

**ARE REDISTRIBUTIVE
LAND REFORMS FEASIBLE?
GUATEMALA AS A CASE STUDY**

by
Christopher Gregory

Supervisor
Kris Inwood

Second Reader
Clive Southey

September 2006

DEPARTMENT OF ECONOMICS

**UNIVERSITY
of GUELPH**

Table of Contents

Section	Title	Page
1.	Introduction	1
2.	Historical Background	2
3.	Theoretical Framework and Literature Review	6
4.	Illustration of the Data and its Shortcomings	12
5.	Methodology	14
6.	Empirical Results	15
7.	The Guatemalan Experience	19
8.	The Experiences of Others	21
9.	Rethinking Redistributive Land Reform	23
10.	Market-led Agrarian Reform	27
11.	Some Final Comments	31
12.	Bibliography	34
Appendix A	Explanation of Prices Used in this Study	38
Appendix B	Value Crop Output Distribution Tables	40
Appendix C	Regression Results Tables	41
Appendix D	Map of Guatemala	48

List of Tables and Figures

Table	Title	Page
1	Distribution of Value Crop Output as a Percentage of Gross Output by Farm-size	40
2	The Distribution of Value Crop Output as a Percentage of Total Crop Output by Farm-size	40
3	Coffee Regression Results	41
4	Bananas Regression Results	41
5	Wheat Regression Results	42
6	Rice Regression Results	42
7	Corn (First Harvest) Regression Results	43
8	Corn (Second Harvest) Regression Results	43
9	Black Beans Regression Results	44
10	Gross Output Regression Results	44
11	Corn and Black Beans Regression Results	45
12	Corn (1 st harvest) and Black Beans Regression Results	46
13	Half Corn (1 st harvest) and Black Beans Regression Results	47
Figure	Title	Page
1	Departments and Regional Divisions (by Topography and Climate)	48

1. Introduction

Severe inequality is an impediment to economic growth and development, and no where is it observed more than in the countries of the less developed world where access to land, capital, power and the like, disproportionately favour the upper and middle fractions of society. Much of this disparity was engendered from historical institutions, such as colonialism, and has persisted throughout the centuries. Land reform is consistently advocated as a policy measure to alleviate pressures from rural poverty, by encouraging agricultural development, where there are defective land tenure systems. This paper looks at the theory and historical evidence behind this issue and makes special reference to Guatemala during the period between 1950 and 1970 as a case study, in an attempt to dispute contemporary stances concerning redistributive land reforms.¹

The paper begins with an introduction to Guatemala's economic particulars and discusses the disparities in the country's land and income distribution. It then enumerates the characteristics of a state-led redistributive approach to land reform and why it is desired as an effective policy measure. It proceeds with an illustration of the data and methodology used in this study's empirical segment as well as it examines the results of the regression analysis. Next it outlines an historical background of Guatemala's experience with this method of poverty alleviation and demonstrates its shortcomings. The paper briefly investigates redistributive land reforms in Mexico and Zimbabwe as well as some countries from the Former Soviet Union and East Central Europe. It follows with a critique of the foundation of a productive reform, the theory of an inverse relationship between farm size and productivity, and illustrates some of the deficiencies

¹ The paper refers to this time period because it utilizes data from the agricultural censuses of 1950 and 1964.

of the state-led approach, such as cost, corruption and red tape. As a result, more indirect methods of redistribution are then considered and analysed. These too, have many problems with government ineptitude, and therefore, pro-market alternatives are suggested and scrutinized, namely the market-led agrarian reform (MLAR). The paper concludes that, although new and improved technologies are available and the leading institution is capitalism, inverse relationships in farming still occur and thus state-led redistributive land reforms should not be purged from political thought.

2. Historical Background

Guatemala is a predominantly Spanish speaking, Central American country that borders Mexico, Belize, Honduras and El Salvador. It is divided by a chain of large volcanic mountains and has dense forests, deep river valleys, as well as elevated plains and plateaus. It is this often tempestuous terrain that allows for a diverse climate, ranging from tropical, to temperate and even to arid and semi-arid regions.

Although, the population was scattered throughout the land in 1950, more than 90 percent of it lived in the south central part of the country, where resources were scarce.² As with most developing countries population growth was very high, and in 1964 the average growth rate was 3.1 percent per year.³ With persistent population growth and insufficient employment opportunities in the countryside, it was inevitable that the rural population would flock to urban centres. This rapid urbanization and relentless population growth fuelled poverty, illiteracy and inequality.⁴ Furthermore, albeit exports were growing rapidly, at 5.8 percent per annum and GDP at 4.4 percent per capita the

² Barraclough, 1973, P 231

³ Fletcher et al., 1970, P 7

⁴ In 1964, only 36.7 percent of the population could read and write. (Fletcher et al., 1970, P 8)

overall standard of living of the poor was not improving, indeed it was deteriorating in some cases.⁵

The problem lies in the significantly disproportionate distribution of wealth and power in Latin American countries, where Guatemala is no exception. A large extent of this inequality is the outcome of colonialism, where restrictive land practices were used to prevent native populations, local peasants and emancipated slaves from owning property, in order to preserve the privileged status of the elite. Systems of coerced labour and serfdom, such as the *mandamiento*, strict vagrancy laws and debt peonage, oppressed landless peasants.⁶ The Catholic Church was also a predominant factor since “the clergy bought and inherited land to materialize its position as supreme religious authority”.⁷ These tenure institutions have persisted over the centuries and have preserved and vindicated the existing inequality.

A study by Frankema (2005) found that Guatemala’s Gini coefficient in 1964 was 77 percent indicating a very high level of inequality.⁸ Accordingly the majority of agricultural land in Guatemala is owned by a relatively small, elite group of farmers, known as *latifundistas*. And although they owned 72.2 percent of the land, they only represented 2.1 percent of the farms.⁹ The smallest landowners are known as *minifundistas* who made up 88.4 percent of the farms, but only accounted for 14.3

⁵ Griffin, 1976, P 164

⁶ The *mandamiento* demanded a certain amount of Indian labourers to work for a specified period of time at a fixed wage, whereas, vagrancy laws made it illegal to be unemployed or without an employer; those who were found guilty could be imprisoned and put to perform public works. The peonage system, on the other hand, controlled labour by providing a cash advance or housing and, once contracted, they were not allowed to leave until the debt was repaid through the provision of labour services. (Schweigert, 2004, P 535)

⁷ Frankema, 2005, P 3

⁸ A coefficient of 100 describes perfect inequality where one person owns everything, while a coefficient of 0 means perfect equality.

⁹ Griffin, 1976, P 162.

percent of the landholding. *Minifundios* are typically sub-family properties that employ primitive techniques, subsistence production on worn out soils and have one low-yield harvest per year due to the cold climate and prolonged dry period.¹⁰ As a result, these small farmers had to find supplementary employment, usually with the *latifundias*, to satisfy their subsistence needs during their off-season.¹¹ Even though these wages were not substantial, this employment provided an essential source of compensation for the poor and landless. However, it further reinforced the enslavement of *minifundistas* to the dominant *latifundistas* and polarised the distribution of landholdings.

Organizations, such as ANACAFE (the National Coffee Association), were created to protect the interests of the *latifundistas*, but simultaneously, systematically neglecting and oppressing the small landholders.¹² So, while *minifundistas* represented a greater proportion of the agrarian population, they were consistently marginalised because large-farm landowners controlled the lion's share of the wealth and political sway. Finance was also disproportionately funnelled into the pockets of large farmers because they were generally better educated, more dynamic and affluent than small farmers, hence, were less risky ventures.

In 1962, only six percent of all agricultural credit was received by small farmers.¹³ What's more, the few *minifundistas* that did receive credit, obtained short term loans that demanded exorbitant rates. The average interest rate was 7.1% per month, which amounted to 94.8% per year.¹⁴ Discouraging credit facilities and the inability to

¹⁰ Barraclough, 1973, P 238.

¹¹ It was estimated that 160,000 people migrated every year to the coast for supplementary work. (Griffin, 1976, P 161)

¹² Griffin, 1976, P 161

¹³ Griffin, 1976, P 162

¹⁴ Whetten, 1961, P 156

benefit from economies from bulk buying meant inflated land prices for small farmers. They received the leftovers of the *latifundistas*, who had access to the best land, in terms of soil quality, accessibility, climate, topography and irrigation.¹⁵ Large farmers employed more sophisticated cultivation techniques, utilized heavy machinery and many practiced absentee management. However, most only cultivated a small proportion of their land. A study by CIDA (Comité Interamericano de Desarrollo Agrícola) found that 68 percent of cultivable land, on *latifundias* in Guatemala, was unutilized.¹⁶ Furthermore, land utilizable for crops and pasture ranged from 95 percent for small farms, to 57 percent for very large ones.¹⁷

The vast quantity of land on *latifundias* and the overall ineptitude of the government to collect taxes allowed owners to hold large sums of idle land. Thus owners often reserved land for its prestige symbol and/or a hedge against inflation, rather than for production.¹⁸ *Minifundistas*, on the other hand, did not have this luxury and therefore employed a much higher percentage of land, which often led to over-utilization. They routinely applied poor farming techniques, for example single crop cultivation, and lacked terracing on hillsides. Moreover, due to the limited nature of the average holding, land was not allowed to lie fallow. Consequently, these persistent pressures led to erosion and declining productivity, thus further exacerbating their egregious circumstances.

Productivity per worker was also negatively affected by increasing population and subsistence demands, deteriorating income and consumption among the poorest members

¹⁵ Double cropping of corn is often practiced in the hot climate of these lowlands where the soil is highly fertile; however in the 'cold country' at high altitudes, where the *minifundistas* harvest, corn could take up to ten months to mature. (Schweigert, 2004, P 540)

¹⁶ Griffin, 1976, P 163

¹⁷ Fletcher et al., 1970, P 71

¹⁸ Barraclough, 1973, P 54

of society. In addition, unemployment was rising, pupil-teacher ratios were inflating, illiteracy was escalating and housing was insufficient.¹⁹ Indeed, inequality was rising, which in turn, impeded the efficient use of disposable resources, depressed the rates of investment and prevented social and political stability.²⁰ Civil unrests and war were not uncommon. Guatemala required drastic measures that would attack this disease at its core, and since 75 percent of the population was classified as rural and a large share of the population (68% in 1950) depended on agriculture in one way or another, a state-led redistributive land reform was considered.²¹

3. Theoretical Framework and Literature Review

There are many different approaches to land reform of which direct reforms are the most commonly used and which demand widespread restructuring of the agricultural and rural sector. They are state-led endeavours designed to alleviate social pressures, such as poverty and inequality, and entail the redistribution of private land from large estates. Furthermore, to help ensure a successful land reform, “the establishment or strengthening of essential government, cooperative, or commercial agencies or services relating to agricultural credit, supply, marketing, extension, and research” is required.²² Although its aim is to reduce inequality, redistributive land reforms have also been claimed to promote agricultural productivity, and in time, overall economic growth.

A study by Engerman and Sokoloff (1997) made a comparison of the differential paths of growth between the northern and southern United States. It found that farmers in the southern US were, more or less, self-sufficient due to the lack of well developed

¹⁹Griffin, 1976, P 164

²⁰ Barraclough, 1973, P 41

²¹ Barraclough, 1973, P 230-231

²² UN, 1962, iv, P 268.

markets which led to lower productivity from a lack of specialization. The majority of these farms were large plantations producing cash crops such as sugar and cotton. Other studies indicated that a polarised agricultural sector created unbalanced economic growth in Latin America and as a result, there were insufficient technology and demand spill-overs to support a sustained process of industrialization.²³ Moreover investment, growth and financial markets deteriorated due to the considerable political risk associated with consistently erroneous and corrupt decision-making of the government, as well as unpredictable policies and policymakers.²⁴

Historical land inequality has been found to be negatively correlated with long run economic growth.²⁵ Furthermore, numerous studies that have established that productivity decreases as farm size increases for developing countries. Authors, such as Berry and Cline, Cornia, Doving, Griffin and many others, have demonstrated this inverse relationship between farm size and productivity, however not without substantial debate.²⁶ An inverse relationship supports the notion of redistribution as a method to increase efficiency and growth as well as reduce poverty and inequality in the rural sector. To illustrate these findings one must look at the differences in the output, inputs, production functions and circumstances of both large and small farms.

Firstly, proponents for redistributive land reform assert that increasing returns to scale, due to advantages from large scale farming activities, are not relevant when considering agricultural production functions in developing countries.²⁷ In most cases,

²³ See Kay (2001) and Johnson (1991)

²⁴ Hirschman, 1986

²⁵ Deininger and Squire, 1998

²⁶ However, it seems that for every study that finds the inverse relation, there is another that attempts to discredit it, for example Dyer (2004).

²⁷ Economies of scale (or increasing returns to scale) exist where increasing the scale of production leads to cost savings due to lower average costs.

this type of technology is not available or feasible in these regions.²⁸ In fact, several empirical studies have found that returns to scale were not significantly different from constant returns, even in some developed countries.²⁹ Consequently, there will be little to no benefits gained from the size of a farm, and any increases in productivity will be the result of improvements in a farm's cropping intensity.

Griffin et al. (2002) argue that economies of scale can still be exploited if redistribution were to occur. If competition becomes too fierce land would be free to be bought or sold allowing efficient farmers to expand their size as required. Furthermore, rental markets for large-scale machinery and equipment may emerge enabling small farmers to benefit from these scale economies. They claim that increasing returns are likely to cause more concern in other rural activities such as agricultural processing, marketing, purchasing of inputs such as fertilizer, and investment in infrastructure, for example irrigation and drainage systems.³⁰ These problems can be solved, they suggest, by creating multi-purpose cooperatives, through market activities and/or through local or provincial government support.

Another important remark is that in most developing economies, as in the case of Latin America, there are dualistic agrarian structures; where farming is separated between a few very large estates and numerous small holdings. Larger farms characteristically have low levels of production in relation to the size of the holding. Land is a very secure asset, thus in developing countries where political instability, imperfect capital markets and chronic inflation prevail, proprietors hold land as a form of asset placement, or for

²⁸ Due to the abundant supply of labour, a high degree of mechanization would represent an inefficient use of resources.

²⁹ Berry and Cline, 1979, P 6

³⁰ Griffin et al., (2002), P 318

speculative gain, prestige and political power. Therefore, more often than not, a considerable proportion of land on large estates is left lying idle. On the other hand, small farms are usually overcrowded due to an abundant labour supply. This excess workforce is a result of their inability to provide full employment for their owners and from the considerable supply of landless labourers.

These small farmers have a higher propensity to utilize land due to surfeit labour and fundamental subsistence needs. Furthermore, they are own-consuming, so if prices are unfavourable, small farms can consume their own output as opposed to selling it, thus reducing the risks involved in production and encouraging higher output levels.³¹ Risks are also reduced because they predominantly hire family labour who exercise greater care and effort in cultivation. Moral hazard problems arise when outside labour is employed. They must be continuously supervised, and, as farm size increases, this supervision constraint becomes more binding thus increasing costs and diminishing profits.³²

Remuneration on small, family farms is typically allocated in the form of shared output, hence, wages approximate to the average product. In general, competitive farms pay workers their marginal products, however in developing countries, large farms characteristically exploit labour by exercising monopsony power in the labour market. As a result, wages and employment are lower compared to what exists under competitive conditions. Therefore, by combining the excess labour on small farms with the idle land on large holdings, a land reform can stimulate superior land utilization generating higher productivity levels, greater competition and output, and ultimately improved agricultural wages(provided that returns are distributed equitably).

³¹ This may also promote the production of staple foods, which in turn reduces specialization. (Berry and Cline, 1979, P 12)

³² Heltberg, 1998, P 1816

In addition, an empirical study by Rosenzweig (1978) of 5000 households in India, found that a redistribution of land which reduces landholding inequality would raise agricultural wages. This can be explained by the premise that, if redistribution were to occur, the demand for labour of labour-importing farms would remain the same or increase, and the supply of labour would decrease from labour-exporting households. The net effect would be higher wages and reduced inequality.³³ In the ideal, this reallocation and improved wages are expected to increase the demand for food and simple manufactured goods, spurring investment in the local agricultural and industrial sectors, subsequently generating economic growth for the country as a whole.

However, a simple redistribution of land is insufficient to achieve these objectives. Redistributive land reforms encompass all aspects of society whether being economic, social, cultural or political, and therefore supplementary programs must be implemented in order to facilitate these goals. Otherwise it may actually lead to a step backward in terms of the economic well-being of the state in question. Governments routinely support urban development disregarding the rural and agricultural sectors of the economy. It is these policy distortions that artificially channel resources away from agriculture. Public investment is concentrated on urban transportation, communications and irrigation. Investment in human capital formation is also funnelled towards urban centres, for instance education, training, research, religion and health. Agricultural development and land reforms should be seen as complementary.³⁴ Therefore, in order to provide such services the government must eliminate this urban bias. Social connectivity

³³ However, his theoretical analysis was indeterminate. Also, the empirical study found that reduction in land inequality would exacerbate existing sex and age wage differentials. (Rosenzweig, 1978, P 858)

³⁴ Griffin et al., 2002, P 316

and community development is also essential and should be encouraged to provide an outlet for collaboration and specialization within the local area.

More often than not, policies in developing countries favour large-scale farming and the production of export crops. For this reason institutions must be developed and enhanced to contribute to a more level playing field. Supervised credit and finance must be made available to reform beneficiaries in order to compensate for imperfect capital markets. Subsidies that support large farms should be withdrawn (for example price support policies) and progressive taxes should be enforced.³⁵ Cooperatives should be encouraged to allow small farmers to pool their risk so they can benefit from lower interest rates and improve their ability to invest in machinery that would have been otherwise too expensive. Extension, research, water distribution and institutional policies that discriminate against the poor and landless peasants should be removed and replaced with more equitable programs.

Often small farmers have been criticized for not being very dynamic in terms of adopting new technologies and farming practices. As a result, government agencies must offer technical assistance and education to stimulate greater efficiency and productivity.³⁶ More often than not, leaders employ a top down approach to decision-making that exclude culture, religion, and the like. This will prove fruitless because redistributive land reforms are not standardized procedures. They should be dynamic, constantly evolving, providing feedback from the bottom up. The overall process should be implemented quickly and transparently in order to reduce the uncertainty to landowners and

³⁵ These fiscal measures can help finance the land reform as well as reduce inequality.

³⁶ Relatively simple information on anti-erosion procedures, for example terracing and multi-cropping, can broaden farmers capabilities for increased output.

beneficiaries. If the theory is sound and the appropriate steps are taken, the results should be favourable and inequality will be lowered while improving productivity.

4. Illustration of the Data and its Shortcomings

The data in this study are from the Guatemalan Agricultural Census of 1950, which was collected in a standardized form and orchestrated in collaboration with the United Nations' Food and Agriculture Organization (FAO). The data are categorized by type of crop, farm-size at national and the twenty-two departmental levels.³⁷ Farm-size is partitioned into twelve intervals ranging from less than one manzana to greater than two hundred caballerías.³⁸ For each crop there are three observations per departmental farm-size interval, which include the number of farms, the area cropped or harvested and the total production for that interval.

There are several limitations that must be mentioned concerning the quality of the data used in this study. To begin with, departmental production was not provided by the census for millet, broad beans and tobacco and thus projected production quantities were used; which were projected based on their individual total outputs.³⁹ Furthermore, gross output for the country and per department was not given and therefore was calculated. Following the methodology from Dylan Ramshaw (2004), ten crops were selected based on the criterion that "their total land harvested represented at least five percent of the total land harvested for at least one department for that year".⁴⁰ The gross output for each crop was converted into values expressed in US dollars by using the Agricultural Crop Prices

³⁷ A department is the equivalent to a county. See Figure 1 in Appendix D

³⁸ 1 manzana = approximately 0.7 hectares, 1 caballería = 64 manzanas = approximately 45 hectares

³⁹ Ramshaw, 2004, P 20.

⁴⁰ Ramshaw, 2004, P 19.

in Guatemala for 1950 used by Dylan Ramshaw (2004).⁴¹ It was used to measure farm productivity because labour and capital inputs are not incorporated into the data set.

Furthermore, because land value is not measured, all land is treated as homogenous. This will cause biases in the regression because variations in land quality, such as topography, soil quality, proximity to local markets, asymmetrical prices, water availability and the capitalized value of other intangible assets, are not accounted for. The effects of these omitted variables are unknown. In addition, due to the cross-sectional nature of the data set, random effects, such as changes in weather, and fixed effects (unobserved farm heterogeneity), such as farming skills and experience, are omitted from the analysis causing further biases. A more appropriate study could consider longitudinal or panel data to account for these disturbances.

Variation is also lost due to aggregation of farms into farm-size intervals and due to the possible omission of the very smallest of farms (less than one manzana) in the samples.⁴² This aggregation, Dyer (2004) claims, reduces the farm heterogeneity and results in an inverse correlation between farm-size and productivity because, at the ‘macro’ level, large farms have poorer soil quality than small ones.⁴³ However this was not the case for Guatemala where small farms were typically located on the poorest agricultural land. Lastly, caution must be exercised when using data from developing countries, and thus, a “certain degree of human arbitrariness”⁴⁴ must be considered. This is because data may be corrupted due to biases in reporting both on the part of the farmers (who may be tempted to over- or under-report output for different reasons) and

⁴¹ See appendix A (Ramshaw, 2004, P 50)

⁴² As a result data was not further aggregated.

⁴³ Cities are generally built on or in close proximity to the best agricultural land in a country; therefore large farms tend to be located in the peripheries where soil is less fertile reducing productivity.

⁴⁴ Cornia, 1985, P 518.

by the census officials (government padding) due to various legal and institutional requirements, whatever they may be. Moreover, official statistics “fail to capture the dynamic character of the continuing struggles between different competing actors to effectively control land resources.”⁴⁵

5. Methodology

In order to make comparisons with other studies the techniques used by Berry and Cline (1979) and Cornia (1985) were implemented. An investigation into the existence of the inverse relation in Guatemala in 1950 was conducted using regression analysis on seven dependent variables, namely gross output and the output of the six major crops (corn, bananas, coffee, wheat, black beans and rice).⁴⁶ Analysis of the other major crops provided could not be undertaken due to data limitations (broad beans, millet and tobacco). Also, because of the aggregation of farms into farm-size intervals, average farm area had to be employed as an independent variable rather than the actual harvested area for each farm, hence reducing variation in the sample.

The six regressions below were implemented for each of the six crops and for gross output.

$$(a) Q/X = \beta_0 + \beta_1 \log X/N$$

$$(b) Q/X = \beta_0 + \beta_1 \log X/N + \beta_2 D_1 + \beta_3 D_2 + \beta_4 D_3$$

$$(c) Q/X = \beta_0 + \beta_1 \log X/N + \beta_2 D_1 + \dots + \beta_5 D_4 + \beta_6 D_1 \log X/N + \dots + \beta_8 D_3 \log X/N$$

$$(d) \log Q/X = \beta_0 + \beta_1 \log X/N$$

$$(e) \log Q/X = \beta_0 + \beta_1 \log X/N + \beta_2 D_1 + \beta_3 D_2 + \beta_4 D_3$$

$$(f) \log Q/X = \beta_0 + \beta_1 \log X/N + \beta_2 D_1 + \dots + \beta_5 D_4 + \beta_6 D_1 \log X/N + \dots + \beta_8 D_3 \log X/N$$

⁴⁵ Borras Jr, 2006, P 92

⁴⁶ See Table 1

Where Q is gross output, X is farm area harvested for all farms per size interval, X/N is average farm area (harvested farm area per interval divided by the number of farms in that interval), and D_1 through D_3 represent different regions of Guatemala giving reference to Higbee's 1947 description. The four regions are the Petén and Caribbean lowlands (D_1), the South Eastern valleys, plains and mountains (D_2), the Highlands (D_3) and lastly the Pacific lowlands and Piedmont areas (which are the base). These dummy variables help to explain the differences among Guatemala's physiographic zones thereby reducing the possibility of misinterpretation of the results.

6. Empirical Results

Employment of the above regression analysis on the sample data has found differing results for each crop and an overall inverse relationship for gross output. Firstly, the productivity of coffee and bananas was found to be inversely correlated with farm-size suggesting that smaller farms are more efficient than larger ones.

Coffee and bananas were the two major export crops and were commonly produced on large plantations; therefore these results are a little peculiar given their typical character of cultivation in Guatemala in 1950. One would expect the reverse to occur because large farms likely employed more advanced farming techniques, superior access to irrigation facilities, heavy machinery, better quality soils, fertilizers and pesticides, were better located in terms of temperature, altitude and market proximity. Whetten (1961) describes a number of reasons why inefficiency may have prevailed on large coffee plantations, of which absentee ownership, insufficient capital investment,

inefficient management and operation of government owned plantations, and backward methods of production were suggested.⁴⁷

Banana farming in Guatemala was dominated by two fruit companies: the United Fruit Company and the Standard Fruit Company. Table 2 shows that almost 73 percent of all bananas were produced on farms greater than 200 caballerías. The United Fruit Company was foreign controlled and had a virtual monopoly over the sector.

Furthermore, it was allowed many concessions by the Guatemalan government such as low taxes and import duties on equipment and supplies.⁴⁸ It is understandable to see that these allowances, coupled with the lack of competition in the market and absentee management could have contributed to inefficiencies on large plantation banana farms.

Conversely, wheat and rice were primarily produced by small farms (almost 90 percent of wheat and 76 percent of rice was produced by farms less than 32 manzanas in size)⁴⁹ and were also found, in general, to have significant inverse relationships. The results for coffee, banana, wheat and rice give credence to favour redistributive land reforms.

On the other hand, corn productivity has been shown to have a positive correlation with farm-size both for the first and second harvest period (see tables 7 & 8). Hence corn productivity increases exponentially as farm-size increases which suggests that large farms are more productive than small ones. However, corn was generally cultivated for subsistence purposes and was widely distributed throughout the different departments. As can be seen in Table 2, 90 percent of corn was produced in farms that were less than 10 caballerías (451 hectares) in size and over 65 percent was produced on farms smaller than 10 manzanas (7 hectares). In 1964, 78 percent of agricultural land was

⁴⁷ Whetten, 1961, P 127-128

⁴⁸ Whetten, 1961, P132

⁴⁹ See Table 2

devoted to the production of corn.⁵⁰ It is unlikely that this figure changed much during the period and may have in fact been higher. Fletcher et al. (1970) also show that corn yields were highest on large farms and explains that this may have been due to improved seed, fertilizer, soil and modern techniques practiced on these large farms. This may suggest that redistributive land reforms may not be economically viable when considering the production of corn. However Fletcher et al. suggest, practices such as inter-planting of beans and double cropping which were more prevalent on smaller farms may have also contributed to this phenomenon.⁵¹ Therefore, inter-planting with beans may reduce the productivity corn. Furthermore, in Guatemala, the majority of small farms were situated on low quality soils in high altitudes where crops took long to mature. An analysis of black beans will help resolve some of these questions.

Beans were the second most widely produced crop in Guatemala and were also cultivated predominantly for subsistence. Table 2 illustrates that over 65 percent of all black bean production takes place among small farmers (that is less than 10 manzanas) and in 1964 twelve percent of agricultural land was planted with them. The results show that four of the six regressions find a significant inverse relation, however both regressions that include slope dummies find an insignificant positive correlation. It is difficult to know which results are more accurate. Still it may be plausible that the inter-planting of black beans with corn could also have produced lower yields on small farms.

However, although the inter-planting of corn and black beans may cause productivity to be lower on small farms for each crop, on the whole, these farms may actually be more productive than large ones as a result of this farming practice. Further

⁵⁰ Fletcher et al., 1970, P 78

⁵¹ "Yields were generally lower for inter-planted corn in 1964." (Fletcher et al., 1970, P 78)

analysis was undertaken to attempt to shed light on the matter. However, due to the limited nature of the data it is impossible to know which farms practised the inter-planting of beans with corn. Therefore, three sets of the above regressions were run using different dependent variables to estimate the varying possibilities of inter-planting. These dependent variables consisted of; the total value of corn and black beans divided by the area of corn's first harvest, the total value of corn's first harvest plus the value of black beans divided by the area of corn's first harvest, half the total value of corn's first harvest plus the value of black beans divided by half the area of corn's first harvest.⁵²

The results showed primarily insignificant positive relationships between farm-size and productivity.⁵³ However, dummies for the highlands and south eastern part of the country were significant and negative suggesting that there was higher productivity in these regions. It is possible that these are more productive due to a greater degree of inter-planting especially in the highlands where farms are predominantly small and soil quality is poor. Unfortunately this cannot be determined without a more detailed data set. Nonetheless, when gross output is considered, the results suggest that small farms are more productive than large ones because a significant inverse relationship is found between farm-size and productivity in all regressions.⁵⁴ Therefore a redistribution of land from large, inefficient farms to small, productive ones may contribute to greater yields and spur further development throughout Guatemala.⁵⁵

⁵² These regressions attempt to analyze a few of the many different possibilities than can occur in the inter-planting of corn and black beans production. The last dependent variable considers that not all farms practise inter-planting.

⁵³ See in tables 11 through 13 in Appendix C

⁵⁴ Significance levels less than 10% were not considered.

⁵⁵ Note well, these results are suggestive rather than definitive.

7. The Guatemalan Experience

The Guatemalan experience with redistributive land reforms commenced with the inauguration of the Guatemalan Constitution of 1945, which opened the doors to future reform policy. It prohibited *latifundias* and their further extension, made provisions for the expropriation of private property in the public interest and encouraged the formation of labour unions.⁵⁶ Jacobo Arbenz became president in 1951 and set about establishing a system of reforms. On June 17, 1952 the Agrarian Reform Law was passed. Its purpose was to “abolish the feudal land system” and pave the way for industrialization.⁵⁷

The government expropriated uncultivated, idle land from estates larger than 2 *caballerías* (223 acres).⁵⁸ This land, along with prior government plantations, were subdivided and allocated to beneficiaries. Most of the recipients obtained a lifetime use contract rather than a full land title, and had to pay a rental fee of 3 percent of the annual value of the crop.⁵⁹ Allotted land could not be sold for 25 years but could be rented out. Upon death the property returned to the state, however, dependents were the first to be considered in its reassignment.⁶⁰ The expropriated land was paid for with long-term agrarian, government bonds and the National Agrarian Bank would supply credit at reasonable rates to beneficiaries for development.⁶¹

Nevertheless, problems and conflicts erupted due to poor policy, uncertainty and corruption. Land and housing previously assigned by *latifundistas* to *colonos* were to be

⁵⁶ Whetten, 1961, P 152

⁵⁷ Whetten, 1961, P 153

⁵⁸ Whetten, 1961, P 154

⁵⁹ Whetten, 1961, P 155

⁶⁰ Whetten, 1961, P 155

⁶¹ These were 3% interest bearing bonds with a maximum maturity of 25 years. (Whetten, 1961, P 155)

expropriated and allotted to the *colonos* permanently.⁶² After distribution landlords' properties often became fragmented because the *colonos*' plots were usually dispersed throughout the plantation. Needless to say, many *latifundistas* became cantankerous, and some even resorted to burning the *colonos*' houses down.⁶³

These problems were further aggravated by the lack of recourse proscribed by the Agrarian Law. The President's decision was final and anyone who opposed the law violently or subversively could have all of their land sequestered without compensation. Naturally the law was seen as an authoritarian measure and unconstitutional, by the *latifundistas*.⁶⁴ Although remuneration was offered for expropriated land, it was claimed that this was not appropriate because there had not been any general re-evaluation of the agricultural properties since 1931.⁶⁵ Therefore, compensation was usually substantially lower than the market dictated. For example, the United Fruit Company alleged that its property was worth 26 times more than the offer price made by the government.⁶⁶ The opposition argued that, because much of the expropriated land was in favour of the government and recipients received lifetime use contracts rather than full titles, the program was used to control the peasants rather than help them. Guatemalan leaders were gaining tremendous political control.⁶⁷

Furthermore, the program proceeded so hurriedly that there was no time for adequate planning. Often, land that was distributed had not yet been surveyed. The atmosphere was one of "widespread unrest, confusion and disorder."⁶⁸ Subsequently, in

⁶² *Colonos* are resident workers on *latifundias*.

⁶³ Whetten, 1961, P 158

⁶⁴ Whetten, 1961, P 159

⁶⁵ Whetten, 1961, P 159

⁶⁶ Whetten, 1961, P 160

⁶⁷ Whetten, 1961, P 160

⁶⁸ Whetten, 1961, P 162

1954 with CIA (Central Intelligence Agency) backing, the Arbenz government was overthrown by an invasion, launched by Guatemalan exiles in Honduras, under the leadership of Colonel Carlos Castillo Aramas.⁶⁹ The Aramas government suspended Agrarian Law and repossessed almost all of the land previously distributed, even the national *fincas*. It was believed that this new government favoured the *latifundistas* rather than the general population, specifically, the poor.⁷⁰ Guatemala has never had another reform and still suffers from many of the ills that the Arbenz government tried to alleviate.

8. The Experiences of Others

Redistributive reforms in other countries have been pursued with differing consequences. The Mexican reform, for example, has had much notoriety but mixed results. It was initiated much earlier than the Guatemalan reform; in 1915 before communism was an issue.⁷¹ In the 1930's agricultural output growth was positive because redistributed land was of "good quality unused cropland".⁷² However, it became negative in the seventies when the land allotted to beneficiaries was already being farmed using efficient techniques. Beneficiaries could not sustain these methods, and as a result, growth in farm output dropped from 5 percent to below 3 percent per year.⁷³ It has been suggested that these problems are the product of the unforeseen demographic explosion and due to the structure of the Mexican land reform.

⁶⁹ Whetten, 1961, P 162

⁷⁰ Whetten, 1961, P 166

⁷¹ Therefore the US did not see it like a threat to national security, unlike the case of Guatemala.

⁷² Yates, 1981, P 751

⁷³ Yates, 1981, P 751

Ejidatarios had no exit options.⁷⁴ That is to say, they were not permitted sell, rent or sub-divide their land; it could only be passed on through inheritance.⁷⁵ Therefore, beneficiaries that were not proficient in farming, or had no inclination towards it, had no other alternatives. Moreover, because the *ejidatario* did not have a property rights, he could be relocated by fiat of the *ejido* president at any time.⁷⁶ As a result, beneficiaries had little motivation to accumulate savings and invest in land development. It is claimed by Yates (1981), that greater productivity could be achieved if these limitations were removed through land titling and better finance.

Another important study by Lerman shows that of 20 countries in East Central Europe (ECE) and from the Former Soviet Union (FSU), which had major restructuring of their agricultural base, only a few managed to achieve any significant growth.⁷⁷ Different strategies of reform were applied throughout the region. These involved the distribution of land to former owners as well as agricultural workers with and without payment, expropriation and distribution of land to collectives and family farms, and distribution through individual entitlement rights to shares of land in collectives.⁷⁸ Although there was a greater diversity of farm ownership than under the previous system, in most instances, the new structure was still very much like the old. Moreover, those countries that outperformed the rest were more individualized and market-oriented, and achieved agricultural growth rates of 11 to 46 percent, during the period 1992 to 1996.⁷⁹

⁷⁴ Each plot of land is called an *ejido*, and is usually divided into sections which are individually operated. *Ejidatarios* are *ejido* members.

⁷⁵ Whetten, 1961, P 164

⁷⁶ Yates, 1981, P 750

⁷⁷ Lerman, 1999

⁷⁸ Lerman, 1999, P 271-272

⁷⁹ Lerman, 1999, P 274

Zimbabwe has also undergone a major restructuring of its agricultural base through redistributive land reform. However, this policy has not been successful in terms of improving the standard of living of the rural poor, in actuality, it has exacerbated conditions. Beneficiaries have been, for the most part, middle-class Zimbabweans. In addition, these reforms have had a devastating impact on agricultural output.⁸⁰ Thus further exemplifying the difficulty in achieving even a moderately successful outcome to land reform.

9. Rethinking Redistributive Land Reform

The above discussion suggests that there are many problems and shortcomings to redistributive land reform, from both theory and evidence. To begin with, the hypothesis of an inverse relationship has been highly contested by many authors, for example, Dyer, Bernstein and Byres. The argument is not so much that this correlation cannot and does not exist, but rather that the relationship is unlikely to emerge given current technology and political institutions. Since the Green Revolution, it has been argued that increasing returns are experienced in agriculture in developing countries. This is due to advances in modern farming technology and techniques, such as, High-Yielding Varieties of seeds (HYV), improved mechanization, fertilizers and pesticides. As a result, higher yields can be achieved by larger farms causing the fabric of the inverse relationship to breakdown, or so it is claimed.⁸¹

Although many authors, such as Dyer (2004), have argued that this inverse relationship is unlikely to occur or may even be reversed since the advent of the Green Revolution, or that the results demonstrating this phenomenon are spurious because they

⁸⁰ Byres, 2004, 13

⁸¹ The above analysis of corn may show that corn is not suitable for redistributive purposes due to its positive correlation with productivity.

do not account for omitted variables such as ability and land quality, a study by Heltberg (1998) has found otherwise. Heltberg (1998) uses a panel data set of Pakistan which covers 14 rounds over the five years from 1986-1987 to 1990-1991.⁸² His analysis found a strong support for the existence of an inverse relationship post-dating the Green Revolution even when controlling for the fixed and random effects described above.⁸³

Despite these results, critics allege that the assertion that small farms are more productive than large ones is questionable, and that the productivity after redistribution is likely to fall. Small farmers have different incentives, culture, and the like as compared to large farmers; utility rather than profit maximization is likely to be a more appropriate motivation for behaviour. Therefore, it is argued “poverty and unemployment rather than leisure preference are the main reasons why small farmers intensify family labour use.”⁸⁴ Thus, when output increases, productivity is likely to fall because previous obstacles, such as debt and subsistence income, are less constrictive and may encourage farmers to relax their labour effort.⁸⁵ This will also negatively affect the level of savings and capital accumulation, as well as the adoption of new technology. As Griffin et al. (2002) propose “the problem is not the motivation of small farmers but the inability of small farmers to innovate, e.g. because of lack of access to financial capital.”⁸⁶ Thus, if support systems are well grounded much of these problems can be alleviated or overcome. However, a major criticism of the state-led approach is that does not or cannot provide these facilities adequately, if at all.

⁸² Heltberg, 1998, P 1810

⁸³ Heltberg, 1998, P 1824

⁸⁴ Sen, 1981, P 209

⁸⁵ Dyer, 2004, P 52

⁸⁶ Griffin et al., 2002, P 318

Opponents claim that it is highly inefficient, bureaucratic, corrupt and costly.

Features such as ceiling legislation have not only caused substantial controversy in terms of what is the optimum size of a feasible holding, but have also been very costly due to extensive lobbying and evasion. Rent seeking by landowners and government officials has lead to considerable bribery and corruption, tenure insecurity and red tape. State-led land reforms generally employ a top-down approach to decision making which, by and large, fails to “capture the diversity between and within local communities” and is unable to respond quickly to their needs.⁸⁷ Social unrest and class conflict often arise when reforms are too conservative or too ambitious and where strategic possibilities occur resulting in the status quo outcome.⁸⁸ Due to these deficiencies in the state-led approach governments often consider less direct methods of redistribution.

Indirect reforms do not result in major restructuring of the agrarian base, rather they attack inequality by using non-invasive methods. Colonization is one approach considered by governments in Latin America. It involves the distribution of state land that was previously prohibited to the public. This land is usually unsuitable for agriculture because it is typically located in unexploited jungles and mountainous regions, thus, development is very costly. These programs generally progress slowly and are unable to keep up with rural population growth rates. Moreover, governments often allocate land to the urban middle class rather than to the rural, landless poor.⁸⁹ “The

⁸⁷ Borras Jr, 2003, P 368

⁸⁸ Horowitz, 1993, P 1009

⁸⁹ “In Guatemala, for example, between 1954 and 1962 only 6000 families, many from the urban middle class, received family-scale units in colonization zones.” Furthermore, this was “less than 7 percent of the demographic increase of the rural population.” (Barraclough, 1973, P 42)

evidence indicates that official colonization activities do not compare favourably with settlement which occurs spontaneously without governmental aid.”⁹⁰

Critics allege that tenure insecurity reduces the incentives for tenants and landlords to invest thus decreasing avenues for growth and productivity. However, Griffin et al. (2002) claim that, in practice, landowners invest in the fixed assets while renters invest in the movable assets of the farm. Also, “tenure insecurity is an integral part of an efficient sharecropping arrangement” which reduce the risks of the parties involved as well as the costs of monitoring and supervising labour. Therefore, “the case for land reform rests not on the existence of defective tenure contracts but on the concentration of landownership rights and the inefficiency, inequality and poverty which this creates.”⁹¹

Other indirect instruments commonly used in Latin America are tenure and labour contract regulation. The purpose of these regulations is to ensure that there is a balance in the bargaining power, and involves the arbitration and mitigation of conflicts between landlords and *campesinos* (peasants), the provision of social insurance, the application of minimum wages and acceptable working conditions.⁹² On the whole, these provisions do not achieve their objectives and are almost impossible to enforce due to the power of the *latifundistas*. In some cases, the results were counterproductive, for example in Colombia, Peru and Argentina tenants on large *haciendas* (plantations) were evicted so as to avoid the effects of the new tenancy laws. Landlords also tended to substitute labour

⁹⁰ Barraclough, 1973, P 43

⁹¹ Griffin et al., 2002, P 283-284

⁹² Barraclough, 1973, P 44

with machinery to avoid future conflict. Accordingly, it is believed that this regulation is linked to the violence in the countryside in rural Colombia.⁹³

Often progressive land, income and inheritance taxes are introduced to level the playing field. Their function is to raise the opportunity costs of idle land, discourage inefficiency by promoting higher cropping intensity and productivity, and increase the supply of land hence reducing its price. However, taxes are not usually implemented properly and tend to penalize productive farmers because they are applied to sales, imports, exports and farm wage payments rather than where they were initially intended. They are often too low, non-existent or evaded by landlords. Cadastral maps are required to determine the appropriate amount of tax. These are typically outdated or absent, and are expensive to revise. As a result, taxes are costly to enforce and implement and are not popular even among potential beneficiaries.⁹⁴

Industrialization is another policy of indirect reform, but it generally grows too slowly to absorb the population growth of the country. In addition, developing countries usually have poor internal markets which obstruct the necessary investment required for industrialization. As a result, as with all other reform approaches, industrialization must be employed in conjunction with supporting systems and cannot be considered a miracle cure. Due to the often undesirable experiences with state-led redistributive reforms, the World Bank has pushed for Market-Led Agrarian Reform (MLAR).

10. Market-Led Agrarian Reform (MLAR)

As its name suggests, MLAR is more conducive to the market and capitalism than the socialistic state-led approach. It is a voluntary program that offers 100 percent spot cash

⁹³ Barraclough, 1973, P 44

⁹⁴ Barraclough, 1973, P 46

based on the full market value of the land. It targets regions where there is land in excess supply, so as not to increase prices.⁹⁵ It utilizes a self selection process, therefore, only the most appropriate individuals will be selected. Applicants with human capital as well as previous savings, who have better access to local social networks and land market information, are likely candidates.⁹⁶ Beneficiaries must produce farm plans prior to purchase so that development proceeds more rapidly. Furthermore, they must create a collective organization in order to pool their risks and offer enhanced bargaining power when negotiating with landlords.

MLAR is a decentralised approach that promises speed, transparency and accountability. The government's purpose is to ensure equity by providing arbitration and tax collection, as well as reducing subsidies and protective instruments that aid large farmers. In addition, the government offers a flexible loan-grant financing in which beneficiaries must repay 100 percent of the cost of the land and the remainder is given as a grant for primary development.⁹⁷ The property is owned by the beneficiary and certified through a progressive land titling system. Therefore, loans can be repaid easier than under the state-led approach because land titles are honoured as collateral. Furthermore, exit options are available to less adequate farmers because land can be freely sold or rented to more fitting ones, allowing for greater competition and efficiency.

Land prices are lower because the market price of land is paid rather than the staggered method used under the alternative, in which landowners inflate prices to account for increased risks and other transaction costs. Also, beneficiaries repay 100 percent of the land cost and future investment is expected to be funded by multilateral

⁹⁵ The ideal ratio of land supply to demand is 3:1. Borras Jr, 2003, P 371

⁹⁶ Borras Jr, 2003, P 371

⁹⁷ Borras Jr, 2003, P 373

and bilateral aid agencies.⁹⁸ Therefore, MLAR is alleged to be less costly than the redistributive state-led approach.

The experiences of the program in Brazil, Colombia and South Africa, however, have been disappointing. Albeit MLAR was supposed to reduce inequality by providing land to the rural poor, they were generally excluded from the process. There was a significant bias against the poor and illiterate because potential recipients had to manage overwhelming amounts of paperwork in order to fabricate farm plans. Accordingly, the majority of beneficiaries were above the poverty line and were often rich peasants.⁹⁹ Furthermore, political power and information asymmetries were paramount to the breakdown of MLAR objectives. The procedure was highly obscure and unaccountable due to considerable manipulation of the self selection process by local government officials, interested church people and elite peasant leaders.¹⁰⁰ With the exception of Brazil, the procedure was highly centralized and leaders withheld information to serve personal agendas. Beneficiaries were not adequately represented and had limited capacities to negotiate and resolve conflicts within organisations, thus strategic possibilities that preserve the status quo were commonplace.¹⁰¹

In addition, methods were not executed correctly or effectively in all of the sample countries. For example, South Africa and Colombia did not employ the flexible loan-grant mechanism for finance and although Brazil did, it was unsuccessful in achieving its objectives.¹⁰² This financing scheme caused land prices to be higher than

⁹⁸ Borras Jr, 2003, P 373

⁹⁹ In South Africa 25 percent of the beneficiaries were above the poverty line. (Borras Jr, 2003, P 387)

¹⁰⁰ Borras Jr, 2003, P 378

¹⁰¹ Borras Jr, 2003, P 387

¹⁰² South Africa employed a 100 percent grant for land purchase and Colombia used a 70 percent grant of the 100 percent land price. (Borras Jr, 2003, P 388)

expected to the extent that there was substantial overpricing of land in Colombia.¹⁰³ Also, progressive land taxes and land titling procedures were not introduced in any country. Grants given were insufficient throughout the regions because land acquired was usually marginal, located in under-populated, remote areas and/or had no irrigation, and therefore required extensive development. Subsistence crop production dominated which resulted in slow and uncertain progress and caused extension services to be inundated with resettlement costs, infrastructure construction and subsistence expenditure.¹⁰⁴

MLAR has not achieved a truly redistributive function the way the state has demonstrated in other countries. In fact, based on the criterion later described by Borras Jr (2006) MLAR has no real redistribution function because it requires 100 percent payment at the market price. For a land reform to be redistributive, he argues, the amount received by the landowner must be more than zero but less than the market price and the sum paid by the beneficiary must be more than zero but less than the acquisition cost.¹⁰⁵ The degree of redistribution depends on these values and allows for an analytical tool for comparison purposes.

Needless to say South Africa's performance was meagre, indeed negligible, in terms of redistributive purposes.¹⁰⁶ It has been suggested by many scholars, such as Bernstein and Byres, that these market-friendly operations may, in fact be a response to rural social struggles and political disturbances over land, rather than purely 'productionist' and/or 'welfarist' intentions. Systematic "land demarcation, titling and

¹⁰³ Borras Jr, 2003, P 387

¹⁰⁴ In Brazil, daily subsistence for the first year represented 20 percent of the total grant. (Borras Jr, 2003, P 380)

¹⁰⁵ Borras Jr, 2006, P 74

¹⁰⁶ 1.65 percent of the target lands and 2.5 percent of the total target of rural poor was realized. (Borras Jr, 2003, P 385)

registration” may “reflect a desire to protect the boundaries and property rights of larger-scale capitalist farms.”¹⁰⁷

11. Some Final Comments

Guatemalans that rely on agriculture for their livelihood have survived on subsistence wages ever since the forced labour era definitively ended in the October Revolution of 1944.¹⁰⁸ In addition, in 1982 approximately 30 percent of adult males economically active in agriculture were landless or without permanent employment.¹⁰⁹ Therefore it is clear that Guatemala still relies heavily on agriculture and inequality still remains rampant resulting in class conflicts and civil war. In countries such as these, for instance Zimbabwe, South Africa and in Latin America where there is an unwavering disparity in landholding, there have been invasions and occupations of land. It is these regions that require comprehensive, radical reforms that actually deliver redistribution.

In order to change these apparent paths of development, sweeping restructuring of the agrarian base must occur and must increase the power of the rural poor and landless to control the land resources, with a corresponding decrease in the share of the power of those who previously had such power.¹¹⁰ Essentially power redistribution is needed. However, typically, “those countries with the most need for massive reforms are by definition short of capital, trained personnel, and a tradition of successful reforms.”¹¹¹ Therefore great care and deliberation must be undertaken so that the reform process

¹⁰⁷ Bernstein, 2002, P 450

¹⁰⁸ Corn wage rate has been “virtually constant throughout the free labour period at the level of some 30 pounds a day”. (Schweigert, 2004, P 548)

¹⁰⁹ Hough et al., 1982, P 77

¹¹⁰ Boras Jr, 2006, P 73

¹¹¹ Barraclough, 1973, P 57

meets the criteria provided above, for instance accountability, transparency and a decentralized nature.

Global politics have undergone many changes over the last century. Perspectives on poverty alleviation have evolved with political movements; from state 'activism', to 'developmentalism', to globalisation and commoditization.¹¹² Views on land reform have also changed with time. Governments, NGO's (Non-governmental Organisations), and the like, have pushed for market-oriented, voluntary methods to land reform, rather than the more socialistic state-led approach, as a means to facilitate capitalism and economic growth. However, as this paper has demonstrated political manipulation, even at decentralized, local levels, plays a crucial role in land reform and cannot be disregarded. Indeed, it has been noted by Griffin that "it is conceivable, even likely that power at the local level is more concentrated, more elitist and applied more ruthlessly against the poor than at the centre."¹¹³ Therefore, in order to promote a successful reform, whether it be state-led, market-led, direct or indirect, transparency and accountability are fundamental.

Redistributive state-led land reforms, although littered with obstacles, should not be conceived as obsolete means to extinguish inequality. For, many countries, like Guatemala and Zimbabwe, still have extremely, obstinate, disparate allocations of land and wealth, and market-friendly approaches appear incapable of achieving rapid, widespread redistribution that is so desperately required. Furthermore, the recent research by Heltberg (1998) demonstrates that there is strong evidence for the existence of the inverse relationship even after the advent of the Green Revolution in Pakistan. Although the results of this paper have also supported a significant inverse relationship for gross

¹¹² Bernstein, 2002

¹¹³ Griffin, 1980, P 225

output and some of the major crops in Guatemala, this analysis is outdated and future research should be undertaken (perhaps on the recent 2003 agricultural census) to find more pertinent, contemporary results. Furthermore, it also shows that redistribution may not be feasible for all crops (for example corn) as a method of increasing output and economic efficiency. However, it is possible (even probable) that this inverse correlation found is still relevant due to the nature of Guatemala's current inequality and polarised agriculture.

Thus, for countries that have dualistic agrarian bases and persistent disproportionate allocations of land and power, redistributive land reforms (in conjunction with the necessary supports systems) should still be considered as an effective policy option.

12. Bibliography

Bachman, Kenneth L. and Raymond P. Christensen. "The Economics of Farm Size," in *Agricultural Development and Economic Growth*, edited by Bruce F. Johnston and Herman M. Southworth. Ithaca, New York: Cornell University Press, 1967, pp. 234-262.

Barraclough, Solon L. "Agricultural Policy and Land Reform," *The Journal of Political Economy*, Jul. – Aug. 1970, Vol. 78, No. 4, Part: 2 Key Problems of Economic Policy in Latin America, pp. 906-947.

Barraclough, Solon. *Agrarian Structure in Latin America*, Lexington, Massachusetts: D.C. Heath and Company, 1973.

Bernstein, Henry. "Land Reform: Taking a Long(er) View," *Journal of Agrarian Change*, Oct. 2002, Vol. 2, No. 4, pp. 433-463.

Berry, R. Albert and William R. Cline. *Agrarian Structure and Productivity in Developing Countries*, Baltimore, Maryland: The Johns Hopkins University Press, 1979.

Borras Jr, Saturnino M. "Questioning market-Led Agrarian reform: Experiences from Brazil, Colombia and South Africa," *Journal of Agrarian Change*, July 2003, Vol. 3, No. 3, pp. 367-394.

Borras Jr, Saturnino M. "The Philippine Land Reform in Comparative Perspective: Some Conceptual and Methodological Implications," *Journal of Agrarian Change*, Vol. 6, No. 1, Jan. 2006, pp. 69-101.

Byres, Terrence J. "Introduction: Contextualizing and Interrogating the GKI Case for Redistributive Land Reform," *Journal of Agrarian Change*, Jan. And April 2004, Vol. 4, Nos. 1 and 2, pp. 1-16.

Byres, Terrence J. "Neo-Classical Neo-Populism 25 Years On: Déjà Vu and Déjà Passé. Towards a Critique," *Journal of Agrarian Change*, Vol. 4, Nos. 1 and 2, Jan. and Apr. 2004, pp. 17-44.

Cornia, Giovanni Andrea. "Farm Size, Land Yields and the Agricultural Production Function: An Analysis for fifteen Developing Countries," *World Development*, 1985, Vol. 13, No. 4, pp. 513-534.

Deininger, K., and L. Squire, "A New Data Set Measuring Income Inequality," *The World Bank Economic Review*, 1998, Vol. 10, No. 3, pp. 565-591.

Deininger, Klaus, Hans Hoogeveen and Bill H. Kinsey. "Economic Benefits and Costs of Land Redistribution in Zimbabwe in the Early 1980s," *World Development*, 2004, Vol. 32, No. 10, pp. 1697-1709.

Dyer, Graham. "Redistributive Land Reform: No April Rose. The Poverty of Berry and Cline on the Inverse Relationship," *Journal of Agrarian Change*, Vol. 4, Nos. 1 and 2, Jan. and April 2004, pp. 45-72.

Engerman, Stanley L. and Kenneth L. Sokoloff "Factor Endowments, Institutions, and Differential Paths of Growth Among New World Economies: A View from Economic Historians of the United States," In *How Latin America Fell Behind : Essays on the Economic Histories of Brazil and Mexico, 1800-1914*, edited by Stephen Haber. Stanford, California: Stanford University Press, 1997, Ch. 10, pp. 260-306.

Flores, Edmundo. "Issues of Land Reform," *The Journal of Political Economy*, Vol.78, No.4, Part 2: Key Problems of Economic Policy in Latin America, Jul. – Aug. 1970, pp. 890-905.

Fletcher, Lehman B., Eric Graber, William C. Merrill and Erik Thorbecke. "Guatemala's Economic Development: The Role of Agriculture," Ames, Iowa: The Iowa State University Press, 1970.

Frankema, E.H.P. "The Colonial Origins of Inequality: Exploring the Causes and Consequences of land Distribution," University of Groningen: Groningen Growth and Development Centre, Oct. 2005.

Griffin, Keith. *Land Concentration and Rural Poverty*, London: The MacMillan Press Ltd., 1976.

Griffin, Keith. "Economic Development in a Changing World," *World Development*, 1980, Vol. 9, No. 3, pp. 221-226.

Griffin, Keith, Azizur Rahman Khan and Amy Ickowitz. "Poverty and the Distribution of Land," *Journal of Agrarian Change*, July 2002, Vol. 2, No. 3, pp. 279-330.

Guatemala, Ministerio de Economía, Dirección General de Estadística (DGE), *Censo Agropecuario 1950*, 3 vols

Hirschman, Albert O. *Political economy of Latin American Development : Seven Exercises in Retrospection*, New Jersey, Princeton: The Institute for Advanced Study, 1986.

Heltberg, Rasmus. "Rural Market Imperfections and the Farm Size-Productivity relationship: Evidence from Pakistan," *World Development*, 1998, Vol. 26, No. 10, pp. 1807-1826.

Higbee, E. C. "The Agricultural Regions of Guatemala," *the Geographical Review*, Apr. 1947, Vol. 37, No. 2, pp. 177-201.

Horowitz, Andrew W. "Time Paths of land Reform: A Theoretical Model of reform Dynamics," *The American Economic Review*, Sept. 1993, Vol. 83, No. 4, pp. 1003-1010.

Hough, R. et al., *Land and labour in Guatemala: An Assessment*, Washington, DC: AID/Washington and Development Associates, 1982.

Johnson, D. G. "Agriculture in the Liberalization Process," In *Liberalization in the Process of Economic Development*, edited by L. B. Krause and K. Kihwan, University of California Press: Berkeley, Los Angeles, Oxford, 1991.

Jones, Chester Lloyd *Guatemala Past and Present*, New York: Russell & Russell, 1966.

Kay, C. *Asia's and Latin America's development in comparative perspective: Landlords, peasants and industrialization*, ISS Working Paper Series, 2001, No. 336, The Hague.

Lerman, Zvi. "Land Reform and Farm Restructuring: What Has Been Accomplished to Date?" *Agriculture and Transition*, May 1999, Vol. 89, No. 2, pp. 271-275.

Martinez Saldivar, M. L. and D. T. Nguyen. "The Effects of Land Reform on Agricultural Production, Employment and Income Distribution: A Statistical Study of Mexican States, 1959-69," *The Economic Journal*, Sept. 1979, Vol. 89, pp. 624-635.

Quibria, M. G. and Salim Rashid, "Toward a More General Model of land Tenancy and reform: Comment," *Quarterly Journal of Economics*, Nov. 1981, Vol. 96, No. 4, pp. 725-730.

Ramshaw, Dylan, "Farm Size, Land Productivity and Factor Utilization: The Economic Case for Guatemalan Land Reform in 1950," University of Guelph, April 2004.

Raup, Philip M. "Land Reform and Agricultural Development," in *Agricultural Development and Economic Growth*, edited by Bruce F. Johnston and Herman M. Southworth. Ithaca, New York: Cornell University Press, 1967, pp. 267-314.

Rosenzweig, Mark R. "Rural Wages, Labour Supply, and Land Reform: A Theoretical and Empirical Analysis," *The American Economic Review*, Dec. 1978, Vol. 68, No. 5, pp. 847-861.

Rutherford, Blair and Evert Waeterloos. "Land Reform in Zimbabwe; Challenges and Opportunities for Poverty Reduction Among Commercial Farm Workers," *World Development*, 2004, Vol.32, No. 3, pp. 537-553.

Schweigert, Thomas E. "Agricultural Wage Rates Under Forced and Free Labour: Pre-1944 and Post 1954 Guatemala," *Journal of Agrarian Change*, Vol. 4, no. 4, Oct. 2004, pp. 534-552.

Sen, A., "*Market Failure and Control of Labour Power: Towards an explanation of "Structure" and Change in Indian Agriculture. Part 1,*" Cambridge Journal of Economics, Vol. 5, No. 3, pp. 201-228.

UN, *Progress in land reform*, UN, Department of Economic and Social Affairs, Third Report, New York, 1963, IV.2.

Whetten, Nathan L. *Guatemala The Land and the People*, New Haven, Connecticut: Yale University Press, 1961.

Yates, P. Lamartine. "*Mexican Land Reform, 1959-1969: COMMENT,*" The Economic Journal, Sept. 1981, Vol. 91, pp. 745-752.

Appendix A

Source: Dylan Ramshaw (2004), Appendix B, P 50-51

Estimated Agricultural Crop Prices in Guatemala for 1950 (US Dollars)

1) Coffee (Cherries): 4.16 dollars/cwt

Methodology: The 1957 price for coffee cherries in Guatemala was 6.5 quetzales/cwt. (Tenencia de la Tierra y Desarrollo Socio-Económico del Sector Agrícola, Comité Interamericano de Desarrollo Agrícola (CIDA), Washington D.C.: Unión Panamericana, Secretaría General de la Organización de los Estados Americanos, 1965, p. 24) Projected this value back to 1950 by means of the Guatemalan Coffee Price Index (Oxford Latin American Economic History Database (OxLAD), <http://oxlad.geh.ox.ac.uk>)

2) Bananas: 0.51 dollars/bunch

Methodology: The 1957 price for bananas in Guatemala was 0.56 quetzales/bunch (CIDA). Projected this value back to 1950 by means of the Guatemalan Banana Price Index (OxLAD).

3) Corn: 2.78 dollars/cwt

Methodology: The 1957 price for corn in Guatemala was 3.71 quetzales/cwt (CIDA). Projected this value back to 1950 by means of the Guatemalan Corn Price Index (OxLAD). A similar price of 2.67 dollars/cwt is obtained using the average value of Guatemalan annual corn production, in 1958 quetzales, from 1950-52. This average value was 22,104,200 quetzales (Fletcher, 43). This value was then divided by the number of units produced (hundredweights) in 1950 to arrive at an approximate 1950 price (Guatemalan Agricultural Census of 1950).

4) Black Beans: 2.78 dollars/cwt

Methodology: The 1957 price of beans is not available therefore; the price for 1950 is estimated as a proportion of the value of corn (see above). Sol Tax observed that beans varied consistently with corn by 160% over six years of observation in Guatemala City. This is probably because corn and beans are grown together, grown in the same season, and have similar cropping outcomes (Tax, 140). This observation is also consistent in 1957 when the price of beans was approximately 160% greater than the price of corn (CIDA).

5) Sugar Cane: 0.28 dollars/cwt

Methodology: The 1957 price for sugar cane in Guatemala was 0.49 quetzales/cwt (CIDA). Projected this value back to 1950 by means of the Guatemalan Sugar Price Index (OxLAD).

6) Rice: 3.10 dollars/cwt

Methodology: The 1957 price for rice in Guatemala was 4 quetzales/cwt (CIDA). Projected this value back to 1950 by means of the Guatemalan Rice Price Index (OxLAD). A similar price of 3.53 dollars/cwt is obtained by using the estimated average price of rice in Guatemala City for 1940, which was 2.89 dollars/cwt (Tax, Appendix 2) and Projecting this price to 1950 by means of the Guatemalan Rice Price Index (OxLAD).

7) Tobacco: 102.13 dollars/cwt

Methodology: The Guatemalan average value of annual tobacco production, in 1958 quetzales, from 1950-52 was 844,200 quetzales (Fletcher, 43). Divided this average production by the number of units produced (hundredweights) in 1950 (Guatemalan Agricultural Census of 1950) to obtain an approximate 1958 price of 41.35 quetzales/cwt. Projected this value back to 1950 by means of the Guatemalan Tobacco Price Index (OxLAD).

8) Wheat: 7.31 dollars/cwt

Methodology: The 1957 price for wheat in Guatemala was 6 quetzales/cwt (CIDA). Projected value back to 1950 by means of the Guatemalan Wheat Price Index (OxLAD).

9) Broad Beans: 2.78 dollars/cwt

Methodology: applied same price as black beans (see above).

10) Millet: 2.78 dollars/cwt

Methodology: applied same price as corn (see above).

Appendix B

Table 1: Distribution of Value Crop Output as a Percentage of Gross Output by Farm-size

Farm-size Interval	Coffee	Bananas	Corn	Rice	Black Beans	Wheat	Tobacco	Broad Beans	Sugar Cane	Millet	Total
Less than 1 manazana	0.00	0.00	87.30	1.49	2.57	5.42	0.62	1.75	0.00	0.85	100.00
Between 1 manzana less than 2	0.00	0.00	81.79	1.54	4.35	7.15	1.73	1.06	0.00	2.39	100.00
Between 2 manzana less than 5	0.14	0.66	71.88	1.77	5.29	8.66	5.87	0.77	2.24	2.73	100.00
Between 5 manzana less than 10	1.44	1.17	65.25	1.55	4.63	12.12	6.33	0.73	4.82	1.96	100.00
Between 10 manzana less than 32	10.07	1.27	55.36	1.42	3.83	10.72	6.75	0.50	8.16	1.92	100.00
Between 32 manzana less than 64	26.56	1.53	39.81	1.26	2.98	5.19	8.14	0.21	13.08	1.24	100.00
Between 1 caballerias less than 10	71.29	1.14	12.61	0.49	0.81	0.95	3.23	0.05	9.16	0.28	100.00
Between 10 caballerias less than 20	70.40	6.01	9.27	0.22	0.37	0.08	2.78	0.00	10.82	0.05	100.00
Between 20 caballerias less than 50	69.65	2.13	16.31	0.07	0.61	0.12	0.45	0.01	10.62	0.04	100.00
Between 50 caballerias less than 100	65.49	0.34	10.75	0.04	0.18	0.05	0.10	0.00	23.05	0.00	100.00
Between 100 caballerias less than 200	54.76	0.00	21.30	0.01	0.45	0.00	0.00	0.00	23.48	0.00	100.00
Greater than 200 caballerias	12.18	83.53	3.54	0.71	0.05	0.00	0.00	0.00	0.00	0.00	100.00

Source: Censo Agropecuario de 1950

Table 2: The Distribution of Value Crop Output as a Percentage of Total Crop Output by Farm-size

Farm Size Interval	Coffee	Bananas	Corn	Rice	Black Beans	Wheat	Tobacco	Broad Beans	Sugar Cane	Millet
Less than 1 manazana	0.00	0.00	7.30	5.28	3.52	3.94	0.57	14.86	0.00	2.55
Between 1 manzana less than 2	0.00	0.00	17.72	14.14	15.43	13.47	4.10	23.24	0.00	18.61
Between 2 manzana less than 5	0.05	1.78	26.04	27.20	31.41	27.30	23.30	28.22	3.88	35.54
Between 5 manzana less than 10	0.34	1.97	14.89	15.03	17.30	24.07	15.83	16.88	5.28	16.13
Between 10 manzana less than 32	2.33	2.13	12.52	13.58	14.21	21.08	16.74	11.52	8.84	15.67
Between 32 manzana less than 64	2.81	1.17	4.11	5.52	5.05	4.66	9.22	2.21	6.48	4.61
Between 1 caballerias less than 10	44.20	5.10	7.64	12.48	8.08	4.98	21.44	2.80	26.62	6.10
Between 10 caballerias less than 20	17.52	10.84	2.25	2.26	1.48	0.18	7.41	0.08	12.62	0.43
Between 20 caballerias less than 50	17.89	3.97	4.10	0.74	2.51	0.26	1.24	0.14	12.78	0.34
Between 50 caballerias less than 100	9.53	0.35	1.53	0.22	0.41	0.07	0.16	0.04	15.72	0.01
Between 100 caballerias less than 200	3.87	0.00	1.47	0.02	0.51	0.00	0.00	0.00	7.78	0.00
Greater than 200 caballerias	1.46	72.68	0.41	3.54	0.09	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Censo Agropecuario de 1950

Appendix C

NB: Standard Errors are shown in parentheses
 *** coefficient is significant at the 99% level
 ** coefficient is significant at the 95% level
 * coefficient is significant at the 90% level

Table 3: Coffee Regression Results

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:		Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	
a	Q/X	no	no	55.10092*** (3.346)	-4.817973*** (0.813)	0.2228
b	Q/X	yes	no	55.47311*** (4.317)	-4.838854*** (0.8403)	0.2090
c	Q/X	yes	yes	51.32091*** (6.74)	-3.80051** (1.545)	0.2182
d	logQ/X	no	no	3.939511*** (0.0886)	-0.1116643*** (0.0215)	0.1786
e	logQ/X	yes	no	3.990691*** (0.1139)	-0.1164131 (0.022)	0.1704
f	logQ/X	yes	yes	3.853493*** (0.177)	-0.0821038** (0.04)	0.1906

Table 4: Bananas Regression Results

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:		Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	
a	Q/X	no	no	261.6303*** (13.18)	-17.89827*** (6.159)	0.0566
b	Q/X	yes	no	298.3311*** (28.196)	-22.30796*** (6.65)	0.1076
c	Q/X	yes	yes	268.2508*** (30.73)	-8.162688 (9.323)	0.1734
d	logQ/X	no	no	5.3517*** (0.07)	-0.08198 (0.033)	0.0398
e	logQ/X	yes	no	5.60767*** (0.148)	-0.11306*** (0.0349)	0.1344
f	logQ/X	yes	yes	5.43474*** (0.16)	-0.031739 (0.049)	0.2020

Table 5: Wheat Regression Results

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:		Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	
a	Q/X	no	no	8.627115*** (0.501)	-1.078707*** (0.392)	0.0681
b	Q/X	yes	no	11.72985*** (1.47)	-0.7745117* (0.415)	0.0962
c	Q/X	yes	yes	9.639933*** (1.44)	-5.147526*** (1.293)	0.2701
d	logQ/X	no	no	1.917915*** (0.085)	-0.0676887 (0.066)	0.0005
e	logQ/X	yes	no	2.174644*** (0.253)	-0.048484 (0.0715)	-0.0133
f	logQ/X	yes	yes	1.997905*** (0.271)	-0.4182995 (0.243)	0.0302

Table 6: Rice Regression Results

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:		Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	
a	Q/X	no	no	13.1697*** (0.588)	-1.12618** (0.495)	0.0254
b	Q/X	yes	no	18.0804*** (1.2)	-1.371372*** (0.475)	0.1270
c	Q/X	yes	yes	17.69136*** (1.2)	0.0547147 (0.782)	0.1450
d	logQ/X	no	no	2.381998*** (0.055)	-0.104623** (0.046)	0.0254
e	logQ/X	yes	no	2.857412*** (0.11)	-0.1299246*** (0.0437)	0.1451
f	logQ/X	yes	yes	2.825394*** (0.11)	-0.0125569 (0.0718)	0.1667

Table 7: Corn (First Harvest) Regression Results

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:		Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	
a	Q/X	no	no	11.43029*** (0.806)	0.7720545** (0.334)	0.0197
b	Q/X	yes	no	16.73676*** (1.24)	0.5585504* (0.308)	0.1754
c	Q/X	yes	yes	15.16377*** (1.68)	1.32537** (0.635)	0.1757
d	logQ/X	no	no	2.373027*** (0.052)	0.0256152 (0.022)	0.0019
e	logQ/X	yes	no	2.796553*** (0.076)	0.0092653 (0.0189)	0.2414
f	logQ/X	yes	yes	2.695533*** (0.1017)	0.0585115 (0.038)	0.2642

Table 8: Corn (Second Harvest) Regression Results

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:		Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	
a	Q/X	no	no	9.437705*** (0.7)	1.044109*** (0.332)	0.0422
b	Q/X	yes	no	13.61748*** (1.148)	0.8476132*** (0.302)	0.2175
c	Q/X	yes	yes	12.24106*** (1.477)	1.614321** (0.604)	0.2302
d	logQ/X	no	no	2.185387*** (0.061)	0.0194509 (0.029)	-0.0027
e	logQ/X	yes	no	2.644264*** (0.092)	-0.002381 (0.024)	0.3048
f	logQ/X	yes	yes	2.503262*** (0.115)	0.0761616* (0.047)	0.3502

Table 9: Black Beans Regression Results

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:		Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	
a	Q/X	no	no	7.084948*** (0.474)	-0.2917647 (0.342)	-0.0013
b	Q/X	yes	no	8.878671*** (0.991)	-0.1114661 (0.337)	0.0698
c	Q/X	yes	yes	8.801788*** (0.982)	1.293604 (0.847)	0.0895
d	logQ/X	no	no	1.782101*** (0.054)	-0.1551736*** (0.039)	0.0680
e	logQ/X	yes	no	2.098729*** (0.105)	-0.1217017*** (0.0358)	0.2484
f	logQ/X	yes	yes	2.088129*** (0.103)	0.0720138 (0.089)	0.2811

Table 10: Gross Output Regression Results

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:		Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	
a	Q/X	no	no	7.555154*** (0.859)	-0.0457918 (0.1669)	-0.0041
b	Q/X	yes	no	8.285131*** (1.381)	-0.0500608 (0.1636)	0.0477
c	Q/X	yes	yes	7.128054*** (1.893)	0.1953847 (0.323)	0.0821
d	logQ/X	no	no	2.024435*** (0.209)	-0.2161443*** (0.0413)	0.1050
e	logQ/X	yes	no	2.022397*** (0.343)	-0.2136213*** (0.0412)	0.1187
f	logQ/X	yes	yes	2.054366*** (0.4733)	-0.220564*** (0.0823)	0.1351

Table 11: Corn and Black Beans Regression Results

Dependent Variable: the total value of corn and black beans divided by the area of corn's first harvest

Independent Variable: Area of corn's 1st harvest divided by the number of corn farms in that interval

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:			East Dummy	Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	High Dummy		
a	Q/X	no	no	48.37651*** (7.1098)	2.581688 (2.943)	—	—	-0.001
b	Q/X	yes	no	88.34863*** (11.418)	1.239862 (2.8357)	-47.8536*** (11.9363)	-55.75535 (13.19)	0.0815
c	Q/X	yes	yes	91.81736*** (15.587)	-0.4511007 (5.8789)	-56.1758*** (18.53)	-54.49329 (20.664)	0.0720
d	logQ/X	no	no	3.68079*** (0.063)	0.0285141 (0.026)	—	—	0.0009
e	logQ/X	yes	no	4.209913*** (0.0937)	0.0098864 (0.02327)	-0.61921*** (0.098)	-0.77032 (0.108)	0.2144
f	logQ/X	yes	yes	4.152803*** (0.125)	0.0377266 (0.047)	-0.653146*** (0.149)	-0.501 (0.1662)	0.2375

Table 12: Corn (1st harvest) and Black Beans Regression Results

Dependent Variable: the total value of corn's first harvest plus the value of black beans divided by the area of corn's first harvest

Independent Variable: Area of corn's 1st harvest divided by the number of corn farms in that interval

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:			East Dummy	Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	High Dummy		
a	Q/X	no	no	34.32535*** (2.296)	2.071216** (0.9507)	—	—	0.0170
b	Q/X	yes	no	48.26934*** (3.554)	1.471778* (0.8827)	-16.01792*** (3.7156)	-22.397*** (4.106)	0.1623
c	Q/X	yes	yes	44.40991*** (4.827)	3.35321* (1.821)	-12.74485*** (5.738)	-14.174*** (6.399)	0.1624
d	logQ/X	no	no	3.475173*** (0.05078)	0.0221854 (0.021)	—	—	0.0005
e	logQ/X	yes	no	3.858983*** (0.07576)	0.006918 (0.0188)	-0.42876*** (0.0792)	-0.613*** (0.0875)	0.2086
f	logQ/X	yes	yes	3.770337*** (0.101)	0.0501318 (0.0381)	-0.39924*** (0.1201)	-0.3338 (0.1339)	0.2371

Table 13: Half Corn (1st harvest) and Black Beans Regression Results

Dependent Variable: Half the total value of corn's first harvest plus the value of black beans divided by half the area of corn's first harvest

Independent Variable: Half area of corn's 1st harvest divided by half the number of corn farms in that interval

Form	Dependent Variable	Regional Dummy Variables:		Coefficients on:			East Dummy	Adj. R ²
		Intercept	Slope	Constant	Log of Average Farm Area	High Dummy		
a	Q/X	no	no	36.87532*** (2.3988)	1.995668** (0.993)	—	—	0.0138
b	Q/X	yes	no	50.01269*** (3.739)	1.390308 (0.9286)	-15.81084*** (3.91)	-20.794*** (4.32)	0.1477
c	Q/X	yes	yes	46.66681*** (5.0754)	3.021385 (1.91)	-13.77296** (6.034)	-12.6453* (6.73)	0.1486
d	logQ/X	no	no	3.547002*** (0.0504)	0.0180811 (0.0208559)	—	—	-0.001
e	logQ/X	yes	no	3.896771*** (0.076)	0.0037939 (0.019)	-0.409564*** (0.08)	-0.5399*** (0.0884)	0.1780
f	logQ/X	yes	yes	3.816869*** (0.1018)	0.0427454 (0.038)	-0.39954*** (0.121)	-0.261** (0.135)	0.2110

Figure 1: Departments and Regional Divisions (by Topography and Climate)

