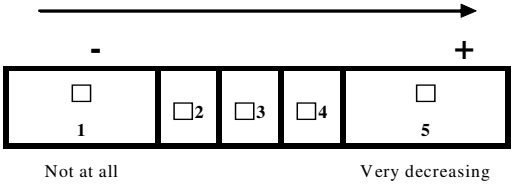


Would you be satisfied with corn grain as collateral?

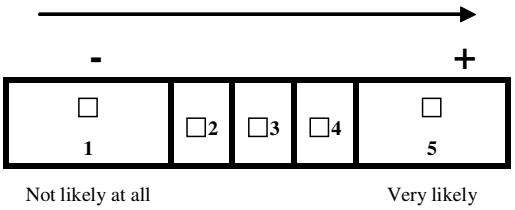
Would you be interested to pay hedging to lock a floor price to cope with risk while the grain is store, once the credit was offered to the farmer and now you are the virtual owner of the grain?



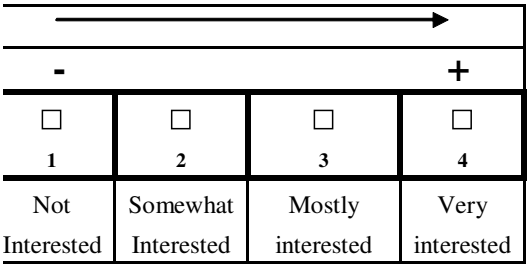
Do you think that monitoring farmers' repayment will decrease with a GRS rather than without?



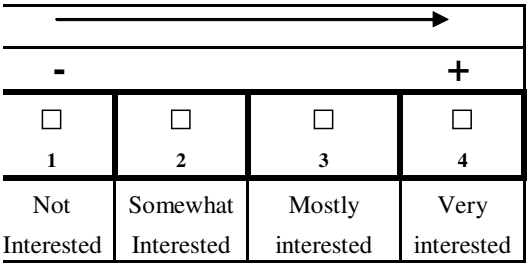
How likely is that you are working together with warehouses to get farmers information?



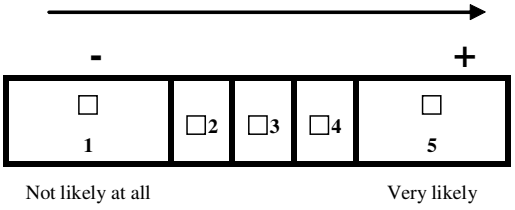
Would you be interested to join forces in information technology (smart cards) with a warehouse to improve rural credit?



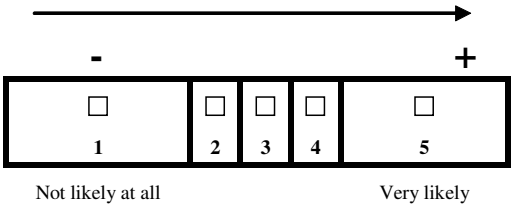
Would you be interested to install an ATM in the warehouse facilities to make easier for farmers the access to cash?



How likely is that your skills in inventory credit will improve with a GRS?



How likely do you think that within a GRS the credits for corn producers will be cheaper due to collaterals are easy to trade in cash and monitoring is made trough warehouses?



What percentage of collateral's value are you willing to lend to corn producers?

_____

What are the variables that you consider when lending money to the farmers? (ex. yield per hectare, inputs used, agricultural practices, others)

_____

Appendix 2 Chi square tests

FARMERS' AGE & FINANCIAL NEEDS

Observed Frequencies			
	FINANCIAL NEEDS		
FARMERS' AGE	No	Yes	Total
30 - 40	4	4	8
41 - 50	4	12	16
51 - 60	9	7	16
> 60	5	6	11
Total	22	29	51

Calculations

fo-fe	
0.54902	-0.54902
-2.901961	2.901961
2.098039	-2.098039
0.254902	-0.254902

Expected Frequencies			
	FINANCIAL NEEDS		
FARMERS' AGE	No	Yes	Total
30 - 40	3.45098	4.54902	8
41 - 50	6.901961	9.098039	16
51 - 60	6.901961	9.098039	16
> 60	4.745098	6.254902	11
Total	22	29	51

(fo-fe)^2/fe	
0.087344	0.066261
1.220143	0.925625
0.637756	0.483815
0.013693	0.010388

Data	
Level of Significance	0.05
Number of Rows	4
Number of Columns	2
Degrees of Freedom	3

Results	
Critical Value	7.814725
Chi-Square Test Statistic	3.445025
p-Value	0.327962
Do not reject the null hypothesis	

Expected frequency assumption is fulfilled.

FARMERS' AGE & FINANCIAL SATISFACTION

Observed Frequencies			
	ECONOMIC SATISFACTION		
FARMERS' AGE	Not Satisfied	Satisfied	Total
30 - 40	7	1	8
41 - 50	9	7	16
51 - 60	7	9	16
> 60	5	6	11
Total	28	23	51

Calculations

fo-fe	
2.607843	-2.607843
0.215686	-0.215686
-1.784314	1.784314
-1.039216	1.039216

Expected Frequencies			
	ECONOMIC SATISFACTION		
FARMERS' AGE	Not Satisfied	Satisfied	Total
30 - 40	4.392156863	3.607843137	8
41 - 50	8.784313725	7.215686275	16
51 - 60	8.784313725	7.215686275	16
> 60	6.039215686	4.960784314	11
Total	28	23	51

(fo-fe)^2/fe	
1.548407	1.885017
0.005296	0.006447
0.362439	0.44123
0.178826	0.217701

Data	
Level of Significance	0.05
Number of Rows	4
Number of Columns	2
Degrees of Freedom	3

Results	
Critical Value	7.814724703
Chi-Square Test Statistic	4.645362789
p-Value	0.199684983
Do not reject the null hypothesis	

Expected frequency assumption is fulfilled.

Appendix 3 Chi square tests

YIELD & ECONOMIC SATISFACTION

Observed Frequencies				
	ECONOMIC SATISFACTION			
YIELD (ton/ha)	Not Satisfied	Somewhat Satisfied	Mostly or Very Satisfied	Total
< 8	18	7	2	27
> 8	10	8	6	24
Total	28	15	8	51

Calculations

fo-fe		
3.176471	-0.941176	-2.235294
-3.176471	0.941176	2.235294

Expected Frequencies				
	ECONOMIC SATISFACTION			
YIELD (ton/ha)	Not Satisfied	Somewhat Satisfied	Mostly or Very Satisfied	Total
< 8	14.82352941	7.941176471	4.235294118	27
> 8	13.17647059	7.058823529	3.764705882	24
Total	28	15	8	51

(fo-fe)^2/fe

0.680672	0.111547	1.179739
0.765756	0.12549	1.327206

Data	
Level of Significance	0.05
Number of Rows	2
Number of Columns	3
Degrees of Freedom	2

Results	
Critical Value	5.991476357
Chi-Square Test Statistic	4.190410053
p-Value	0.123045014
Do not reject the null hypothesis	

Expected frequency assumption is fulfilled.

ECONOMIC SATISFACTION & PAY STORAGE COST

Observed Frequencies			
	PAY STORAGE COST		
ECONOMIC SATISFACTION	Not Interested	Interested	Total
Not Satisfied	20	8	28
Satisfied	14	9	23
Total	34	17	51

Calculations

fo-fe	
1.333333	-1.333333
-1.333333	1.333333

Expected Frequencies			
	PAY STORAGE COST		
ECONOMIC SATISFACTION	Not Interested	Interested	Total
Not Satisfied	18.66666667	9.333333333	28
Satisfied	15.33333333	7.666666667	23
Total	34	17	51

(fo-fe)^2/fe

0.095238	0.190476
0.115942	0.231884

Data	
Level of Significance	0.05
Number of Rows	2
Number of Columns	2
Degrees of Freedom	1

Results	
Critical Value	3.841455338
Chi-Square Test Statistic	0.633540373
p-Value	0.426059649
Do not reject the null hypothesis	

Expected frequency assumption is fulfilled.

HECTARES FOR GROWING CORN & HEDGING

Observed Frequencies			
	Column variable		
Row variable	C1	C2	Total
R1	20	11	31
R2	10	11	21
Total	30	22	52

Calculations

fo-fe

2.115385	-2.115385
-2.115385	2.115385

Expected Frequencies			
	Column variable		
Row variable	C1	C2	Total
R1	17.88462	13.11538	31
R2	12.11538	8.884615	21
Total	30	22	52

(fo-fe)^2/fe

0.250207	0.341191
0.369353	0.503663

Data	
Level of Significance	0.05
Number of Rows	2
Number of Columns	2
Degrees of Freedom	1

Results	
Critical Value	3.841455
Chi-Square Test Statistic	1.464414
p-Value	0.226229
Do not reject the null hypothesis	

Expected frequency assumption is fulfilled.

GRAIN AS COLLATERAL & HECTARES GROWING CORN

Observed Frequencies					
	HECTARES GROWING CORN				
GRAIN AS COLLATERAL	5 - 15	16 - 30	31 - 50	> 50	Total
Not Interested	13	6	5	5	29
Interested	7	5	5	6	23
Total	20	11	10	11	52

Calculations

fo-fe

1.846154	-0.134615	-0.576923	-1.134615
-1.846154	0.134615	0.576923	1.134615

Expected Frequencies					
	HECTARES GROWING CORN				
GRAIN AS COLLATERAL	5 - 15	16 - 30	31 - 50	> 50	Total
Not Interested	11.15385	6.134615	5.576923	6.134615	29
Interested	8.846154	4.865385	4.423077	4.865385	23
Total	20	11	10	11	52

(fo-fe)^2/fe

0.30557	0.002954	0.059682	0.20985
0.385284	0.003725	0.075251	0.264594

Data	
Level of Significance	0.05
Number of Rows	2
Number of Columns	4
Degrees of Freedom	3

Results	
Critical Value	7.814725
Chi-Square Test Statistic	1.30691
p-Value	0.727493
Do not reject the null hypothesis	

Expected frequency assumption is fulfilled.

Appendix 4 Chi square tests

GRAIN AS COLLATERAL & LIVESTOCK

Observed Frequencies			
	LIVESTOCK		
GRAIN AS COLLATERAL	No	Yes	Total
Not Interested	7	22	29
Interested	7	16	23
Total	14	38	52

Calculations

fo-fe	
-0.807692	0.807692
0.807692	-0.807692

Expected Frequencies			
	LIVESTOCK		
GRAIN AS COLLATERAL	No	Yes	Total
Not Interested	7.807692	21.19231	29
Interested	6.192308	16.80769	23
Total	14	38	52

(fo-fe)^2/fe

0.083554	0.030783
0.105351	0.038814

Data	
Level of Significance	0.05
Number of Rows	2
Number of Columns	2
Degrees of Freedom	1

Results	
Critical Value	3.841455
Chi-Square Test Statistic	0.258502
p-Value	0.611151
Do not reject the null hypothesis	

Expected frequency assumption is fulfilled.

GRAIN AS COLLATERAL & YIELDS

Observed Frequencies			
	YIELDS (ton/ha)		
GRAIN AS COLLATERAL	< 8	> 8	Total
Not Interested	15	14	29
Interested	12	11	23
Total	27	25	52

Calculations

fo-fe	
-0.057692	0.057692
0.057692	-0.057692

Expected Frequencies			
	YIELDS (ton/ha)		
GRAIN AS COLLATERAL	< 8	> 8	Total
Not Interested	15.05769	13.94231	29
Interested	11.94231	11.05769	23
Total	27	25	52

(fo-fe)^2/fe

0.000221	0.000239
0.000279	0.000301

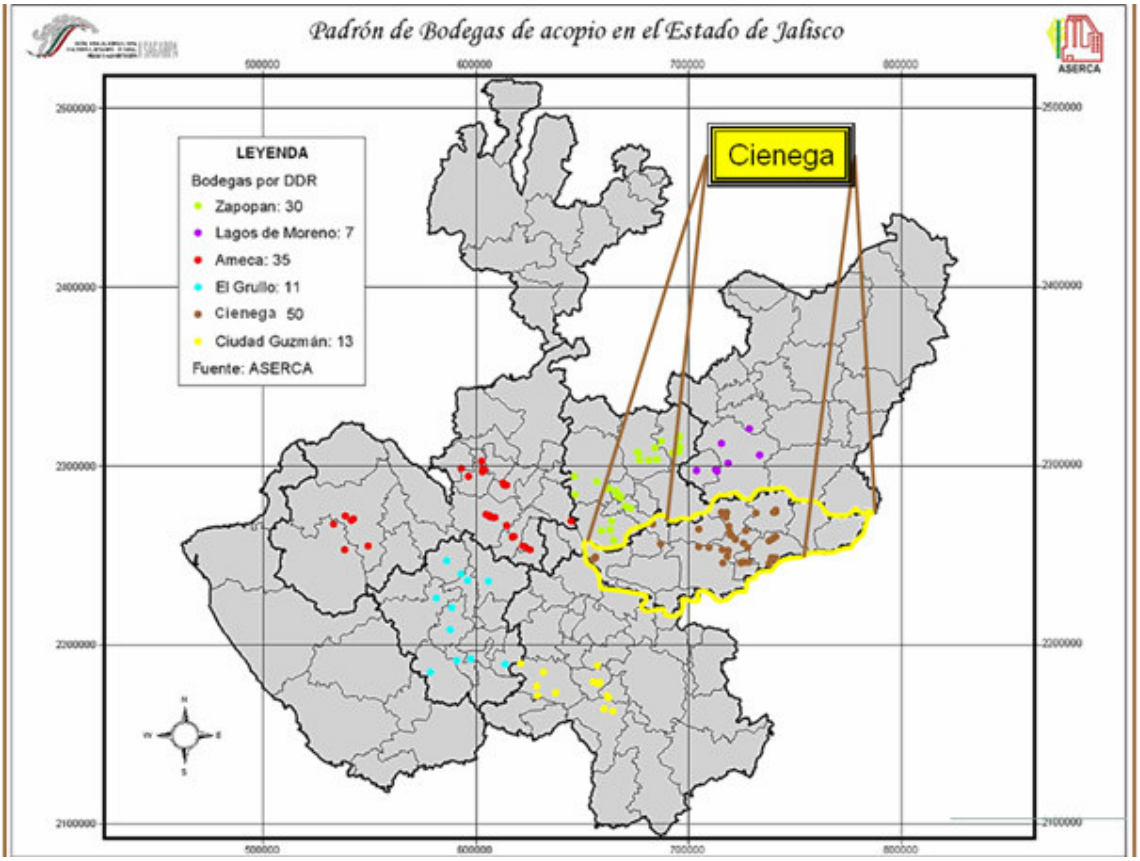
Data	
Level of Significance	0.05
Number of Rows	2
Number of Columns	2
Degrees of Freedom	1

Results	
Critical Value	3.841455
Chi-Square Test Statistic	0.001039
p-Value	0.97428
Do not reject the null hypothesis	

Expected frequency assumption is fulfilled.

Appendix 5 Elevators in the Cienega Province

GRAIN ELEVATORS IN THE CIENEGA



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