Benefits and costs of land reform in Zimbabwe

with implications for Southern Africa

Klaus Deininger, Hans Hoogeveen and Bill Kinsey

Empirical evidence from a set of land reform beneficiaries suggests that Zimbabwe's land reform was successful: the internal rate of return to the land reform project is high, settlers accumulated substantial amounts of assets, and they increased their agricultural productivity substantially over time. This evidence contradicts the general notion that land reform was a failure, a notion supported by welfare indicators showing poverty to be as high amongst land reform beneficiaries as it is amongst communal farmers. In this paper, we employ a unique data set comprising information on a group of land reform beneficiaries and a control group of communal farmers to re-examine, using the propensity score matching technique, the existing evidence on the success of land reform.

Contrary to previous research efforts, we use per capita expenditure as measure of success Our main finding is that the financial return to land reform is mediocre. The use of a per capita instead of a household measure partly explains this finding. Constraints like insecure property rights, restrictions on the possibility to work off farm and the high cost of purchasing land also contribute to the modest return. We finally argue that political, rather than economic, motives are behind these constraints. Drawing upon our findings and the recent violence surrounding Zimbabwe's land reform program we consider implications for Namibia and South Africa.

1.1 Introduction

After a period of great interest in the 1950s and 1960s, land reform disappeared from the development agenda. Recently however there is a revival of the interest in land redistribution. Two developments freed the way for land redistribution becoming an accepted policy instrument again: the dismissal of the widespread opinion that large farms are more efficient than small ones plus a literature on poverty traps showing that under certain circumstances a redistribution of assets leads to both greater equity *and* higher production

Despite the renewed interest in land reform little empirical micro-evidence on its impacts exists. An exception holds for Zimbabwe, for which a unique household level (panel) data set exists that includes comprehensive information for a group of land reform beneficiaries. That Zimbabwe is used to inform about the benefits of land reform may seem ironic, especially in the light of the country's current land reform efforts, which appear to be motivated more by political considerations and less by arguments regarding poverty reduction or economic efficiency. Yet Zimbabwe has a long history of land reform that dates back to the early 1980s. At that time, Zimbabwe's land redistribution program was well planned, carefully organized and lawful.

Various authors have explored the panel data set for land reform households. On the basis of the prevailing material one may conclude that the evidence favors land reform. There has been vast asset accumulation (Kinsey *et al.* 1998) and crop incomes have increased tremendously since the early 1980s (Gunning *et al.* 2000). High agricultural productivity is also reflected in the rates of return to land reform (of about 21%) reported by Cusworth (1990) and Robilliard *et al.* (2001).[1] But not all authors share in the enthusiasm. Alwang, Ersado and Taruvinga (2001) report that poverty incidence is as high among land reform households as it is among communal farmers. And Hoogeveen and Kinsey (2001) show how, for land reform beneficiaries, conclusions based on household level indicators may substantially differ from per capita indicators.

This paper re-examines the evidence. To this end use is made of information collected between 1997 and 1999 on a control group of "ordinary" smallholder peasant farmers, the so-called communal farmers. In order to identify the benefits of land reform, we use the propensity score matching method to link land reform beneficiaries to a control group of communal farmers.

There are four main findings. Firstly, comparing asset accumulation and gross crop income between settler households and their communal counterparts, the success of land reform as reported by Kinsey *et al.* (1998) and Gunning *et al.* (2000) is confirmed. Next, after controlling for differences in household size and after taking into account opportunity costs, we establish that the per-capita benefits from land reform are modest. Thirdly, we argue how politically motivated market distortions have had negative consequences for the economic return to land reform. Distortions in the land market and factors such as insecure property rights and regulations prevented

[1] These authors do not base themselves on the panel data set for land reform beneficiaries.

households from responding optimally to the prevailing opportunities. In conclusion, we argue that the existence of an (implicit) coalition between large-scale commercial farmers and the political elite was instrumental to the introduction of these market distortions. This not only led to a reduction in economic returns from land reform, the recent political violence centred around land shows that lack of progress with the land reform process may become harmful to the economy as a whole and to the large-scale farmers in particular. The latter is of relevance for South Africa and Namibia.

The paper is structured as follows. Section two provides a brief review of the literature on asset redistribution, presents an overview of land reform as implemented in Zimbabwe, and reviews earlier literature on the subject and reconfirms existing evidence on the success of land reform. The third section re-examines this evidence. A discussion is presented on the importance of looking beyond crop income, of considering household size, and initial conditions. With this as point of departure we determine the benefits to land reform through propensity score matching and compare these benefits to the costs of the program. The fourth section examines causes for the lack of the program's success, and conclusions follow in the fifth section.

2. Background to land reform in Zimbabwe

2.1 Land redistribution and economic efficiency

Redistribution of assets was long considered an ill-conceived policy on the grounds that it would hamper incentives and hence growth. Yet an increasing literature suggests that asset inequality itself can be economically costly. This raises questions about the circumstances when an equity-efficiency trade-off might not exist. For instance, in the presence of malfunctioning labor and capital markets and in the presence of fixed set-up costs, farmers might not be able to access more highly productive activities. Access to credit could allow farmers to enter the high return activity but if credit constraints are linked to collateral requirements and if land can be used as collateral, then households with relatively low land endowments may not be able to access credit. This may lead to a situation where farmers do not to cultivate all their land and instead will rent out some of their labor to households with larger land holdings (Eswaran and Kotwal 1986). A redistribution of land would then contribute to both a more equitable division of assets and higher productivity. Other advocates of the growth with equity thesis emphasize the role of non-convex production technologies where a credit-constrained poor family cannot overcome the minimum threshold for investment (e.g. Galor and Zeira 1993). A common criticism of these models is that they do not allow agents to save themselves out of the low income situation, or poverty trap. But recent work by Carter and Zimmerman (2000) has shown that even if asset markets exist, the process of change may be so slow (and the associated efficiency losses so large) that a redistributive policy could improve on the market's performance on both efficiency and equity criteria.

There is another, much older, argument suggesting that the equity-efficiency trade-off may be less of an issue with respect to land. It argues that, for a given level of technology, small or family farms are more efficient than large ones because they face fewer problems in supervision. In agriculture (although less so for plantation crops like bananas or oil palms) the spatial dispersion of the production process and the need to adjust to micro-variation in the natural environment imply that the potential losses from imperfect information may be large, and the cost of supervision high. The fact that family members are residual claimants to profits, that they may be better entrusted with valuable animals or machinery, that they share in the risk, and that they can be employed without incurring hiring or search costs are reasons why family-operated farms are more efficient than large-scale agricultural operations using wage labor (see Srinivasan 1972; Eswaran and Kotwal 1985; Feder 1985; Binswanger and Rosenzweig 1986; Otsuka, Chuma and Hayami 1992; Johnson and Ruttan 1994; Binswanger *et al.* 1995).

Empirical evidence, both for the existence of situation where a redistribution would enhance growth and improve equity (also called the poverty trap thesis) and small-but-efficient farms is mixed. Hoogeveen (2000) reports evidence for Zimbabwe of a livestock-induced poverty trap when he shows that, in the absence of credit markets and other livestock sharing arrangements, access to the profitable plowing technique can only be accessed by households owning at least two head of cattle. Evidence to support the land-access-to-credit poverty trap is not available. Absence of ownership rights may prevent farmers from accessing credit markets, but it is unclear whether, with ownership rights, they would be prepared to do so. In the absence of labor markets or crop insurance for instance, farmers may well be reluctant to pledge their land as collateral for fear of losing it if the harvest turns out badly (Kanyinga 2000).

With respect to the inverse-farm-size-productivity relationship, the observation goes back to Chayanov (1925). But the empirical evidence, to the extent that it estimates output per acre as a function of total farm size and other

characteristics, is sensitive to measurement error and omitted variables like land quality (see Deaton 1997). When data on land quality are available (Bhalla and Roy 1988) or when quality and measurement error are controlled for by instrumental variable methods (Benjamin 1993), there is little or no evidence of a negative relationship between farm size and productivity.

2.2 The Zimbabwean land experience

In Zimbabwe, as elsewhere in Southern Africa, disenfranchisement of rural households was part of an active policy pursued by the colonial governments to ensure that the reservation utility that could be obtained through farming was so low that farmers would have no option but to seek employment in the mines, on commercial farms or as part of the urban labor force. Hence farmers were moved to densely populated "reserves" where land was less fertile and access to infrastructure more difficult; cattle were taken (on the grounds that stock numbers led to overgrazing), grazing rights were restricted, water for irrigation was reserved for large-scale agriculture, pass laws were introduced and farmers were not allowed to grow some of the most profitable crops, such as coffee (Weiner 1990; Deininger and Binswanger 1995; Munro 1998). To further ensure that farmers had an incentive to seek paid employment, per-capita taxes were introduced.

This disenfranchisement of land is reflected in the extremely inequitable distribution of land that, upon independence in 1980, the Government of Zimbabwe inherited. Roughly 15 million hectare of overwhelmingly good quality land (natural regions I, II and III) was owned by about 6100 families of European decent, while16.4 million hectares of less fertile of land (natural regions III, IV and V) was occupied by a little less than 800,000 indigenous families.[2] Additionally an elaborate web of political, legal, institutional, and infrastructural arrangements was inherited that reinforced and facilitated the dominant role of the white-controlled subsector.[3] To redress this imbalance, the government removed restrictions on smallholder farming. Subsequently, between 1979 and 1989, the area under cotton increased by 25 percent annually while yield increased 1.3 percent per year. At the same time, average maize yields increased by 6.7 percent annually (World Bank 1991).

Not only was the distribution of land in Zimbabwe extremely inequitable, the country also inherited a dualistic agricultural sector with a dynamic, modern, large-scale agricultural subsector alongside a traditional, densely populated small-scale agricultural subsector. The availability of land in the large scale sub-sector was such that not all land was productively utilized. But this land was not offered on the market either so that in addition to the efficiency and growth with equity reasons, an additional economic rationale for land redistribution existed in Zimbabwe: to equalize the marginal product of land across the two subsectors. Immediately after independence the government embarked on an ambitious program of land reform. To this end it rapidly acquired large areas of formerly white-owned farmland.[4] The first resettlement target was set at 18,000 families on 1.1 million hectares of land at an estimated over a 3-year period. This target was subsequently revised to 162,000 households on about 9 million hectares of land in the Three-year Transitional Development Plan of 1982 to 1985 (Cusworth and Walker 1988). In reality between 1982 and 1984 about 25,000 households were resettled (Mhishi 1995). After that time the pace of land acquisition and resettlement stalled. By the end of 1989, 52,300 households had been resettled—far from the target of 162,000 households. The target was revised in 1990 to 75,000 new families over 10 years. This target was not been met either. Between 1990 and 1998, on average 2,000 households were resettled each year (Moyo 1998). Despite the inability to meet the original targets, it needs to be realized that was has been accomplished may be deemed impressive as by 1997, 9.1 percent of all land had been resettled.

In the early 1980s, resettlement was initially carried out under an intensive program.[5] The settler included in our data set were included in this program, which made use of a centralized planning and implementation sequence and which relied on large amounts of specialist inputs. Under the program land, was acquired by the government and a wide range of infrastructure and supporting services was provided to the schemes. Resettlement schemes were provided with depots for seeds and fertilizer, dip tanks for cattle, schools and clinics, and—where possible—

[2] The World Bank (1991) presents the figure of 15.064 million hectare of Large Scale Commercial Farmer land in 1979. By 1988 this had reduced to 11.213 million hectares or 28.6 percent of the total land area. By 1988 Communal Areas comprised 42 percent of the land area. It is assumed that there was no reclassification of communal land between 1980 and 1988. The population estimate is based on 4,272,811 in 1982 in district councils (World Bank, 1991), a population growth rate of 3 percent and an average rural family size of 5.1 (CSO, 1994).

[3] For instance in 1983 the road density (expressed in km / 1000 persons) in large scale commercial farming areas was 20.3 as opposed to 4.9 in communal areas. (in km/km^2 the corresponding figures are 0.20 and 0.12) (Heidhues and Thalmeier (1986))

[4] Land acquisition was facilitated by the fact that many white commercial farmers had abandoned their land during the independence war. A drought in 1982-84 and the resulting loan defaults made additional land available for the program.

[5] The intensive description relates to the major expenditure on the provision of infrastructure that accompanied the resettlement of the small holders and not the farming systems that the farmers pursue (Mhishi 1995)

clean domestic water sources.[6] A systematic procedure identified settlers, and those resettled got preferential access to agricultural extension, veterinary services and credit. The costs of this program were borne by the government of Zimbabwe and donors from various countries, including the European Community, the African Development Bank and the Kuwait fund. The UK, which had pledged assistance for land distribution during the talks that led to Zimbabwean independence, contributed the largest share, £20 million, of which approximately £16.6 million was actually disbursed (Adams *et al.* 1996).

Those eligible for land reform had to be married or widowed, aged 25 to 55 and not in formal employment.[7] In addition they had to belong to one of three categories. They had to be (i) refugees or other persons displaced by war, including extra-territorial refugees, urban refugees and former inhabitants of "protected villages" (tightly packed enclosures where many rural blacks were confined during the liberation war); (ii) landless or near-landless residents of communal areas; or (iii) small-scale farmers with insufficient land to maintain themselves and their dependents. Families selected for resettlement were assigned land and residential plots under one of the four optional models for relocation. Model A was the most important form of resettlement and approximately 90 percent of the land has been redistributed under this modality.[8] Unlike models B, C and D, it largely replicates the conditions of the communal areas, where most of the settlers originated.

A significant difference between model A schemes and the communal areas is the degree of control exerted on farmers by the government. For instance, farmers were not given ownership of their land. Instead each settler was granted three permits: one for a residence plot (of approximately 4000 square meter), one for arable land (about 5 hectares) to be used for cultivation of crops, and one for pasture land to be used for livestock. This grazing land was made available on a communal basis. Permit-holders were expected to earn their living exclusively through farming. In fact, they were supposed to engage in commercially oriented production. Subsistence farming was frowned upon, as was engaging in off-farm activities. Until the drought of 1992, heads of household were not permitted to work off their own farms, nor could they migrate to cities and leave their spouses to work their plots. Regulations were also promulgated with the intent to ensure the sustainability of production in resettlement schemes. These included among others, limits on livestock numbers and prohibitions on environmentally destructive practices.

The lack of ownership rights to land prevents the legal sale of land and makes it impossible to pledge land as collateral. The restriction on credit is not complete however as resettled households benefited from preferential access to credit for productive purposes through a special fund for loans to settlers created by the Agricultural Finance Corporation (AFC). This fund was widely used but repayment rates were low. By 1987, 73 percent of the resettled farmers who took out loans were in arrears (Zimbabwe 1992); they were subsequently cut off from any further loans. Still, in the 1999 round of the survey, about 12 percent of the resettled farmers indicated that they had been awarded loans by the AFC.

2.3 Data and existing evidence

Zimbabwe is unique, in Africa and in the world, in not only having implemented a program of land reform but also in having a long time series of micro data with which to analyze the impact of such an intervention. In an effort at in-depth data collection, supported by the University of Zimbabwe, the Ministries of Agriculture and of Health, as well as a number of donors, a data set on resettled households has been assembled (Kinsey 1999). Since the initial survey in 1983/84, the 400 households initially surveyed have been revisited in 1987 and all years between 1992 and 2000. Starting in 1997, 150 communal households were added to the survey to serve as counterfactuals to the land reform experience.

The data set reflects the diversity of Zimbabwe's agro-ecological environments as one resettlement scheme was randomly selected in each of the country's three agro-ecological zones (known as Natural Regions—NRs) with the highest relevance for resettlement.[9] In each NR, the two communal villages were selected that had supplied the largest number of households to the original panel. In each selected village, 25 households were interviewed,

[6] There was a considerable self-help element in the provision of schools in that settlers were expected to contribute both materials and labor to the building program.

[7] Female heads of households could also get permits in their own names, however only widows qualified initially.

[8] The other three modalities of relocation were: model B, a collective mode of production, model C, allowing individual farming centred on a core estate and model D, focusing on extensive ranching.

[9] Natural region I, the area of highest agricultural potential, and NR V, the area with lowest potential are not included.

making a total of 150. For this paper we utilize primarily the information collected—part of it retrospectively—between 1997 and 2000.

This paper is not the first to exploit this data set to report on the performance of Zimbabwe's land reform program. Results from the early 1980s indicated that beneficiaries considered participation a 'mixed blessing'. Most even felt that their families were worse off than those not in the schemes, though only five percent wanted to return to their home areas (Kinsey 1984). These early findings should (partly) be attributed to the timing of the first survey, which took place during the 1982-1984 drought. Later evidence is therefore more favorable. Kinsey *et al.* (1998) consider changes in cattle ownership by resettled households between 1983 and 1995. They find almost a tripling of herd size to an average of 10 animals in 1995. On this basis, the authors conclude that land reform substantially improved household welfare. Gunning *et al.* (2000) also explore the panel character (1983-96) of the data to examine the income and asset dynamics of resettled households. They confirm the accumulation of assets and construct a measure of gross crop income. The latter is used to determine changes in household income over time. The authors find a dramatic income increase between 1982/83 and 1995/96 of 460 percent. Part of this increase should be attributed to differences in rainfall (1982-84 were drought years) but, once this is controlled for, most of the increase in crop production is attributed to increased returns to assets, land and capital equipment especially. Gunning cum suis also consider the effects of initial conditions on crop outcomes and conclude that differences in initial conditions, such as previous farming experience, had few persistent effects on agricultural performance.

Kinsey *et al.* (1998) and Gunning *et al.* (2000) base their positive assessment of the agricultural performance of land reform beneficiaries by comparing the performance of these households in the early 1980s to that in the 1990s. They lack the data to make a comparison with non-land-reform beneficiaries. The reported success is therefore relative to the time when the war of independence was just over. As this war was characterized by economic disruption and asset losses, the finding of success may be more an indication of recovery rather than of progress. The presence of a control group of communal farmers in our data set allows for the verification whether the land reform households are also successful in comparison to others.

Table 1 illustrates the agricultural performance of land reform beneficiaries and communal households. Those resettled crop consistently double the amount of area of their counterparts in communal areas. Resettled farmers also grow much larger areas of cash crops, especially cotton and groundnuts, and are the ones who have ventured into tobacco. Even though the areas they cultivate are much larger, they obtain consistently—and in most cases significantly—higher yields than communal farmers. In maize, as well as sorghum and groundnuts, yields obtained by resettled households are in many cases close to double those achieved in the communal areas.

Table 1: Acreage planted and yield per acre for land reform beneficiaries and communal farmers

The better performance of resettled farmers may be due to differential input use or better access to credit and other government services. As indicated earlier, resettled farmers have preferential access to AFC loans. This is reflected in the use made of credit. In the 1999 round of the survey, for instance, 27 of the 400 resettled households indicated that they had been awarded loan(s) by the AFC for the previous season (mainly to purchase seasonal inputs) compared to none of the 150 communal households.[10] Credit can be obtained however from various sources (for cotton especially inputs can be obtained on a credit basis). Still the mean amount borrowed is much higher for resettled farmers: Z$ 2,039 compared to Z$ 893 (in 1995 prices). Resettled farmers also receive more favorable levels of support from extension staff. Approximately one-third of the communal households receive visits from extension workers, in contrast to nearly two-thirds of the land reform beneficiaries. The latter group also receives more visits. Of all households that received visits from an extension worker in 1999, resettled households were visited on average 2.5 times a year as opposed to 1.8 times for communal farmers.

To examine the presence of differences in productivity between the two groups in more detail, production functions comparable to those in Gunning *et al.* (2000) were estimated. To do so a measure of gross crop income was constructed and combined with variable reflecting the availability of labor, assets and livestock in the household. Due to the timing of the surveys—in the midst of the growing season, only two years of complete information could be obtained. In the survey, harvest information is collected for the previous season, so that two years of information are required to complete the information for one season. So out of the three survey years

[10] Although the proportion of RA households receiving AFC loans fell from 87 per cent in 1983 to only 7 per cent in 1999, the proportion of RA farmers receiving institutional credit was in fact much greater in 1999 than the figure of 7 per cent suggests. Liberalization has seen organizations with interests in specific commodities—cotton, maize and malting sorghum—introduce their own credit programs as a way of stimulating production and capturing marketed output. Less than a quarter of seasonal crop loans in 1999 came from AFC, and many RA farmers who have been disqualified for AFC credit through default now receive such loans from these other sources.

information for the seasons 1996/97-1997/98 is complete. This information has been pooled[11] and a Cobb-Douglas production function estimated directly with livestock, family labor and physical capital as arguments. As no information on actual use has been collected, the variables are expressed in stock terms and measured as available livestock (expressed as trained oxen equivalents), labor (expressed as male adult-equivalents) and equipment (expressed in Z$ 1995).

Control variables included are the number of visits by extension officers, amount spent on fertilizer and chemicals (in Z$ 1995), amount obtained as credit (in Z$ 1995) and rainfall. For rainfall, only national figures could be obtained. This is unsatisfactorily as rainfall varies substantially across space. However the data showed a very strong correlation (0.89) between national rainfall and the mean annual maize yield. This correlation is exploited and the log of mean natural region maize yield is taken as indicator for rainfall. By construction this rainfall variable also captures yield differences between different natural regions, so that dummies for natural regions do not have to be included. Differences between communal and resettled households are captured by a dummy variable that reflects whether or not a household is a land reform beneficiary.

Estimating this production function shows that capital, livestock and labor each contribute in a significant way to the generation of gross crop income (Table 2, estimation (i)). The estimation results confirm the productivity advantage of resettled households. Land reform beneficiaries are about 70 percent more productive than those in communal areas.[12] Rainfall and livestock—with production elasticities of 78 and 28 percent respectively—are key inputs in Zimbabwean agriculture. Similarly, labor and capital are of high relevance, with elasticities of 16 and 14 percent, respectively. Credit, the use of chemical inputs and visits from extension workers—with elasticities of 10 percent, 8 percent and 8 percent—are of importance for increased agricultural production as well.

It follows from regression (i) that differences in access to family labor, livestock and capital do not explain the substantially higher gross crop income for land reform households. To explore whether differences in asset productivity exist between settler and communal households a second regression was carried out which includes interaction terms for being a land reform beneficiary with livestock, labor and capital. The inclusion of interaction terms is sufficient ensures that the land reform dummy becomes insignificant. The outcomes suggest settlers attain a higher rate of return on assets than communal households. This holds especially for livestock which is almost twice as productive in land reform areas as it is in communal areas. Family labor and capital are equally productive in both areas. This finding underscores the importance of using a control group as it differs from Gunning *et al.*(2000) who found a substantial increase in productivity over time for land and capital, but not for livestock.,

Finally we carried out a regression which includes land as an explanatory variable. This is done primarily to compare our results with Gunning *et al.* (2000) who included land in their production function and who found, contrary to what regressions (i) and (ii) suggest, that family labor does not contribute to gross crop income. Area cultivated is a choice variable however and deal with its endogeneity by instrumenting it with the area planted in the previous year. The results reported as regression (iii) suggest that once the area under cultivation is included, labor no longer contributes positively to the formation of gross crop income. In resettled areas labor is more productive than in communal areas, but its contribution is still not positive. Another change from the inclusion of land in the regression is the insignificance of draft power, both in settlement and communal areas. An explanation for this finding is that labor and livestock are only important to bring land under cultivation. It confirms the notion that once the dry season is over, there exists a short window of opportunity (namely just after the first rains) during which households should plant. Planting before the rains start is not feasible because the soils are very compacted and because the risk of losing one's seed if the rains turn out to be delayed or sporadic is high. Late planting is not an option either because the rainy season is short. Delayed sowing reduces harvests considerably.[13]

[11] It was attempted to exploit the panel character of the data set. However estimation of a fixed effects model resulted in insignificant coefficients for each of the variables except for rainfall. This disappointing result should be attributed to a high noise to signal ration which results from first differencing. Especially in using subsequent years, changes in most variables are small, leading for a given measurement error, to large signal to noise ratio's (see also Deaton, 1997). The loss in information is therefore too high and a household fixed effects approach was not attempted further. We estimated a village random and fixed effect model however. The random effects model was rejected by a Hausman test. The results of the fixed effects estimation are comparable to the ones reported in Table 2.

[12] For coefficients over 0.1 the dummy coefficient is not an accurate approximation of the percent changes. It needs to be calculated instead. The formula to express the productivity of resettled households relative to those of communal households is $e^{0.53}$-1. Had the productivity of communal household been expressed relative to that of resettled households the formula would have been: 1-$e^{-0.53}$-1 or 41 per cent.

[13] Maize planting trials have shown for instance that each day's delay in planting after the start of the first effective rains results in yield reductions of

It follows that during the period of soil preparation, livestock and labor are in high demand, but once the acreage cultivated is determined, the marginal contribution of labor and livestock to gross crop income become negligible. For labor it suggests that once the planting season is over, it could better be used in off farm activities.

Table 2: Production functions: dependent variable is log (gross real crop income): 1996/97-1997/98

The production functions suggest that settler households generate significantly higher crop incomes than communal farmers, primarily because of the higher returns to livestock. This higher return is realized during the planting season, when draft animals are used to bring land under cultivation.

Another measure of success discussed in the literature is the fact that settlers accumulated substantial herds of cattle (Kinsey *et al.* 1998). The reason to consider herd size and indicator of success is that livestock are an important productive asset and buffer stock. The possession of a sizeable herd thus contributes to household welfare through the generation of income and by insulating the household against shocks. To examine whether the accumulation of livestock by land reform beneficiaries exceeded that of communal households, Table 3 presents the evolution of livestock assets for resettled *and* communal households since 1981. It shows that after the war of independence both groups possessed comparable levels of livestock assets, though non-beneficiary households were slightly better endowed. Twenty years later settler households possess herds that are almost twice the size of communal households. So on this count too, resettlement may be considered a success. This measure of success needs to be interpreted with care however as the association of herd size to household welfare is not straightforward. The prohibition to work off farm applicable to settler households, arguably make their incomes more volatile, creating a larger need to accumulate buffer stocks. And, as the return to livestock is higher in land reform areas, the larger herds owned by land reform beneficiaries could be just a reflection of differences in investment opportunities.

Table 3: Evolution of livestock (bovine) assets

3 Re-examining the evidence

The satisfactory performance of land reform beneficiaries as suggested by section 2, is a finding that is not uniformly shared. In fact, the general notion still is that land reform was a failure. There is evidence to support this view. Comparing nutritional indicators like the body mass index and the weight for height between land reform beneficiaries and communal household members, Kinsey (1999) finds that settlers do not outperform non-land reform beneficiaries. Also in terms of per-capita consumption, land reform beneficiaries and individuals in communal areas are equally well off (Hoogeveen and Kinsey 2001). This latter finding is confirmed nationally by Alwang, Ersado and Taruvinga (2001). These authors use the nationally representative 1996 income, consumption and expenditure survey to determine poverty incidence in Zimbabwe and find a poverty incidence of 65.3 percent among land reform beneficiaries and of 66.8 percent in communal areas. How can these findings be reconciled with the apparent success of land reform? To explore this we consider a number of caveats in the research to date.

1. Those reporting success deal with agricultural performance. Given the focus of the land reform program, this is the logical starting point. Yet to establish success, it would be preferable to consider total household income or a recognized welfare indicator like consumption.
2. The divide between those reporting success and failure appears to be associated with whether household outcomes are considered (such as crop income or accumulated assets) or per-capita outcomes (like nutritional indicators, poverty or per-capita expenditure). One reason for this phenomenon is that land reform households are now substantially larger. They comprise about 10 members as opposed to about 6 for communal households.
3. To establish the success of land reform, a direct comparison between land reform and communal households does not suffice. Differences in initial conditions and recurrent program benefits should be accounted for—especially since not all communal households were eligible for resettlement—and to take into consideration the fact that land was allocated to "those least likely amongst the communal farming community to be able to make full use of the productive potential of the resources" (Mhishi 1995: 6).
4. The benefits of the program are only half the story. To obtain an idea of the economic performance of the program its costs have to be taken into account.

Below each of these considerations is treated in turn.

2.3 percent (Shumba 1992).

3.1 Looking beyond agricultural performance

Focusing on agricultural performance alone is misleading. Consider for instance Table 4, which presents total household income for land reform and communal households and its breakdown in components. Total income comprises net crop income (crop value and value of garden crops minus value of chemicals and fertilizer purchased during the season), gross income from businesses, gross income from livestock (including sales of animals and livestock products and services), the increase in herd size, remittances and private transfers, and off-farm income.[14] It shows that for non-beneficiary households crop income only represents about 40 percent of their total income. An additional 15 percent is obtained from livestock. Resettled households focus almost entirely on agriculture. Crop and livestock income represent at least 80 percent of household income. Communal households obtain much more in remittances and transfers and, to a lesser degree, business and off-farm income than land reform beneficiaries. It is clear that communal farmers obtain slightly more than half their income from cultivation and livestock rearing, so that comparing agricultural outcomes alone for both groups can be misleading.

However, even if total income is considered—on a season-by-season basis to account for variations in rainfall—household income for communal households is approximately half that of resettled households, suggesting that the finding for crop outcomes holds also for total income. This result should be interpreted with care however as there are methodological difficulties in estimating income. As an instrument to monitor the dynamics of land reform households—who initially were not allowed to seek employment elsewhere, the survey was designed to estimate household income from agriculture. With regard to incomes earned off farm, through self-employment or through remittances, the survey is less comprehensive so that it is possible that a substantial fraction of income is not recorded. This affects communal household incomes disproportionately, as they obtain a much larger fraction of their income from non-agricultural sources.

Table 4: Total income and its composition for land reform beneficiaries and non-beneficiaries

For these reasons, consumption may be preferred as a measure of performance, although consumption comes with its own set or problems. The list of consumption items for which information is collected is limited, leading to an underestimation of consumption expenditure. This hampers any comparison with income, but is not a reason not to compare expenditures between communal and resettled households. There are no indications that consumption information is systematically mismeasured. A comparison of expenditure information can therefore prove to be more revealing than one for income. Table 4 shows that land reform households consume substantially more than their communal counterparts. Over the period 1997-1999, resettlement household consumption is 66 percent higher than that for communal households so that, irrespective of whether crop income, total income or household consumption are used, land reform households perform substantially better.

3.2 Household or individual measures

One of the puzzles surrounding land reform households is why family size is so much bigger. This has not always been the case. In the early 1980s, the size of land reform families was comparable to that of communal households at the end of the 1990s (7.3 versus 6.7), which suggests that family size has increased tremendously since resettlement. Currently the mean is around 10 household members and, according to the Land Reform Monitoring and Evaluation Survey (Government of Zimbabwe 1992), this level had already been attained in 1989.

The large household size is puzzling. Various suggestions as to why this is the case can be advanced, including:

- the stipulation that households have to be successful in agriculture, in combination with the absence of a rural labor market, requires land reform households to be large to meet the demand for labor;
- land reform regulations prevent the subdivision of land as a means for inheritance. A potential response to this rule may be that adult children remain on their parents' plot to ensure that their claim to the land will be honored (*in-vivo* inheritance); and
- success in land reform—linked to a declining economy and rising adult death toll related to HIV/AIDS—attracts additional household members.

[14] Outliers—identified as households with a log(total income) exceeding the mean by 2.5 standard deviations—have been omitted. Also excluded are all households for which continuous information is not available. In total, 140 communal households (out of 150) and 384 resettled households (out of 400) are included.

Each of these suggestions carries some weight, but none provides a full explanation. The stipulation that households have to be successful in agriculture, the absence of a rural labor market and the restrictions on off-farm employment by the permit holder favor the formation of large land reform households. That the rules regarding off-farm employment still bear consequences is illustrated in Table 6, which shows that the mean number of male household heads in resettled areas is about 20 percent higher than in communal areas (0.77 versus 0.64). High demand for labor, especially during the planting season, is another income-related incentive favoring large resettled households. It certainly is a reason for many urban-based individuals to move to their rural homesteads at the onset of the rainy season. But, as the production functions have indicated, after planting much of this labor is no longer needed. The information on household size and composition is collected after the stress of planting is over, thus the numbers recorded may reflect mainly unproductive labor. [15]

Another factor contributing to the large household size is that children (adult sons especially) remain in the household. As Table 6 illustrates, in communal areas the number of male children remaining in the household is 1.5. But in resettled areas this is much higher—2.2. Why do these sons, who are not bound by regulations regarding off-farm employment, stay? Lack of income-earning opportunities in other sectors of the economy may be one reason. Another is that by remaining, sons are able to lay a claim on the land of their father—although only one son can take over the father's plot. Whatever the reason, sons of permit-holders often remain on the plot of their father and get married. This is demonstrated by the number of daughters-in-law in resettled areas (Table 6). The presence of these "new" families who stay on the residential plot of the permit-holder further contributes to household size as the wives of married sons have children. An OLS regression of household size on the number of daughters-in-law and grandchildren reveals that, for each daughter-in-law, approximately 2.1 grandchildren are present in the household (regression is not presented). This explains to a large degree the high number of other children present in land reform households.

Table 6: Household composition

The large household size in resettlement areas is also a result of the influx of communal area children who temporarily or permanently live with their relatives in resettlement schemes. One reason for this is that children from outside the schemes are attracted by the better schooling facilities that are provided in the schemes (Government of Zimbabwe 1992). Another is the fostering of children from broken marriages and in cases where one or both parents have died.

Needless to say, once performance indicators are expressed in per-capita terms much of the "success" of land reform households disappears. Table 5 shows for instance that expressed in per-capita terms, land reform households consume less than communal households.

Table 5: Household size and consumption (1997-1999) for land reform beneficiaries and communal households

This suggests a reversal of the earlier findings. However per-capita consumption may not be the proper measure either, and a consumption measure based on adult equivalents that takes into account household economies of scale might be more appropriate. If we calculate per adult-equivalent consumption (Table 5)—converting household size into household adult food-equivalents using WHO estimates for nutritional requirements (WHO 1985) for rural household members in tropical agriculture, then the finding that communal folks do better is not reversed. If, additionally, we take into account economies of size, then the two consumption measures become similar—but still land reform households do not outperform communal ones.[16]

Irrespective of the measure chosen, the outcomes in Table 4 change very little. In the remainder of the paper, therefore, the focus will be on per-capita consumption as the least contentious measure of individual welfare.

3.3 Getting a proper control group

[15] This holds less in the first of the three resettlement areas—Mupfurudzi—surveyed every year where the survey begins at a period of great labor stress, when the weeding of early-planted crops completes with late planting and replanting.

[16] Economies of size can be taken into account by raising the number of adult-equivalents raised to the power φ where φ is a number between zero and one. Deaton and Zaidi (1999) suggest that in the richer economies φ might be as low as 0.75 but that in the poorest economies φ should be set at or close to one. In our case, we set φ equal to 0.95.

So far two consequences of the program have been identified. One is that land reform beneficiaries focus substantially more on agriculture. Another is that land reform beneficiary households are substantially larger. In determining the benefits of this program, both these factors potentially lead to biased outcomes. The focus on agriculture implies that a comparison on agricultural income alone is likely to lead to a bias in favor of land reform. Total income would be a better basis for comparisons, but total income figures are unreliable in this data set. Instead we chose to use expenditure information. The use of household instead of per capita outcome measures is another reason for biased outcomes as land reform households are larger than non-beneficiary households. Even in the absence of difference in individual welfare, comparisons on a household basis would thus lead to the conclusion that settlers do better than communal households. For these reasons, a per-capita comparison is preferred.

Ignoring differences in initial conditions, could also lead to biased outcomes when comparing land reform beneficiaries and communal households. The data set comprises information on three groups of farmers, namely: those who applied for land reform and were accepted into the program (the beneficiaries); those who applied but were rejected, and those who did not apply at all, either because they were not allowed to apply or did not wish to apply. A comparison between land reform households and all communal households –both those that did not apply and those that were rejected, could lead to biased results. This especially since those that chose not to apply may have had reasons not to do so. Reasons that are likely to still affect their performance.

Table 7: Initial conditions (1981) for those resettling and not resettling

The presence of differences in initial conditions among the three groups is illustrated in Table 7. It shows that land reform beneficiaries possessed more land in the early 1980s than those who did not apply. They also had more livestock and were older than those whose applications were rejected. Beneficiaries were better educated and younger and possessed less livestock than those who did not apply at all. This finding confirms that land reform beneficiaries were indeed among the less-well-off, at least relative to those who did not bother to apply. Those who applied were also younger and better educated than those who did not apply, suggesting that the applicants were "ambitious". But, in comparison to those who were rejected, land reform beneficiaries were better off. They possessed more livestock and had more land at their command.[17]

Apart from controlling for differences in initial conditions, do we also want to control for differences in other household attributes. In section 2.1 this was attempted when the use of inputs was included in the estimation of the production functions. A problem here is that it is not clear whether the observed differences in e.g. credit use reflects differences in household characteristics or whether it should be attributed to the land reform program. One way around this problem is to rely on propensity score matching and to relate land reform households to communal households with the same pre-intervention characteristics (Rosenbaum and Rubin 1983, 1985). The propensity score is defined as the probability of participation in land reform, conditional on covariates. In this instance, the propensity score method associates to land reform households comparable rejected communal households on the basis of household characteristics at the start of the land reform program. Obviously such associations are difficult when there are numerous pre-intervention variables as is the case here (see Table 2). The innovation of Rosenbaum and Rubin is that they show that the propensity score—which is determined on the basis of a participation model, usually a logit explaining participation in a program by pre-intervention characteristics—summarizes the various pre-intervention variables. This characteristic allows the association of land reform and rejected communal households on the basis of the closeness of their propensity scores. An important assumption underlying this method is that participation in land reform is associated only with observable pre-intervention variables. This is the ignorable treatment assignment assumption (Heckman and Robb 1985; Holland 1986).[18] Given the importance of this assumption, we implement a test proposed by Jalan and Ravallion (1999) for any remaining selectivity bias after matching.

The data at hand are suited for propensity score matching. First, because similar (in fact identical) surveys have been administered to both groups of farmers. Second, because these farmers live in similar economic environments and, third, because assignment to the program has not been random. There has been selection on observables several of which have been recorded in the questionnaires (see Table 2).

[17] So, contrary to what is frequently stated, those selected for land reform were not the most disadvantaged.

[18] The assumption underlying the propensity score method is that assignment to the program is associated only with observable pre-intervention variables (see Heckman and Robb, 1985; Holland 1986; Rubin 1974, 1977, 1978). Bias due to unobservables can therefore not be ruled out.

One caveat to this approach has to be pointed out. It is often suggested that land reform generates substantial positive spillovers because, in the areas vacated by the beneficiary households, land becomes available. So not only does land reform reduce population pressure on already marginal land by relocating households, but it also leads to a second-order effect through the movement of household members from marginal communal households to relatively better-off land reform households. By having selected the communal households from communities that provided large numbers of the settlers, these effects are ***not*** taken into account. But given that most settler households possessed little or no land in their former communal areas (on average 7.1 acres) and that they probably did not release this land when they moved to the resettlement schemes, resettlement probably has had little impact on the intensity of communal land use.

The propensity score is determined by estimating a participation equation on the probability of inclusion in the program. In this case, a simple logit is used, and the determinants included are whether the household had been staying in a "protected village" during the war of independence, the land available to the household at independence, the level of education of the head of household and the natural region in which the household is located. Because of the peculiar set-up of the survey in which about 400 program participants are interviewed and 150 control households are available, it was decided to match the rejected communal households to the participants. Hence the treatment group are the rejected households. The outcomes therefore give an indication of the difference in outcome indicators had the household not been included in the land reform exercise.

Predicted values of the propensity score of being rejected for land reform were used to match those in the treatment group to the group of communal farmers. To ensure that observations included for matching are taken over common values, the (predicted) propensity scores were trimmed at 2.5 percent from the top and the bottom.[19] The latter is of importance because Heckman, Ichimura and Todd (1997, 1998) have found that, in determining program benefits using matching techniques, failure to compare participants and matched households at common values of the matching variables is the single most important source of bias. Subsequently to each rejected communal household was matched the land reform household with the closest propensity score (measured by the absolute difference in the scores). We follow the method of the nearest neighbor, so only the closest match was taken. Results are presented in Table 8

Table 8: Benefits from acceptance in the land reform program

The results indicate that had those who applied for the land reform program not been accepted they would have been substantially less well off. Their crop incomes would have been nearly two-thirds less, the household would have cultivated an area 42 percent smaller and yields would have been half their current value. The agricultural focus of land reform households is reflected in their asset possessions. Irrespective of whether it is expressed in household or per capita terms, settlers possess significantly more livestock and farm implements. The conclusion that resettled household accumulated more livestock since 1980 than did communal households, is also confirmed. The increase is less than what was suggested on the basis of Table 3, underscoring the importance of controlling for differences in initial and other conditions.

Household expenditures of land reform beneficiaries would have been reduced by a third had they not been accepted on the settlement schemes. At the same time, household size would have been 21 percent lower so that, in per-capita terms, being accepted in the land reform program was beneficial. An individual in a land reform household typically consumes Z$ 832 as opposed to Z$ 766 for an individual from a communal household. The difference in per-capita expenditure between land reform and communal households is not significant however, so that care is needed in interpreting this outcome. That land reform households are only slightly better off is underscored by another welfare indicator—educational attainment. For children aged 12 to 18, a significant (but small) difference in educational attainment is detected. No such statistically significant (yet a positive) difference in favor of land reform beneficiaries was found for those aged 6 to 12.

The Z$ 66 (Z$ 832-Z$ 766) can be used to inform about the benefits of land reform. To do so, a correction has first to be made for the underreporting of consumption. The degree of underreporting can be established by

[19] To be precise, trimming was at 2.5 percent from the bottom and top both the participant and non-participant groups, whichever was higher respectively lower. Dropping this condition of a common support, increased the number of matchable households by 3, but did have an effect on the estimated benefit.

comparing the per-capita expenditures in the survey with those reported by Alwang, Ersado and Taruvinga (2001). These authors use the 1995/96 nationally representative income and expenditure survey (ICES) and report, for land reform beneficiaries, yearly per capita consumption expenditures of Z$ 1620 and a median of Z$ 1363 (in 1995 prices). In our survey, the corresponding figures for the 1995/96 survey year are Z$ 643 and a median of Z$ 554.[20] It follows that the expenditure data are underestimated by a factor of 2.5. Using this factor and a US$/Z$ exchange rate of 0.1055 (for the first quarter of 1996, IFS), and based on the difference in household expenditures reported in the Table 8, the per capita return to land reform is set at US$ 17.

To consider whether a return of US$ 17 is a reliable estimate of the benefit to land reform, a sensitivity analysis was carried out. Various options were explored. First, we tested whether the result is sensitive to the "nearest neighbor" method. To this end, the number of land reform households that was matched to communal households was varied. Outcomes were determined for the 2, 3 and 10 closest matches (in terms of the square difference in the predicted propensity scores). Additionally, various weighting methods were attempted: no weighting (or taking the average), weighting by the inverse of the rank order of the match (whereby the closest match gets weight 1 and the n^{th} match weight 1/n), and weighting by the square of the inverse of the rank order of the match. Finally the relevance of the specification of the participation model was considered. To this end, squared terms were added to the original specification. Also, the age of the head of household (and its square) were added. Results are presented in Table 9.

Table 9: Benefits (in US$) from land reform under different specifications for the participation model with various weighting schemes and varying number of matches between treatment and control group

The table presents the net benefits from land reform. In the upper left corner of the first panel the benefit reported thus far, US$ 17.4, is presented. This is the benefit calculated using the method of the nearest neighbor (relying on one match). Moving down, results are reported for those cases with respectively the 2, 3 and 10 closest neighbors. The results in the first column are unweighted, or simple averages. In taking averages, the reliability of the estimated benefit reduces if the difference in the propensity scores becomes large. For this reason, the average for the 10 nearest neighbors is probably less reliable. The second and third columns (where weighted benefits are calculated) are therefore more revealing. The table suggests that benefits might vary between US$ 12.9 and US$ 36.7, a range that is very acceptable. For instance in their paper on the gains from participation in a workfare program in Argentina, Jalan and Ravallion (1999) report a divergence in return from US$ 157 to US$ 100 in moving from a nearest neighbor estimate to the nearest five estimates.

The second and the third panel of Table 9 give the estimated benefits for land reform under different specifications of the participation model. They show that the size of the benefits is insensitive to the specification of the participation model. This is comparable with the results reported by Dehejia and Wahba (1999). These authors explore the sensitivity of the size of the treatment effect from a matching exercise for different specifications of the propensity score by comparing benefits from different matching exercises with the unbiased benefit from a randomized sample. In line with the results in Table 9, they find that the estimates for the treatment effect are not sensitive to the specification of the propensity score.

As the matches are chosen on the basis of similarities in observed characteristics, this leaves the possibility that there are unobservables that jointly affect per-capita expenditures and participation in the land reform program. A way to test for this is to look for a partial correlation between per-capita expenditure and the residuals from the participation model. Jalan and Ravallion (1999) suggest this test, which they label the test for selection bias in the matching estimator. It is an application of the standard Sargan-Wu-Hausman test; for a combined sample of the rejected communal households and the matched land reform beneficiaries, a regression is carried out with per-capita expenditures as the dependent variable and with—as control variables—the propensity score, the residual from the participation model and the control variables from the participation model.[21] The last is to control for heterogeneity in the expenditure outcomes. Selection bias is indicated if the coefficient for the residual is significantly different from zero. In our case, this is not the case. The t-value of the residuals coefficient is –0.55 (see Table 10).

[20] Information on communal households was first collected in 1997, so that no information is available for 1995/96.

[21] In a linear model such a specification would not be possible and one would have to omit at least one control variable from the participation equation. The non-linearity of the propensity scores in the control variables means that this condition is not essential here (Jalan and Ravallion 1999).

Table 10: Sargan-Wu-Hausman test on selection bias in the matching estimator

It appears that the benefit of US$ 17 is insensitive to different specifications of the participation equation and a reasonable estimate under different weighting schemes. Additionally, we find no evidence to support the notion that unobserved variables affect the estimated benefit. In view of these results—but keeping in mind that the number of observations is small—we consider US$ 17 a realistic estimate for the per-capita return to land reform.

3.4 The return to the program

To determine the return to land reform, information on the cost of the land reform exercise is required. Various cost estimates exist. Cusworth (1990) reports that the cost per settler household of the 1980s program of land reform was approximately Z$ 22,000, or US$ 2300 in 1996 prices. Bratton (1990) presents a comparable figure. He estimates the costs of resettling 52,000 households over the 1980-89 period at US$ 112 million, or about US$ 2,154 per household prices. Unfortunately, a breakdown of the costings of Cusworth and Bratton could not be obtained. It is provided however by Robilliard *et al.* (2001) who determine the *current* cost of land reform for farmers in three types of natural regions. Their estimates are presented in Table 11 and are based on the assumption that an average farm comprises 30 hectares in NR II, 45 hectares in NR III and 90 hectares in NRs IV and V. This assumption corresponds reasonably well to what is done in practice. In our data set for instance, and depending on the natural region, the amount of land per beneficiary household varies from 29 to 76 hectares.

Table 11: Summary of Costs per Land Reform Beneficiary Household (US$1994-95)

Going by the figures from Robilliard *et al.* (2001), US$ 4,000 would be a conservative estimate for the current cost of land reform. This is considerably more than the approximately US$ 2,200 Cusworth (1990) and Bratton (1990) use. The cost difference is attributable to changes in land prices which tripled between 1980 and 1996 (see figure 1). If the cost of current land reform is calculated using land prices from the early 1980s, then the total cost per participant becomes about $ 2,500, reasonably close to Cusworth's (1990) estimate, so that US$ 4,000 is acceptable. In any case it is close to the figure provided by the Inception Phase Framework Plan 1999 to 2000 –the government's plan prepared to revive the land reform effort after the more or less failed 1997 attempt to acquire 1800 commercial farms, of US$ 3596 per family (Government of Zimbabwe 1999).

Figure 1: Per Hectare Cost of Land

Based on this cost figure a tentative rate of return to the land reform program can be determined. As was indicated previously, the best basis for doing so is to utilize per-capita consumption. Starting from a cost estimate of US$ 2,200 and an average household size of 9.4 members the per capita rate of return would be 7.4 percent. If current land prices are used (and a cost estimate of US$ 3,700) a return of US$ 17 per beneficiary suggests a rate of return of 4.4 percent. This is mediocre at best and probably below what could have been earned had the money spent on land reform been put in an interest bearing account.

Two important proviso's need to be made with respect to this calculation: the reliance on market prices for the cost of land and the amount of land provided to land reform beneficiaries. It is questionable whether market prices can serve as a reliable indicator for the opportunity cost of land as Zimbabwe's land markets are highly distorted. Untill very recently large scale commercial farms could not be sold in part. This so called ban on the subdivision of large scale commercial farms has now been lifted but has been replaced by a requirement to only sell "economically viable" portions farm land. What constitutes an economically viable portion of land is administratively determined by the extension staff. The practice thus far suggests that few subdivisions are approved, and that little land is sold on the land market. It contributes to a dualistic situation where on the one hand a great scarcity of land is felt –in the communal areas, and where on the other hand large tracts of commercial farmland are not utilized. An estimate by the World Bank (1991) suggests for instance that as much as three million hectares of commercial farmland remain idle. The absence of incentives to sell underutilized land, for instance in the form of a land tax, further contributes to a very thin land market.

In the face of these distortions, land prices are unlikely to be a reflection of the opportunity cost of land. Yet what constitutes a realistic estimate of it is not obvious. As much commercial farm land is not utilized at all one could argue that land is not a scarce good in Zimbabwe and that the opportunity cost is zero. The latter is suggested by Khatri, Jayne and Thirtle (1994), who estimate a profit function for Zimbabwe's large-scale farming subsector to

determine the shadow price of land. Their finding is that the opportunity cost is even negative, a result that may be explained by the fact that at the time the study was carried out Zimbabwe's real interest rate was negative.

Another way to obtain an indication of the opportunity cost of land is by determining the net present value of the profits that accrue to it. To this end, we base ourselves on Sukume, Makudze, Mabeza-Chimedza and Zitsanza (2000) who report for the 1995/96 season and for different NRs the gross profit (net profit plus the reward for the use of land) from cultivation for a range of crops. Thus the gross profit of growing one hectare of burley tobacco on a commercial farm in NR I is US$ 1,612. If it is assumed that a third of this gross profit is the return to land – and the remainder the remuneration for the entrepreneur's labor, his risk taking and capital investments, and if a 12 percent real rate of interest is assumed, then the implicit price of one hectare of land is US$ 4,400. This estimate is on the high side, as tobacco was the most profitable crops in the season under consideration. If the price of land is determined using crop proportions planted at the time, then the per hectare price of arable land varies from US$ 44 in NR IV to US$ 910 in NRs I and II, estimates that correspond reasonably well to the land prices as projected by the CFU (all reported in Table 12). Prices for grazing land are lower than those for arable land in NR I and II, US$ 147, but similar to those for arable land in NR IV. This reflects that land in NR IV is not suited for cultivation.

Both the land prices calculated on the basis of profitability and the CFU figures, are likely to overstate the "true" land prices. The implicit assumption of continuous cultivation and no fallow creates an upward bias in the return to land. And the artificial scarcity of land on the market (due to the subdivision laws) ensures that land that is sold on the market fetches unrealistically high prices. Yet, the order of magnitude of the per hectare prices in Table 12 is such that the prices on which the cost estimates in the Inception Plan (1999) and in Robilliard *et al.* (2001) are based, and which range from US$ 32 in NR IV to US$ 79 in NR I, are very reasonable.

Table 12
Estimated opportunity costs of arable land and prices paid (arable and grazing), in US$ (1995-96)

The other proviso is with regard to the amount of land provided to land reform beneficiaries. Depending on the natural region the average acreage provided to settlers varies from 30 hectares in NR I and II to 90 hectares in NR IV and V. Of these 5 can be used for cultivation and the remainder is set aside as communal grazing land. This division of land, where most land is set aside for grazing has been instigated by the desire to avoid overgrazing. Yet livestock only contributes 10 to 20 percent to total household income (Table 4). Of course, livestock also has an indirect contribution to income through its use as draft power, but the practice to set aside up to 90 percent of the land acquired for settlement for grazing seems economically inefficient.

Draft power and draft animals are an essential element of the small holder farming system and this is why in settlement schemes land is set aside for grazing. However the stocking rates used to determine how much land needs to be allocated to grazing is debatable (Abel and Blaikie 1989). The calculations are based on the economically efficient carrying capacity, i.e. the stocking rate at which the highest sustainable off take rate is possible, and not on the amount of land required to maintain a herd of a size that allows the cultivation of a 5 hectare plot. It leads to a situation where the marginal return from grazing land is much below that of arable land. The calculations typically assume that one class of livestock is kept within a certain area, under one form of management which is the exception rather than the rule. The calculations also include the choice of a "proper use" multiplier, which is normally set between 30 and 45 percent. The decision to use 45 or 30 percent, however, doubles or halves the calculated carrying capacity (Bartels *et al.* 1993).

Reflecting on the above, it may very well be possible that the carrying capacity figures used lead to an inefficient allocation of land. Telling in this respect is the observation by Scoones (1989) that in communal rangeland areas the theoretical carrying capacity is exceeded many fold, and that this situation is apparently sustainable over long periods. If one were prepared to reconsider the optimal carrying capacity, or to consider changes in the farming system, like reliance on tractor power or zero grazing techniques, then the acreage per family could be reduced. And as the purchase of land reflects the major cost factor in land reform, substantial economies could be realized by reconsidering the acreage required per family. It goes without saying that the rate of return would improve as well from a more efficient allocation of land in settler programs.

4 Explaining the findings: policy constraints as reason for lack of success

4.1 The political economy of land reform in Zimbabwe

Land reform in Zimbabwe has been less than satisfactory. The speed of the reform process –though what has been attained has been impressive, has been below what was intended and the economic return generated by land reform beneficiaries is mediocre. Important reasons for the latter were discussed in section 3: the increase in household size, inflated land prices and a generous allocation of land. A politically motivated system of rules and regulations should be added to that.

Various rules and regulations enhance the dependency of resettled farmers vis-à-vis the government and obstruct their economic efficiency. These rules and regulations are enforced by the resident resettlement officer and associated to the three permits issued to the settlers—to reside, to cultivate and for pasture. These permits put resettlement farmers in an insecure and dependent position if only because none of the permits received by settlers states a period of validity. The permits to reside and to cultivate may be evocated at any time and without notice as long as compensation –its level is at the discretion of the government, is paid. Other rules enhance this dependency. The rule, effective till the drought of 1992, forbidding the permit-holder to seek off farm employment in combination with the requirement to revoke any claims on the communal land from which the settlers originated, effectively ties settlers to land over which the government has ultimate control.[22]

Specific terms in the various permits have a negative influence on settler's incentives to produce.[23] Innovation is hindered by the fact that under the permit system the use of the land is strictly limited to the purpose for which the permit is granted. Diversification is constrained because permit holders are limited in the number of cattle they can keep. Investment is negatively influenced by the fact that permit-holders are prohibited from constructing any building or other structure on the arable land they usufruct. Constraints in access to credit in combination with a permit to reside that stipulates that on revocation there will be no remuneration for improvements (improvements may be removed however!) aggravate this further. [24] The absence of rules for inheritance, putting uncertainty on inter-generational transfers and hence investments, come on top of that.[25]

Rules and regulations also hinder successful farmers in their expansion as it is forbidden to lease or to borrow land within the settlement schemes. Bringing any additional land under cultivation is not allowed either as permit-holders have to renounce any right to build upon or to cultivate on the grazing commons. This despite the fact that 90 percent of the land in resettlement areas is set aside for grazing. Not only do these rules negatively affect farm efficiency they also limit the possibility of dealing with shocks through land transactions—either by selling land, by renting it out or by pledging it as collateral. This vulnerability is compounded by the obstacles to working off farm.

The question that these interventions raise, is why, if they are harmful, have they been put in place? Lack of awareness about their economic effect seems less of an explanation. Already at the start of the land reform program did Kinsey (1982), Sampliner (1983) and Bratton (1994) express their concern on the consequences of insecurity of tenure for productivity. Bratton even notes that "the full productive potential of resettled lands will only be realized when small farmers feel it is truly theirs". This suggests that the government was probably aware of the economic consequences of its measures but that it chose to ignore this for political reasons. That political considerations played a role with respect to resettlement is illustrated by the fact that in Matabeleland, home of Zimbabwe's largest minority tribe—the Ndebele, 'outsiders', i.e. non-Ndebele, were located in places where the

[22] It should be noted, however, that no permits have been issued since 1992, when the government printer exhausted its stocks. All households in the panel did receive permits, but those allocated plots in the past decade have not.

[23] Not everybody agrees with this point of view. Roth and Bruce (1994) indicate for instance that there is little fear on the part of the settlers that they will be dispossessed, an observation that is in line with our own field experiences. And Cusworth and Walker (1988), citing the building of houses and planting of fruit trees by settlers, even suggest that tenure security is adequate.

[24] Short-term seasonal loans and medium-term loans for purchases such as oxcarts, draft oxen, fencing and implements can indeed be obtained through the AFC. And inputs can be obtained on credit through traders. But loans for buildings and other long-term improvements on the land are not available from AFC, and lack of mortgage title is one reason why commercial banks will not meet credit need (Roth and Bruce 1994).[24]

[25] The general practice is that if a male permit-holder dies, his wife takes over the permits. But there is no legal basis for this practice, so that widows have been left to the administrative discretion of the resettlement officers. When the original generation of settlers has died, it is unclear what happens to the permits. Often the land will be transferred to a residing son, but again, this has been up to the discretion of the local resettlement officer. Prior to the end of 2000, there was a resident resettlement officer (RO) in each scheme. This individual administered all matters relating to land. These scheme-specific RO posts were however abolished at the end of 2000, and there is currently only one RO per district. With severely limited mobility, the district ROs cannot possibly deal with local land allocation issues. In theory, this problem is being resolved by returning resettlement areas to "traditional" administration, as outlined in the Traditional Leaders Act (1999).

government perceived that it was politically weak (Alexander 1991).[26] This reflects a general attitude by Zimbabwe's ruling party, namely to extend the state and to control activities at all levels (Moyo 1995, Masilela and Weiner 1996). Giving land to peasants seems to have been one means to do so. It ensured a continued political control over settlement farmers at the expense of their efficiency.[27]

Political motives may also explain the slow pace of land reform as the government has an incentive to keep land reform high on the political agenda. One way to do so is to carry out a program of land reform but to maintain the inherited scarcity of land. It reduced the motivation to ensure that the land reform program obtained its targets and contributed to an attitude of little concern as to whether or not resettled farmers actually released their land in the communal areas. In areas that were demarcated for settlement few households were actually resettled as 90 percent of the land was set aside for grazing. It resulted in a population density in resettled areas that is *less* than that on large scale commercial farms (MDC 2001).[28] Land redistribution through the market has never been stimulated either. By refusing to introduce a land tax or to scrap the subdivision act of land, commercial farmers could costlessly maintain large tracts of land, even if it this was underutilized or not utilized at all. A land tax in combination with the right to sell small pieces of land, would have released some of this land on the market and would thus have contributed to a market led redistribution of land.

This is not to say that high budgetary demands (the government of Zimbabwe had to match any donor funds on a 50/50 basis), a lack of planning capacity and the large number of implementing agencies involved, did not contribute to the slow pace land reform. However given the political objectives, no urgency was felt to address these issues. It led to a situation where of the 20 million pound the UK pledged for assistance for land distribution during the Lancaster House talks, only approximately 16.6 million pound was disbursed (Adams *et al.* 1996). This lack of commitment was reinforced by the lobby of the (previously all-white) Commercial Farmer's Union (CFU) which argued that changes in land use from large-scale private farms to small-scale peasant farms with communal tenure was likely to be economically disastrous (Potts and Mutambirwa 1997). So, while the government was little motivated to increase the speed of land reform it found a convenient economic rationale in the arguments put forward by the commercial farmers (whose primary interest was to slow down the process of land reform).

4.2 Recent events and implications for Southern Africa

The evidence from Zimbabwe suggests that political –not economic, motives explain the lukewarm land reform outcomes, either in terms of its pace or its economic returns. With the benefit of hindsight it can be concluded that this slow pace of land reform continued a politically unsustainable and explosive situation. Looking back, the political leverage of the CFU had better been used to ensure that the land reform processes did not slow down and that it was carried out with economic criteria in mind.

In Zimbabwe the realization that commercial farmers could better embrace land reform rather than oppose it, came late, namely when in 1997, the compulsory acquisition of 1,471 farms was attempted by the government. This attempt largely failed, because the compulsory acquisitions could successfully be challenged in court. Still 109 farms were acquired, but most of these had been offered for sale voluntarily. This was a marked change from the previous attitude toward land reform. Yet the change came too late. After the more-or-less failed acquisition of farms, Zimbabwe's land reform program entered a downward spiral characterized by unlawfulness, violence and political opportunism. This chain of consequences continues to date and has enormous economic, social and political ramifications, both within Zimbabwe, and within the region.

The pattern described for Zimbabwe might not be unique to the country. South Africa and Namibia for instance are also characterized by an extremely inequitable distribution of land, along racial lines and a land reform program that makes little progress.

---

[26] The control of the government over the peasantry in communal areas through land is illustrated by the establishment of the district councils and their representatives at the village levels (so called VIDCOs and WADCOs, village respectively ward development committees) through the 1982 Land Act which was amended in 1985. This act gave authority to demarcate land for cropping and grazing (thus bypassing traditional form of land allocation), to regulate crops grown and determine soil an natural conservation measures, to levy taxes and with the authority to sanction land use plans.

[27] The government has applied this approach successfully as is illustrated by the fact that in the three areas where we the panel data are collected there is an overwhelming support for the ruling party.

[28] There is little economic justification for such low population densities, as is illustrated in Table 4 which shows that the gains through breeding and sale of animal products and services yield a contribution of at most 20 percent to household income.

When South Africa made the transition to majority rule, white farmers controlled 83 percent of the country's arable land. In South Africa, the new government introduced three kinds of land reform programs: land restitution—to restore land to the victims of forced removals between 1913 and 1994; land redistribution—which aimed to transfer 30 percent of agricultural land to black people by 1999; and tenure reform—to address the insecurity of farm workers, labor tenants and people living on state and communal land. The pace of reform has been slow. By November 2000, some 821,000 hectares had been redistributed under the land redistribution program. This reflects less than two percent of the original target. At the same time 14 percent (or 9852) of the claims filed for restitution had been settled (South Africa 2001). Yet this figure is flattering as it mostly reflects relatively quick to resolve claims filed by urban individuals (who filed 80 percent of all claims) whose handling usually only involves financial compensation. Of the more difficult to resolve rural claims, which may embrace 50-10,000 people and which do involve the transfer of land, few have been taken up. It explains why by November 2000, only about 370,000 hectares had been redistributed under restitution. Interestingly, the slow pace of reform should not be attributed to a lack of funds. Since 1994, the Department of Land Affairs has consistently underspent its annual land reform capital allocation.

In Namibia, on coming to power in 1990, the SWAPO government inherited a landholding system in which 74 percent (or 30.5 million hectares) of the best arable land is owned by some 4,000 white farmers. Commitment to land reform was expressed at the National Conference on Land Reform and the Land Question held in 1991 but by May 2001 only 97 farms, reflecting some 569,000 hectares had been purchased for redistribution, and a total of 6,661 families had been resettled (Werner 2001). In addition, under the Affirmative Action Loan Scheme, 300 farmers have been granted soft loans to buy freehold farmland. So after 10 years of independence less than two percent of the freehold land had been acquired for redistribution (Adams and Howell 2001).

Various reasons can be advanced as to why the land reform programs advanced less speedily than envisaged in these countries. In South Africa, the delays in implementation should be attributed to bureaucratic impediments, lack of co-ordination between the various departments and agencies involved and administrative and technical capacity problems. But the land redistribution program is also hindered by long negotiations that proceed the acquisition of land. In Namibia, the speed of land reform has been affected by the fact that "the political balance of forces is stacked against the landless and dispossessed" (Werner 2001: 13). This is partly due to the fact that those who have been dispossessed of their land are typically the pastoralists in the South, a small and unorganized, minority who find it hard to make their case.

It suggests that in Namibia and South Africa, like in Zimbabwe, there are obstacles to land reform that slow down its process. And apparently the political motivation to deal with these obstacles is insufficient to be able to deal with them effectively. Part of this can be attributed, like in Zimbabwe, to a powerful minority of large scale farmers who oppose land reform. In South Africa's by contesting restitution cases in court. In Namibia through an effective lobby that opposes a proposed land tax and which argues that resettlement turns productive commercial farming land into unproductive communal land or destroys fragile ecology. Like in Zimbabwe, the unequal distribution of land along racial lines is potentially explosive, so that the opposition to land reform by the large scale farmers seems ill-advised.

5. Conclusion

This paper is based upon a unique panel data set from Zimbabwe which comprises information for land reform and small holder households. This data set is explored to determine the economic benefits from land reform. To this end propensity score method has been applied. It is found that *as households*, land reform beneficiaries have been successful. Irrespective of the measure employed (income, agricultural productivity, accumulated wealth, household expenditure) and irrespective of whether a comparison is made with the household at the start of the land reform program, or contemporaneously with communal households, land reform beneficiary households perform well. Relative to their communal counterparts, land reform households' crop income and yields are twice as high. Land reform beneficiaries own substantially more in livestock assets (approximately twice as much) and their consumption expenditure is 45 percent higher than that of communal households. But, land reform households are also substantially larger. Once expressed in *per-capita* terms, and this is the main result of the paper, most of the "success" disappears. Controlling for differences in initial conditions we find that land reform raised per-capita expenditure by as little as US$ 17 per annum. At the current cost of land reform, a return of US$

17 per capita is less than the opportunity cost of the resources that have to be expended to resettle an additional household.

Among the factors identified as determinants for the modest return, family size is an important one. Since the early 1980s the size of settler households has increased by more than 60 percent, a phenomenon for which we do lack a good explanation. On the cost side, high land prices and a generous allocation of land affected the rate of return negatively. Distortions such as those contained in Zimbabwe's permit system reduced the economic benefits from land reform. These distortions create insecurity of tenure and by preventing farmers to work off farm, to rent land in or out or to pledge land as collateral, they obstruct capital formation and innovation.

The case of Zimbabwe illustrates that irrespective of the theoretical arguments in its favor, land reform programs can easily slip. Not only are the economic returns less than they could have been, the progress in the land redistribution has been slow. As an administrative process, land reform is very involving—it requires screening of beneficiaries, land identification, valuation and demarcation, involves legal procedures and frequently assistance to the beneficiaries in farming, management, etc. In combination with a strong opposition against land reform – typically from large-scale landowners, with the opportunities land distribution offers for favoritism or to obtain other political benefits like votes, the process can easily get derailed. In countries characterized by an extremely inequitable distribution of land (along ethnic or racial lines), this is an explosive combination, which, if unaddressed can have grave macro-economic and social consequences. The current social and economic woes in Zimbabwe illustrate this. It requires a strong commitment, from policy makers and farmers (small and large scale) alike to ensure that land reform does not get derailed.

References

Abel N.O.J. and P.M. Blaikie 1989. Land Degradation, Stocking Rates and Conservation Policies in the Communal Rangelands of Botswana and Zimbabwe. *Land Degradation and Rehabilitation* 1(1): 1-23.

Adams M., E. Cassidy, J. Cusworth, M. Lowcock and F. Tempest 1996. *Report of ODA Land Appraisal Mission to Zimbabwe 23 September – 4 October 1996*, ODA.

Adams M. and J. Howell 2001. *Redistributive Land Reform in South Africa*. ODI Natural Resource Perspectives No. 64

Aghion P. and P. Bolton 1997. A Theory of Trickle Down Growth and Development. *Review of Economic Studies* 64(2): 151-172.

Alexander J. 1991. The unsettled land: the politics of land distribution in Matabeleland, 1980-1990, *Journal of Southern African Studies* 19, 581-610.

Alwang J., L.Ersado and N. Taruvinga 2001. Changes in poverty in Zimbabwe between 1990 and 1996, *Development Southern Africa* 18, 5, 553-579.

Banerjee A. and A. Newman 1993. Occupational Choice and the Process of Development. *Journal of Political Economy* 101(2): 274-298.

Bartels G.B ., B.E. Norton and G.K. Perrier 1993, An Examination of the Carrying Capacity Concept. In Bhenke R.H. , I. Scoones and C. Kerven (eds.), Range Ecology at Diseqilibrium, new Models of Natural Variability and Pastoral Adaptation in African Savannas. (London: ODI).

Bratton M. 1990. *Ten Years After: Land Redistribution in Zimbabwe, 1980-1990*. In Prosterman, Temple and Hanstad (eds.), Agrarian Reform and Grassroots Development: Ten Case Studies. Curry Foundation.

Bratton M. 1994. *Land Redistribution 1980-1990*, chapter 4 in M. Rukuni and C.K. Eicher (eds) Zimbabwe's Agricultural Revolution. (Harare: University of Zimbabwe Publications).

Chimedza, R. 1994. *Rural Financial Markets*, chapter 10 in M. Rukuni and C.K. Eicher (eds) Zimbabwe's Agricultural Revolution. (Harare: University of Zimbabwe Publications).

Cusworth J. 1990. *Land Resettlement*. Background paper prepared for the World Bank Agricultural Sector Memorandum. (Washington DC: The World Bank)

Cusworth J. and J. Walker 1988. *Land Resettlement in Zimbabwe: A Preliminary Evaluation*. Evaluation Report no EV 434: (London: Overseas Development Administration)/

Eswaran M. and A. Kotwal 1986. Access to Capital and Agrarian Production Organisation. *Economic Journal* 96(382): 482 –498.

Government of Zimbabwe 1997. *The Agricultural Sector of Zimbabwe, Statistical Bulletin March 1997*. Harare: Economics Division, Ministry of Agriculture.

Government of Zimbabwe. 1997. *Poverty Assessment Study Survey (1995)*. Harare: Ministry of Public Service, Labor and Social Welfare.

Government of Zimbabwe. 1998a. *Poverty in Zimbabwe*. Harare: Central Statistical Office.

Government of Zimbabwe. 1998b. *Technical Annexes for Poverty Analysis Including the Poverty Datum Line*. Harare: Central Statistical Office.

Government of Zimbabwe, 1999. Inception Phase Framework Plan 1999 to 2000 An implementation plan of the land reform and resettlement programme –phase 2. Harare: Technical Committee on Resettlement and Rural Development and Mational Economic Consultative Forum Land Reform Task Force.

Gunning J.W., J. Hoddinott, B. Kinsey and T. Owens. Revisiting forever gained: Income dynamics in the resettlement areas of Zimbabwe, 1983-1996. *Journal of Development Studies* 36, 6 (August 2000).

Heckman J. and Robb R. 1985. Alternative Models for Evaluating the Impact of Interventions in J. Heckman and B. Singer *Longitudinal Analysis of Labor Market Data*, Econometric Society Monograpgh no 10 (Cambridge: Cambridge University Press).

Holland P.W. 1986. Statistics and Causal Inferences. *Journal of the American Statistical Association* 81: 945-960.

Hoogeveen 2001. *Risk and Insurance in Rural Zimbabwe*. (Amsterdam: Thela Thesis).

Hoogeveen H. and B. Kinsey. 2001. Land reform, growth and equity: Emerging evidence from Zimbabwe's resettlement programme: A sequel. Amsterdam. *Journal of Southern African Economics* 27(1): 127-136.

Kinsey B. H. 1983. Emerging policy issues in Zimbabwe's land resettlement programmes. *Development Policy Review* 1, 2

Kinsey B. H. 1999. Land reform, growth and equity: Emerging evidence from Zimbabwe's resettlement programme. *Journal of Southern African Studies* 25, 2, 173-96.

Kinsey B. H., J. W. Gunning and K. Burger 1998. Coping with drought in Zimbabwe: Survey evidence on responses of rural households to risk. *World Development* 26, 1, 89-110.

May J., B. Roberts, J. Govender and P. Gayadeen 2000. *Monitoring and Evaluating the Quality of Life of Land Reform Beneficiaries*. Report for Department of Land Affairs, South Africa.

MacIntosh A., J. Barnard, G. Wellman, A. Vaughan, S. Sejake, L. Cliffe and R. Palmer. *Review of the Land Reform Programme.* Report for the Department of Land Affairs.

Masilela C. O., and Weiner, D., 1996. Resettlement Planning In Zimbabwe and South's Africa's Rural Land Reform Discourse. *Third World Planning Review* , Volume 18 (1), pp. 23-43.

Mhishi S.G. 1995. *A critical analysis of the land Reform Programme in Zimbabwe.* Mimeo.

Moser, C.O.N. 1998. *The Asset-Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies*, World Development, vol. 26(1): 1-19.

Moyo S. 1995. *The Land Question in Zimbabwe.* (Harare: SAPES Books).

Moyo S. 1998. *The Land Acquisition Process in Zimbabwe (1997-8).*(Harare, UNDP).

Munro W. A. 1998. *The Moral Economy of the State: Conservation, Community Development and State Making in Zimbabwe*. (Athens, Ohio: Ohio University Center for International Studies).

Ravallion M. and S. Chaudhuri 1997. Risk and Insurance in Village India: Comment. *Econometrica* 65(1): 171-184.

Rubin D. 1974. Estimating Causal Effects of Treatments in Randomized and Non-Randomized Studies. *Journal of Eucation Psychology* 66: 688-701.

Rubin D. 1977. Assignment to a Treatment Group on the Basis of a Covariate. *Journal of Educational Statistics* 2: 1-26.

Robilliard A.S., C.Sukume, Y.Yanoma and H. Löfgren 2001. *Land Reform and Poverty Alleviation in Zimbabwe: Farm-Level Effects and Cost-Benefit Analysis.* Mimeo.

Sampliner G. 1983. Zimbabwe's Land Resettlement Program: Lessons from Kenya and Algeria. *Journal of International and Comparative Law* 5:49-85.

Sen A. 1981. *Poverty and Famines*. (Oxford: Clarendon Press).

Scoones, I. 1989. Economic and Ecological Carrying Capacity Implications for Livestock Development in the Dryland Communal Areas of Zimbabwe. *Pastoral Development Network* 27b (London: ODI).

Shumba E.M. 1992. The Farming Systems. Chapter 3 in E.E.. Whingwiri, M.K. Rukuni, M. Mashingaidze and C.M. Matanyaire (eds.) *Small-Scale Agriculture in Zimbabwe.* (Harare: Rockwood Publishers).

Sibanda S. (2001). *Land Reform and Poverty Alleviation in South Africa.* Mimeo

Werner W. (2001). *Land Reform and Poverty Alleviation: Experiences from Namibia*.

Weiner D. 1990. *The Land Question in South Africa.* Chapter 10 in Agrarian Reform and Grassroots

WHO 1985. *Energy and protein requirements.* Technical Report Series 724 (Geneva: World Health Organization)

World Bank 1991. *Agricultural Sector Memorandum.* (Washington DC.: The World Bank).

Table 1: Acreage planted and yield per acre for land reform beneficiaries and communal farmers

Communal farmers						
	Acreage			*Yields (kg/acre)*		
	1995-96	1996-97	1997-98	1995-96	1996-97	1997-98
Maize	2.48	2.73	2.36	612.2	454.0	379.8
Cotton	0.38	0.37	0.31	421.9	325.7	494.8
Groundnuts	0.57	0.84	0.71	360.0	516.3	247.8
Nyimo	0.16	0.39	0.34	159.2	156.2	161.8
Sorghum	0.06	0.08	0.19	255.5	510.7	134.8
Sunflower	0.22	0.07	0.05	482.1	269.4	47.6
Tobacco	0.00	0.00	0.00			
Mhunga	0.14	0.09	0.03	99.9	5.4	0.2
Total area	4.01	4.57	3.99			
Resettled farmers						
	Acreage			*Yields (kg/acre)*		
	1995-96	1996-97	1997-98	1995-96	1996-97	1997-98
Maize	4.95	4.47	4.31	1050.2	900.2	638.2
Cotton	1.34	1.23	1.12	552.9	525.8	536.6
Groundnuts	0.89	1.20	0.92	733.1	843.7	390.0
Nyimo	0.26	0.38	0.39	324.3	460.0	354.6
Sorghum	0.22	0.24	0.42	496.2	1021.7	675.5
Sunflower	0.18	0.08	0.13	359.3	415.0	268.5
Tobacco	0.03	0.11	0.15	628.9	608.4	425.6
Mhunga	0.22	0.05	0.02	45.8	15.4	1.7
Total area	8.09	7.76	7.46			

Table 2: Production functions; dependent variable is log(gross real crop income): 1996/97-1997/98

	(i)		*(ii)*		*(iii)*	
	Coefficient	T-stat	Coefficient	T-stat	Coefficient	T-stat
Land cultivated (log, instrumented)	-	-	-	-	1.8678	6.28
Livestock (log)	0.2839	6.46	0.1742	2.95	-0.0696	-0.74
Family labor (log)	0.1619	2.40	0.1478	1.03	-0.4588	-3.22
Capital (log)	0.1393	3.37	0.1274	2.69	0.0856	2.26
Interaction terms with D-land reform						
Land cultivated (log, instrumented)	-	-	-	-	-	-
Livestock (log)	-	-	0.1388	1.71	0.1312	1.32
Family labor (log)	-	-	0.0157	0.10	0.2899	1.97
Capital (log)	-	-	0.0534	0.74	-0.0585	-1.00
D-land reform	0.5258	4.45	-0.0946	-0.17	-0.2566	-0.61
Log rainfall	0.7807	7.74	0.7857	8.29	0.9697	10.09
Number of visits from extension agent	0.0955	3.82	0.0928	3.67	0.0439	2.22
Log credit	0.0972	6.74	0.0949	6.74	0.0342	2.70
Log input value	0.0993	4.73	0.0984	4.84	0.0805	5.63
Constant	-0.4160	-0.64	-0.1946	-0.33	-2.4055	-3.73
R-squared	0.59		0.59		0.56	
P value (F-statistic)	0.0000		0.0000		0.0000	
Number of observations	1015		1015		1015	

Table 3: Evolution of livestock (bovine) assets

Period		Communal	Land-reform
1980	At independence, before land reform	3.11	3.00
1992	Before 1992 drought	3.36	5.45
1993	After 1992 drought	2.44	4.65
1996	After 1995 drought	2.89	5.55
2000	Current number	3.63	6.36

Note: Cattle are measured in (1995) value equivalents. A trained ox is set at 1.00 livestock unit, a young ox at 0.57, a cow at 0.73, heifers 0.61 and calf 0.30. Outcomes are weighted to control for the over-sampling of resettled households in natural regions II and III, so that a comparison can be made between land reform beneficiaries and non-beneficiaries. Figures presented do not represent the population of communal or resettled farmers in Zimbabwe.

Table 4: Total income and its composition for land reform beneficiaries and non-beneficiaries

Non-beneficiaries			
	1995/96	1996/97	1997/98
Total income (1995 Z$)	5065	3173	2890
Pct. From cropping	36	41	39
Pct. From livestock	9	15	19
Pct. From business	17	10	19
Pct. From remittances and private transfers	12	27	22
Pct. From off-farm activities	26	8	1
Household consumption (Z$ 1995)	5588	4635	4867
Beneficiaries			
	1995/96	1996/97	1997/98
Total income (1995 Z$)	8584	6340	5946
Pct. From Cropping	75	69	62
Pct. From Livestock	10	14	18
Pct. from business	9	10	12
Pct. from remittances and private transfers	4	5	6
Pct. from off-farm activities	2	2	1
Household consumption (Z$ 1995)	7867	8159	6500

In the determination of household expenditures, those with expenses above Z$ 5244 per capita were excluded.

Table 5: Household size and consumption (1997-1999) for land reform beneficiaries and communal households

		Consumption		
	Household size	*Per capita*	*Per adult-equivalent*	*Adjusting for economies of size*
Land reform	9.9	786	1074	1186
Communal	6.4	792	1106	1193

Consumption is determined on a per capita (household member) basis. A cut off point in real per capita expenditure was introduced as mean consumption level plus three standard deviations (i.e. Z$ 5244). Weighted on a per capita basis, not on a household basis.

Table 6: Household composition

	Land reform		*Communal*	
	Female	Male	Female	Male
Number of household members	4.70	4.50	3.30	2.81
Household head and spouses	1.14	0.77	1.08	0.64
Own children	1.56	2.24	1.35	1.51
Other children	0.99	1.07	0.50	0.44
In-law	0.55	0.00	0.15	0.00
Other[1]	0.47	0.42	0.22	0.22

[1] Includes tenants, parents of children and brothers and sisters.

Table 7: Initial conditions (1981) for those resettling and not resettling

	Beneficiaries	*Non-applicant*	*Application was rejected*	*P-value* H_0*: Means are equal, between land reform beneficiaries and those that applied but were not-accepted*
Land available (acres)	7.1	5.9	4.3	0.00
Land used (acres)	4.3	4.7	3.4	0.02
Trained oxen	1.5	1.8	0.6	0.00
Young oxen	0.5	0.7	0.1	0.00
Cows	1.5	2.1	0.9	0.02
Heifers	0.5	1.0	0.2	0.00
Calves	0.4	0.6	0.3	0.39
Age of head of household	41.3	44.9	36.5	0.04
Education of head of household	5.2	3.9	5.6	0.51
Observations	304	56	30	

Table 8: Benefits from acceptance in the land reform program

	Matched resettled households	*Household was rejected for land reform*	*P-value* H_0*: Means are not equal*
Crop income (Z$ 1995)	5654	1991	0.00
Household expenditures (Z$ 1995)	7583	5125	0.00
Value of livestock (Z$ 1995)	14773	9687	0.00
Value of capital stock (Z$ 1995)	2729	1730	0.00
Acreage planted	8.4	4.9	0.00
Crop income per acre (Z$ 1995)	690	430	0.00
Maize yield per acre	1025	535	0.00
Cotton yield per acre	209	159	0.26
Groundnut yield per acre	483	229	0.01
Household size	9.4	7.4	0.00
Crop income per capita (Z$ 1995)[1]	662	268	0.00
Real expenditures per capita (Z$ 1995)	832	766	0.39
Value of capital stock per capita (Z$ 1995)	310	226	0.00
Value of livestock per capita (Z$ 1995)	1732	1351	0.05
Increase in livestock numbers since 1981	4.0	3.1	0.16
No of years of education of children aged 6-12	3.0	2.6	0.23
No of years of education of children aged 12-18	7.5	6.9	0.04

Note: A total of 42 households in the data set was rejected for land reform. Eleven observations were lost because of missing information on initial conditions. Four observations were lost because no common support with the land reform households was found. Hence eventually for 27 households a match could be made. Matches are for each of the 3 years for which we have data (i.e. there are 81 observations). One household was subsequently dropped because of inconsistent answers in off farm income earned. Significance test for unpaired data with no assumption of equal variances.

Table 9: Benefits (in US$) from land reform under different specifications of the participation model, with various weighting schemes and varying number of matches between treatment and control group.

Number of matches	*Equal weights*	*Declining weight (*)*	*Declining quadratic weight (**)*
	Participation model as presented in text		
N=1	17.4	-	-
N=2	15.6	14.2	13.2
N=3	12.7	12.9	12.9
N=10	36.7	24.5	17.7
	Participation model includes quadratic terms for available land and years of education		
N=1	30.9	-	-
N=2	18.5	21.9	24.8
N=3	12.1	16.6	19.8
N=10	22.7	20.6	23.2
	Participation model includes age of the head of households and quadratic terms for available land, years of education and age of the head of household		
N=1	24.5	-	-
N=2	6.1	12.4	17.1
N=3	3.7	9.8	15.8
N=10	17.7	14.2	16.4

Note: Declining weight is 1/n where n reflects the rank order of the closeness of the match. Declining quadratic weight is 1/n squared where n reflects the rank order of the closeness of the match.

Table 10: Sargan-Wu-Hausman test on selection bias in the matching estimator

	Coefficient	*T-stat*
Propensity score	1147.3	1.44
Residual	-13.2	-0.55
Years of education of head of households	20.3	1.29
D- Household stayed in a protected village	60.9	0.41
D-natural region III	322.5	2.57
D-natural region IV	19.4	0.21
Constant	464.4	2.75

Table 11: Summary of Costs per Land Reform Beneficiary Household (US$1994-95)

	Natural region II	*Natural region III*	*Natural regions IV and V*
Land Allocation /beneficiary	30	45	90
Farm Acquisition	2370	2385	2880
Land Assessment and Distribution	314	393	627
Farmer Support	119	119	119
Credit Support	478	478	478
Infrastructure Support	763	763	763
All costs	4044	4138	4867

Note: Farm acquisition reflects the cost of buying land. Land assessment and distribution reflect the costs for land valuation, for drawing a land-use plan, for land demarcation and carrying out a title survey. Farmer support comprises training, inputs provided to the beneficiary in the first year, land preparation and extension advice. Credit is an important element in the program. The amount loaned covers the cost of purchasing animals. It is US$600 in the second year and US$300 for the third year. Half the loan is a subsidy; the other half is will be repaid over a 10-year period at a 10 percent interest rate after a two-year grace period. The entry for infrastructure support comprises expenses for the provision of water, schools, clinics, dip tanks and roads.

Source: authors' calculations based on Robilliard *et al.*

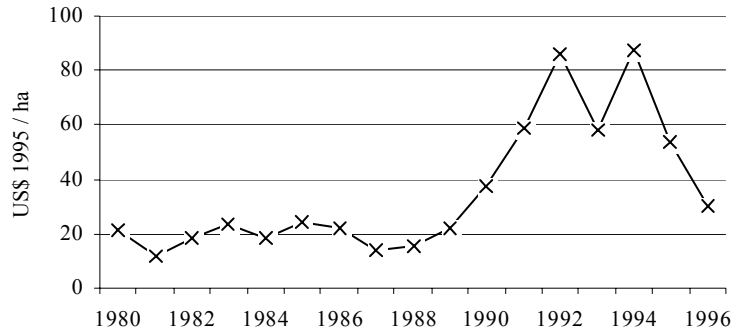
Table 12
Estimated opportunity costs of arable land and prices paid (arable and grazing), in US$ (1995-96)

	NR I - II	*NR III*	*NR IV*
		arable land	
Estimated net present value	910	582	44
Low prices paid	686	196	25
High prices paid	980	392	49
		grazing land	
Low prices paid	147	49	25
High prices paid	147	98	49

Note: The exchange rate to the dollar is: Z$ 10.2 / 1. Net present value for NR I –II is the average for NR I and NR II. The net present value for NR V is negative and not reported. It reflect that land in NR V is not suited for crop cultivation. Prices paid are based on information from the CFU. In brackets are the prices for grazing land.

Source: Authors' calculations based on Sukume *et al.* 2001.

Figure 1: Prices paid per hectare for land purchased for resettlement



Source: Adams *et al.* (1996)