Comparative Economic Performance of Zimbabwe's Resettlement Models

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by

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INTRODUCTION

This paper attempts to compare economic performance across a range of Zimbabwe's resettlement models. The point needs to be made at the outset, however, that a comprehensive evaluation of the economic performance of the models included in the study is impossible. Even in the more mature schemes, Government has failed to collect data systematically that would allow such an evaluation; and there is simply no performance data for the schemes established more recently. Moreover, while the fieldwork under the Alternative Models Study (AMS) was designed to permit comparison across schemes and models, there were weaknesses in the fieldwork that restrict the depth of analysis. Nevertheless, the data collected through the fieldwork do capture important elements, and it is the task of this paper to summarise the more salient differences across the models. In cases where the data cast doubt on the conclusions drawn, this is pointed out at the appropriate point in the presentation.

METHOD AND VALIDITY

There are several key points that should be made at the outset. We are attempting to evaluate the performance of resettlement models—and not that of the households who find themselves living on a scheme set up according to a particular model. The chain of causality thus visualises the various resettlement models as enabling—or not—families to be 'successful' in agriculture by realising potentials crippled by the previous land-holding regime. Our underlying premise is that there are likely to be significant differences in the way the various models enable people to be successful in agriculture. We assume the causality lies in this direction, and not the reverse—where the talent and energies of farmers would make a model look 'successful' no matter how flawed the model.

We also need to draw attention to several important caveats arising from our working method. Eleven resettlement schemes, representing five different models or variants, were visited in April and May 2002.[1] These schemes are identified in Table 1. In each scheme visited, the AMS team interviewed a limited number of families from only a single village.[2] Systematic sampling was not employed; rather farmers and their wives were invited to attend a meeting, which was the focal point for a group discussion and around which the individual interviews took place. Although the intention was to obtain at least 25 interviews with individual households in each scheme, Table 1 shows this target was met in only one case. With a normal distribution, a sample size of 20 is regarded as the minimum needed to obtain valid summary statistics. As the remainder of this paper will show, populations in resettlement areas are enormously heterogeneous. In many cases, therefore, we must reject mean values as being representative and utilise median values instead.

Second, the team worked in each area for only a single day, a limitation that precluded good field checking and quality control procedures and ruled out revisits to correct errors. This factor was compounded by the use of new teams of enumerators in each area, so there was little learning-by-doing in interviewing and thus limited improvement in data quality. Some questions were consistently misinterpreted by certain of the enumerators with the result that the data from these questions are unusable. An unfortunate example of this was the question that sought to ascertain the number of years of schooling attained by each member of a household. Nevertheless, thorough cleaning at the data-capture stage and beyond has significantly improved the quality of the data upon which this analysis is based.

It should be obvious that:

- a self-selected group of households may not represent an entire village,
- a village certainly does not adequately represent a scheme, and
- a single scheme may or may not adequately represent a resettlement model.

[1] A copy of the survey instrument employed is available from the AMS team members.

[2] The single exception was in Midlands/Shurugwi, when families from two different villages/models—Zhaugwe and Mavhumashava—were interviewed on the same day.

Table 1: Schemes visited by the Alternative Models Study team

Name of scheme	Model	Identifier	Location	Year est.	Agro-ecological region	No. of households interviewed
Gutsaruzhinji	B (modified)	1982-B	Midlands/Shurugwi	1982	3	21
Mavhumashava	A2	1996-A2	Midlands/Shurugwi	1996	3	11
Makonese	Irrigated	1973-Ir	Masvingo/Chivi	1973	4	18
Mkwasine	Irrigated	1981-Ir	Masvingo/Chiredzi	1981	5	18
Mushandike	Irrigated	1986-Ir	Masvingo/Masvingo	1986	???	27
Nyagundi	A1	1980-A1	Manicaland/Mutare	1980	3	20
Nyamazura	A1 and C	1982-A1	Manicaland	1982	3	20
Zananda	Irrigated	1988-Ir	Midlands/Shurugwi	1988	4	16
Zhaugwe	A1	1997-A1	Midlands/Shurugwi	1997	3	8
Lancashire Circle V	Fast-track	2000-F1	Midlands/Shurugwi	2000	???	15
Runde	Fast-track	2000-F2	Midlands/Zvishavane	2000	???	15
Brooklands			Midlands/Shurugwi	1997	3	

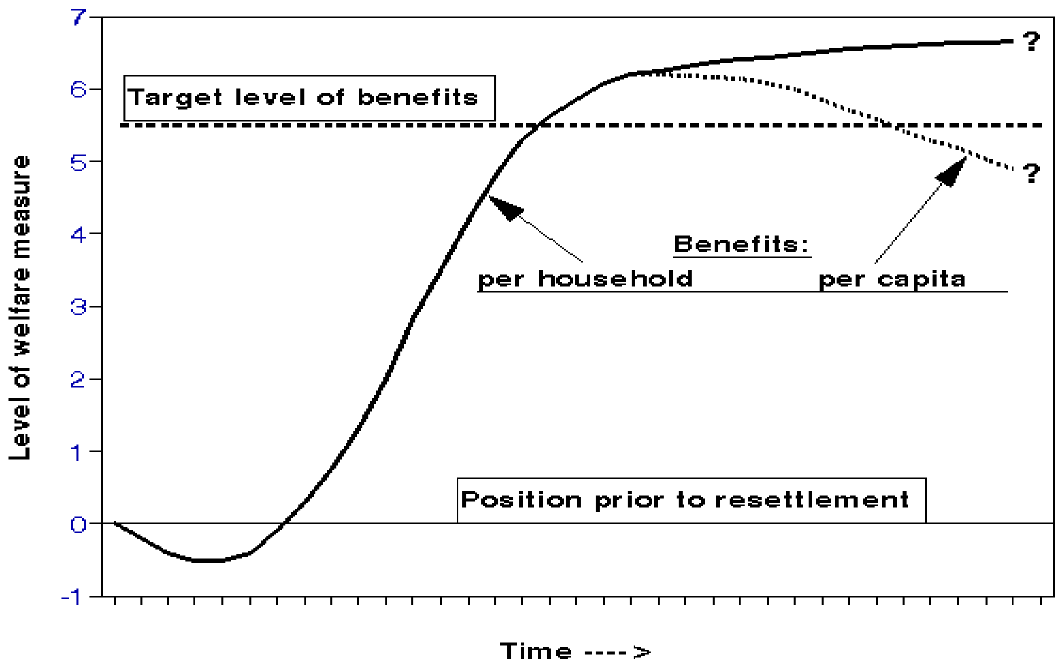
Note: The identifiers, which combine the model with the year the scheme was established, are used in the graphs that follow.

‘Overall’ Performance

Given the well-known vagaries of agriculture—whether rainfed or irrigated, it is not wise to use farm incomes as a benchmark against which to assess performance—whether long-term or seasonal. Incomes are so positively correlated with the amount and timing of rainfall and with other exogenous factors, such as inputs and labour supply, that a single season’s income may be more a reflection of luck than of skill or performance. Contemporary development theory argues that farmers—in the face of an unpredictable environment—do not attempt to stabilise income in any event. Rather what they seek to do is to avoid negative shocks to consumption through strategies that make available in lean years the surplus production and income from good years. Thus, they may store physical stocks of foodstuffs, hold cash in the form of savings, or build a mutual support network by assisting others in difficult times. They may also accumulate a variety of assets in good times in order to be able to draw upon them in unfavourable seasons.

Given that our ‘portfolio’ of schemes includes both some established prior to independence as well as some created in only the past two years, it is useful to have a common conceptual framework upon which to hang the evaluation. Figure 1 draws upon resettlement experience internationally and within Zimbabwe to construct an idealised trajectory of welfare following resettlement—whether on a well-designed and implemented scheme or spontaneous resettlement.

Figure 1: The trajectory of welfare following resettlement



Experience shows that welfare levels are almost universally lower following resettlement than before. The period following resettlement is one of stress and adjustment from which most—but not all—households will recover. There is then an upturn as farmers complete the post-relocation adjustment process and begin to reap benefits from their enhanced resource base. As experience accumulates and collaborative efforts begin, benefits continue to grow—often quite rapidly. At some point, as the potential of the resource base and the technologies employed are more fully realised, the rate of growth of benefits slows. Depending upon what happens subsequently in the realms of technology and markets, the growth of benefits may level off, or even begin to decline. If the rest of the economy is not dynamic enough to absorb the growing population in the settlement sub-sector in the longer term, then benefits per capita will certainly decline as resettled households increase in size. Finally, it should be noted that the shape of the curve tracking the growth of welfare is extremely sensitive both to specific interventions—such as the provision of effective extension, ensuring timely delivery of inputs, etc.—and to the wider economic environment.

Guided by this conceptual underpinning, then, we begin our evaluation with an assessment of performance in this 'overall' sense.

Asset accumulation.—The first indicator we examine is the accumulation of assets. Although we avoid using a single season's farming income as our primary indicator, we postulate at the outset that schemes that score well in terms of asset accumulation and consumption will be those with surplus incomes that could be used for these purposes. As a preliminary piece of evidence on this point, Table 2 gives the actual uses to which the proceeds from crop and livestock sales were put following sales from the 2001 harvest.

Revenue from both cropping and livestock sales is used primarily to purchase food and to pay for educational expenses (Table 2). Consumption claims about 40 percent of revenue from cropping but only about a quarter of that from livestock sales. However, something over a quarter of reported uses for crop revenue relate to acquisition of assets and/or reinvestment in the farming—or another—business, although this proportion is much smaller for livestock sales.

Table 2: Main uses for crop and livestock revenue, 2001-2002

	Crops		Livestock	
Stipulated use	No.	Percent	No.	Percent
Consumption				
Purchase food	107	34.5	19	25.0
General purchases	16	5.2	1	1.3
General expenditure for children	2	0.6	0	0
Subtotal	125	40.3	20	26.3
Investment				
Purchase assets	40	12.9	6	7.9
Agricultural inputs	29	9.4	2	2.6
Reinvested in business	12	3.9	4	5.3
Subtotal	81	26.2	12	15.8
Other				
Education	83	26.8	20	26.3
Pay for services	7	2.3	3	3.9
Saved	7	2.3	0	0
Health	5	1.6	4	5.3
Other*	2	0.6	17	22.2
Subtotal	104	33.6	44	57.9
Total	310	100.0	76	100.0

Source: AMS fieldwork 2002.

*For livestock, the reasons for selling include: paying lobola, assisting relatives, paying taxes or levies, and the age or health of the animal.

The fieldwork gathered information on three types of moveable assets: farm equipment and implements, household durables, and a third, residual category that includes vehicles, bicycles, grinding mills, solar installations and so on. Respondents were asked two questions: how many of each item they possessed when they first resettled and how many they had on the day of the interview.

Preliminary analysis performed a simple count of the number of items in each category and calculated the change in the number of items over the period since resettlement. Mean and median values were then calculated for all households in all schemes and for each scheme individually. The results for all households are set out in Table 3.

Table 3: Representative values for moveable assets, all households, 2002

Category	Median	Mean	Std. dev.
Farm equipment			
In early 2002 (*no. of items*)	26.5	29.8	21.2
Percentage change since resettlement	8.0	239.6	578.6
Household durables			
In early 2002 (*no. of items*)	30.0	40.0	33.1
Percentage change since resettlement	41.0	320.7	852.0
Other equipment			
In early 2002 (*no. of items*)	4.0	4.4	3.8
Percentage change since resettlement	1.0	89.5	203.6

Source: 2002 AMS fieldwork.

The next task was to compare asset ownership across schemes and to identify the schemes that stand out in terms of both possession and acquisition of assets. The outcomes for these schemes are shown in Table 4. Two irrigation schemes—Mkwasine and Mushandike—had the highest levels of ownership of farming equipment in 2002, but the ownership of equipment appears to have been more evenly distributed across households in Mushandike, as indicated by the relative values of the median and mean. A model B scheme—Gutsaruzhinji—has made the greatest percentage gains in terms of equipment ownership, although these gains were made from a relatively modest initial endowment. In terms of ownership of household durables, the Zhaugwe villages appear to be not only extraordinarily well-equipped but also to have made the greatest gains over time.[3] Finally, Mkwasine has the largest holdings of equipment in the other category, while Mavhumashava and Nyagundi have recorded the greatest gains.

The tabular presentation in Tables 3 to 5 can be somewhat difficult to absorb. Accordingly, a graphical approach is taken in Figure 2, which plots asset ownership in two dimensions—the ownership of farm equipment and other durable nonhousehold items (most of which assist in processing or marketing in some way). For example, items such as vehicles and solar panels are included under the latter heading.

Table 4: Schemes with greatest asset ownership, median and mean values

Asset category and scheme	Indicator	
	Median	Mean
Farm equipment		
In early 2002 (*number*)		
Mkwasine	36.5	**52.0**
Mushandike	**38.5**	35.1
Change since resettlement (*%*)		
Gutsaruzhinji	**350.0**	**497.1**
Household durables		
In early 2002 (*number*)		
Zhaugwe	**105.5**	**92.6**
Change since resettlement (*%*)		
Nyamazura	**350.0**	**1023.3**
Other equipment		
In early 2002 (*number*)		
Mkwasine	**7.0**	**8.7**
Change since resettlement (*%*)		
Mavhumashava	200.0	**309.3**
Nyagundi	**300.0**	281.8

Source: 2002 AMS fieldwork.

Note: Highest values are shown in bold.

[3] It should be noted, however, that only eight households were interviewed from Zhaugwe villages, thus no results from this particular scheme can be considered representative of the scheme as a whole.

Table 5: Physical assets and percentage changes in ownership, median values, by scheme and overall

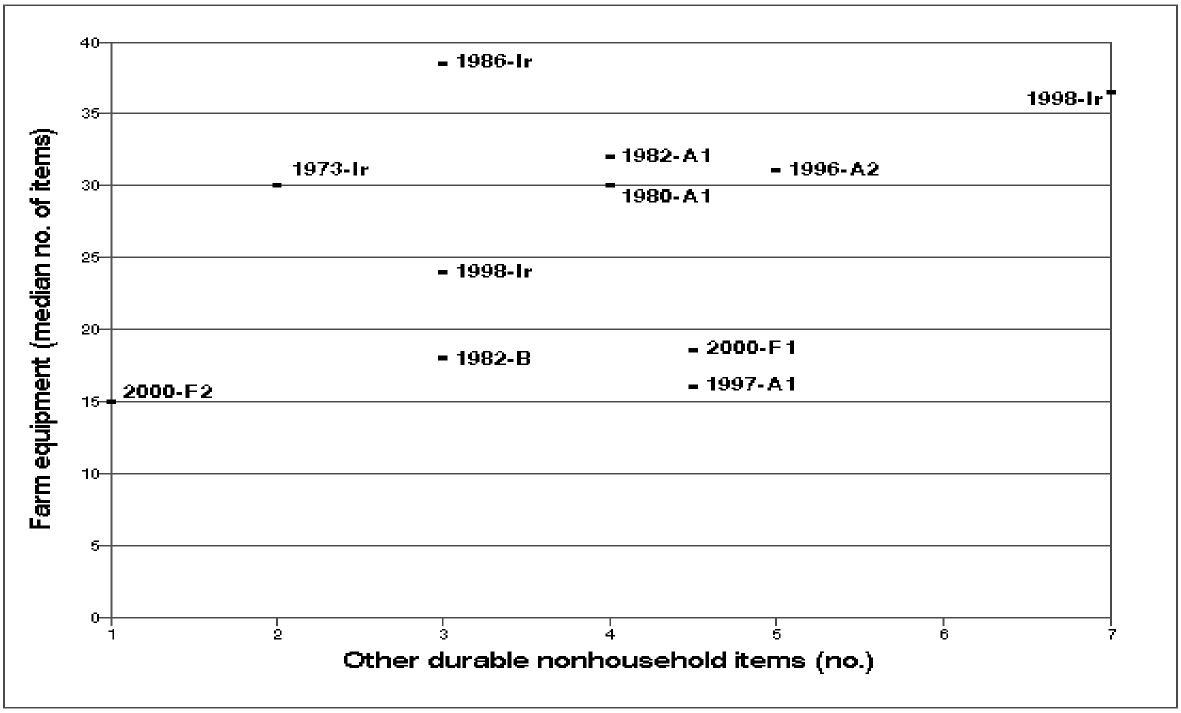
Scheme	Farming equipment		Household durables		Other assets	
	2002	Change (%)	2002	Change (%)	2002	Change (%)
Overall	26.5	41.7	30.0	14.3	4.0	0.0
Gutsaruzhinji	18.0	**350.0**	34.0	**466.7**	3.0	200.0
Mavhumashava	31.0	145.5	27.0	122.7	5.0	200.0
Makonese	30.0	<u>0.0</u>	25.0	<u>0.0</u>	2.0	<u>0.0</u>
Mkwasine	36.5	<u>0.0</u>	57.5	<u>0.0</u>	**7.0**	<u>0.0</u>
Mushandike	**38.5**	<u>0.0</u>	<u>19.0</u>	2.7	3.0	<u>0.0</u>
Nyagundi	30.0	235.0	26.0	414.3	4.0	**300.0**
Nyamazura	32.0	191.7	29.0	350.0	4.0	75.0
Zananda	24.0	60.0	36.0	71.8	3.0	45.8
Zhaugwe	16.0	71.2	**105.5**	68.8	4.5	10.0
Lancashire Circle V	18.5	<u>0.0</u>	22.5	<u>0.0</u>	4.5	<u>0.0</u>
Runde	<u>15.0</u>	<u>0.0</u>	31.0	<u>0.0</u>	<u>1.0</u>	<u>0.0</u>

Source: 2002 AMS fieldwork.

Notes: See text for method of construction of variables. Highest values are in bold and lowest are underlined.

The data plotted in Figure 2 confirm the ability of farmers in the older-established, larger-scale irrigation schemes to accumulate farming equipment. Mushandike and Mkwasine are the outstanding performers. The small-scale scheme—Zananda—lies in an intermediate position. The four schemes with the lowest levels of farm equipment include the three most recently established (including the two fast-track schemes), the one Model B scheme, and the most recent Model A scheme. The pattern for other durable assets again attests to the ability of Mkwasine farmers to build capital assets and suggests that those resettled more recently—Mavhumashava, Lancashire Circle V and Zhaugwe—enter schemes already fairly well endowed with these assets. Runde, however, is clearly the least well-capitalised scheme of all. The two early A1 schemes cluster together in both dimensions.

Figure 2: Median ownership of farm equipment and other durable nonhousehold items, by scheme, 2002



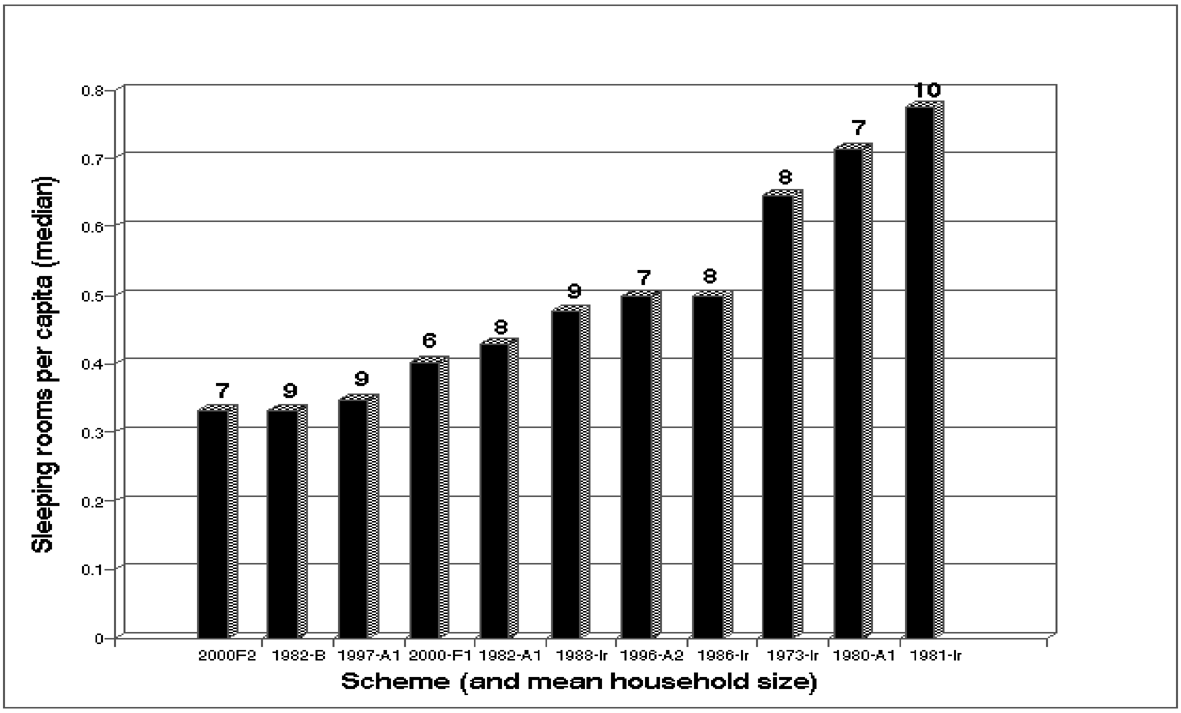
Source: AMS fieldwork 2002.

Note: See Table 1 for the names corresponding with the scheme identifiers.

The AMS team also collected data on fixed assets in the form of housing and other structures, and this data can be used to gain a somewhat different perspective on asset accumulation. Recorded along with the data on structures was information on how many rooms in each structure are used for sleeping. This information is important in two senses. First, it tells us the total number of such rooms and thus provides an indicator of investment in residences. Second, when considered in parallel with household size, it gives us the number of rooms used for sleeping per household member. This latter dimension is important in a wider development sense because crowded sleeping quarters are both an indicator of poverty and more conducive to the spread of disease. We therefore use this second concept as a simultaneous indicator of both asset accumulation in the form of housing and of the social adequacy of the family's stock of housing.

Eight of the eleven schemes have on average one sleeping room or less for two persons (Figure 3). Three schemes—the model B, one of the fast-track schemes, and the most recent A1—have on average three people sleeping per room. The adequacy of provision of sleeping facilities seems independent of household size. Mkwasine, with the largest mean household size, has also invested most in sleeping facilities. Along with Mkwasine, Nyagundi and Makonese have also invested relatively significantly in sleeping facilities.

Figure 3.—Median number of rooms used for sleeping, per household member, by household size



Source: AMS fieldwork 2002.

In Zimbabwe's resettlement areas, farmers do not typically indulge in distress sales of capital assets in times of acute stress. They do however dispose of biological capital in the form of livestock, which serve an important function in many ways—not least as a buffer to help maintain consumption over time. (Kinsey, Burger and Gunning 1998). For this reason, information was collected on the size, composition and value of livestock holdings in early 2002. Selected indicators for all households interviewed are displayed in Table 6.

Table 6: Livestock holdings, all households, 2002

Item	N	Mean	Median	Std. dev.	Maximum
Total bovines owned	188	7.7	6	8.8	85
Total smallstock owned	188	26.8	16	43.7	400
Total value of bovines	186	151,859	101,000	165,739	903,000
Total value of smallstock	184	19,432	10,250	28,414	212,250
Total value of all livestock	183	173,818	125,400	175,471	1,115,250

Source: AMS fieldwork 2002.

Notes: Smallstock includes goats, donkeys and all poultry. Mean values include those households with no livestock assets. Minima in all cases are zero.

What is immediately striking from Table 6 is how unevenly distributed livestock ownership is among resettled farmers. In all cases, the standard deviation is larger than the mean and the mean exceeds the median—and in some instances dramatically so. The figures imply little reliance can be placed on the mean values for livestock ownership across all models. It might reasonably be surmised, however, that such large variation has its origins in the aggregation of irrigated with non-irrigated resettlement schemes. Farmers in irrigated schemes practice an intensive form of agriculture and may well have less time and inclination for comparatively extensive forms of livestock management, or even for intensive approaches such as poultry-rearing. Moreover, the regulations to which farmers in irrigation schemes are subject normally prohibit the keeping of largestock within the scheme, at least at certain times of the year.

This hypothesis can be explored by repeating the earlier exercise of identifying those individual schemes that stand out in each category. The results of this exercise are set out in Table 7.

Table 7: Livestock holdings, individual scheme performance, 2002

Item	N	Mean	Median	Std. dev.	Maximum
Total bovines owned (*no.*)					
Mkwasine	18	10.3	0	20.7	**85**
Zhaugwe	8	**14.3**	**13**	7.6	26
Total smallstock owned (*no.*)					
Mavhumashava	11	26.3	**26**	14.5	43
Mkwasine	18	**75.0**	20.0	119.0	**400**
Total value of bovines (*Z$*)					
Zhaugwe	8	**324,255**	**307,900**	203,347	665,000
Mkwasine	18	66,944	0	21,962	**903,000**
Total value of smallstock (*Z$*)					
Makonese	18	36,831	**27,150**	24,934	106,500
Mkwasine	18	**43,319**	10,000	65,984	**212,250**
Total value of all livestock (*Z$*)					
Zhaugwe	8	**338,223**	**318,400**	211,265	702,800
Mkwasine	18	110,264	10,000	263,142	**1,115,250**

Source: AMS fieldwork 2002.

Notes: Smallstock includes goats, donkeys and all poultry. Figures in bold are the highest values for the entire sample.

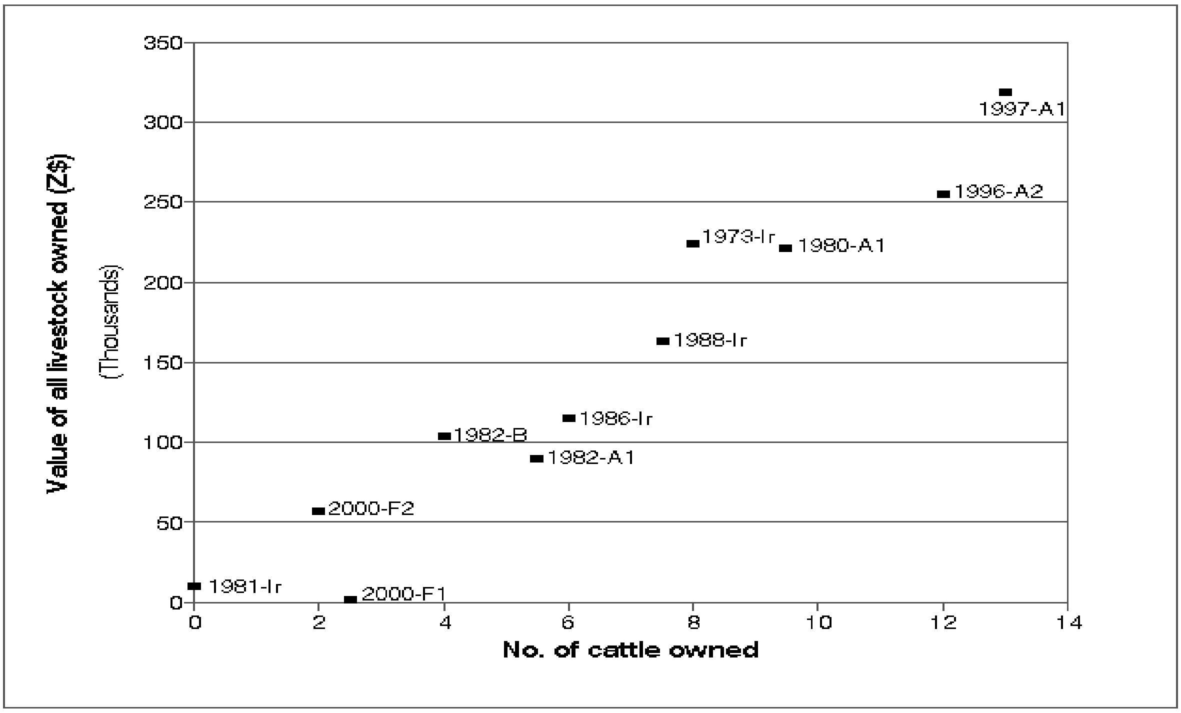
The figures in Table 7 reveal dominant performances in livestock assets by two schemes: one irrigated—Mkwasine, and one rainfed—Zhaugwe.[4] The mean results for Mkwasine, however, are unrepresentative, since over 60 percent of respondents own no cattle at all (Annex Table 1) and the median number of cattle owned is zero, while the largest cattle herd is 85 beasts. A more meaningful way to compare schemes in terms of livestock holdings is shown in Figure 4, which plots median cattle ownership against the median value of all livestock owned. Here, Mkwasine ranks lowest, while the two fast-track schemes do only slightly better. It is the two most recently established A1 and A2 schemes—Mavhumashava and Zhaugwe—that rank most highly on bovine assets, an indication that farmers in these schemes were already fairly wealthy in terms of cattle when they entered the schemes.

Average values notwithstanding, 24 percent of resettled households reported owning no cattle in early 2002, while 20 percent also reported owning no smallstock and poultry. Data

[4] It is striking that the farmers interviewed in Mkwasine keep 80 percent of their cattle holdings off the irrigation scheme. Farmers on two other irrigated schemes—Mushandike and Zananda—however, keep all their cattle on the scheme.

comparing ownership of cattle and smallstock and the value of total livestock holdings are set out, for all models, in Annex Table 1.

Figure 4: Median values for cattle ownership and total value of livestock, all schemes, 2002



Source: AMS fieldwork 2002.

Consumption.—If households generate cash surpluses, they have the choice of either investing them in capital assets to generate future income, in education for family members or of spending the surplus on immediate consumption.[5] The previous section examined the acquisition of capital assets. It is the task of this section to assess differences in consumption across schemes. The procedure utilised can be summarised as follows.

Ideally, consumption is measured on a per-capita basis. Even better, it is measured using units adjusted in terms of adult-equivalents. That is, all comparisons are made in terms of consumption units calculated in terms of their relationship to a 'standard' adult unit, usually taken as an adult male of working age. Thus, children, women and the elderly are treated as

[5] There is, of course, the additional possibility that households may decide to reinvest surpluses in agricultural enterprises in the form of non-capital expenditure. This possibility is investigated in a subsequent section.

some fractional equivalent to the standard. Both approaches are used here. First, we work with per-capita measures that treat all resident members of the household the same. This procedure may, of course, make households with large numbers of the very young or the very old appear worse off in per-capita consumption terms than they actually are. Thus, as a second step, we recalculate consumption—in expenditure terms—based on adult-equivalents.

Household sizes vary significantly across the schemes examined. The mean size is 8.1 resident persons per household, with a standard deviation of 3.7 (Table 8). The range is from one to twenty persons.[6]

A measure of total consumption is defined to comprise three components as follows. First, total household expenditure on 18 foods or food categories is calculated for the month preceding the interview. Second, market values are attached to the food consumed out of the household's own production for the previous month. Finally, comparable valuations are done for ten categories of non-food expenditure (clothing and footwear, water, transport, taxes, etc.). Each of these three components is in turn calculated individually on a per-capita basis, and all components are summed to obtain total per-capita consumption expenditure.

It should be noted that the measure used here refers only to the month prior to the interview, and no attempt has been made to extrapolate this one-month's reported consumption to an annual basis.[7] Another point to note is that we take only partial account in calculating consumption of the value of food and consumer goods transfers into the household.[8]

The procedure employed here is identical to that used above, i.e., first overall statistics are presented for the consumption of all households across the eleven different schemes, and then the focus shifts to identifying those schemes that exhibit superior performance.

Table 8 sets out the results for all households for the consumption indicators calculated.

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[6] The maximum number of persons resident in some households may exceed 20, however the data collection instrument used allowed details to be collected for only 20 persons.

[7] Purely for the sake of illustration, the median monthly total per-capita consumption would be equivalent to US$1.63 (range US$0.19 to US$10.39) per day at the highly overvalued official exchange rate or US$0.07 (range US$0.01 to US$0.48) at the parallel exchange rate prevailing in April 2002.

[8] The data allow us to consider transfers in cash, and this is done in a subsequent section.

Table 8: Consumption indicators for all households, March-May 2002

Item	*N*	Mean	Median	Std. dev.	Range
Household size (*persons*)	187	8.1	8.0	3.7	1-20
Food expenditure per capita (*$*)	178	1428	1117	1284	136-10,273
Food value per capita (*$*)	164	1385	1057	15,934	0-13,571
Total food per capita (*$*)	164	2790	2257	2273	239-14,266
Nonfood expenditure per capita (*$*)	180	609	217	1163	0-8160
Total consumption per capita (*$*)	161	3420	2693	2880	306-17,140

Source: AMS fieldwork 2002.

Note: See text for derivations.

It will be noted that the sample size of 161 on which the estimated total value of consumption is based is some 15 percent less than the full sample of 188 households. This is largely because the enumerators and/or respondents proved very poor at reporting consumption out of own production and/or stocks. As a result, total food and nonfood expenditure are more representative than those elements in the table that attempt to incorporate the value of consumption of own produce.

Based on the calculations shown in Table 8, it appears that a representative figure for the value of consumption per capita is some Z$2700 per month, or some $90 per day. In the present climate of hyperinflation, however, calculations of this kind are very rapidly outdated.

The data in Tables 8 and 9 are easier to grasp in graphical format, and Figures 4 and 5 attempt to elucidate the main findings from the tabular data.

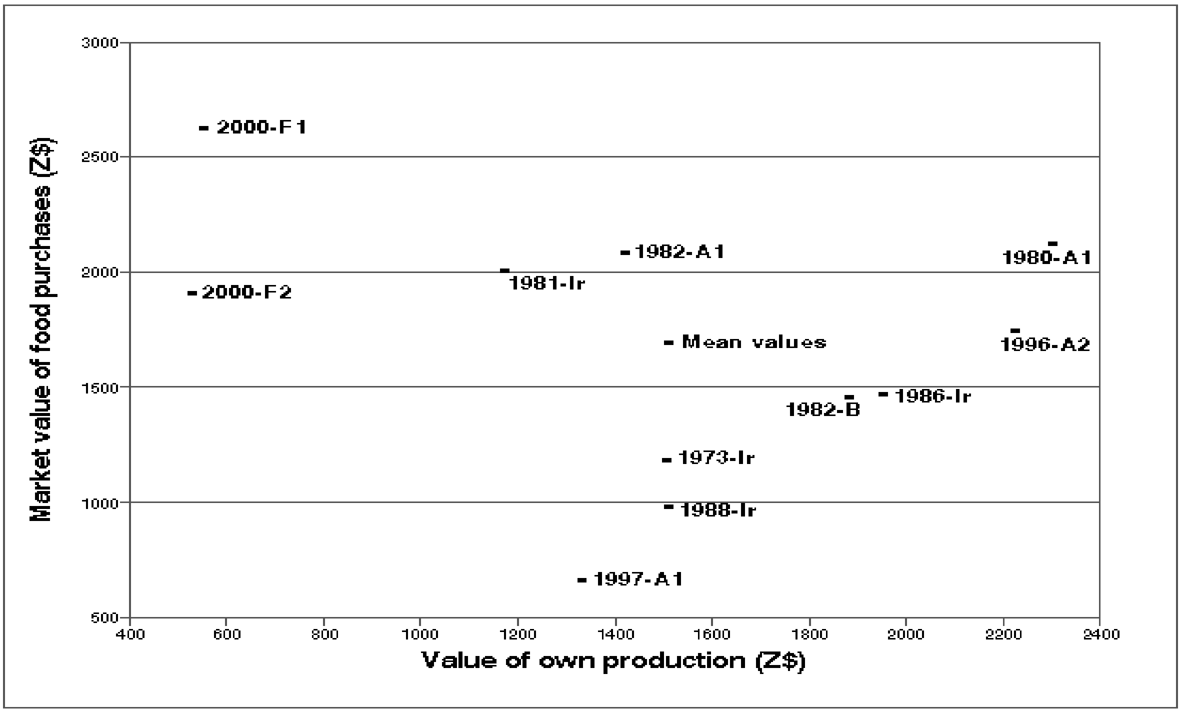
Table 9: Comparison of mean per-capita consumption levels, by scheme, March-May 2002

Scheme	Size of household	Food expenditure	Value of food	Nonfood expenditure	Total consumption
	(*n*)	(*Mean per capita values in $*)			
Gutsaruzhinji	9	1116	1444	509	3069
Mavhumashava	7	1477	1940	213	3629
Makonese	8	1075	1127	257	2466
Mkwasine	**10**	1751	1043	**2257**	**5191**
Mushandike	8	1361	1664	398	3397
Nyagundi	7	1823	**2026**	558	4406
Nyamazura	8	1373	1455	874	3597
Zananda	9	875	1352	124	2351
Zhaugwe	9	604	1174	420	2199
Lancashire Circle V	6	**2366**	523	279	3652
Runde	7	1660	443	469	2728

Source: AMS fieldwork 2002.

Notes: Highest value in each column is in bold and lowest value is underlined. Columns 3 to 5 do not sum to column 6 in all cases because the number of valid observations across columns 3-5 varies for some schemes.

Figure 5: Per-capita food consumption by mean value of consumption from own production and from purchases

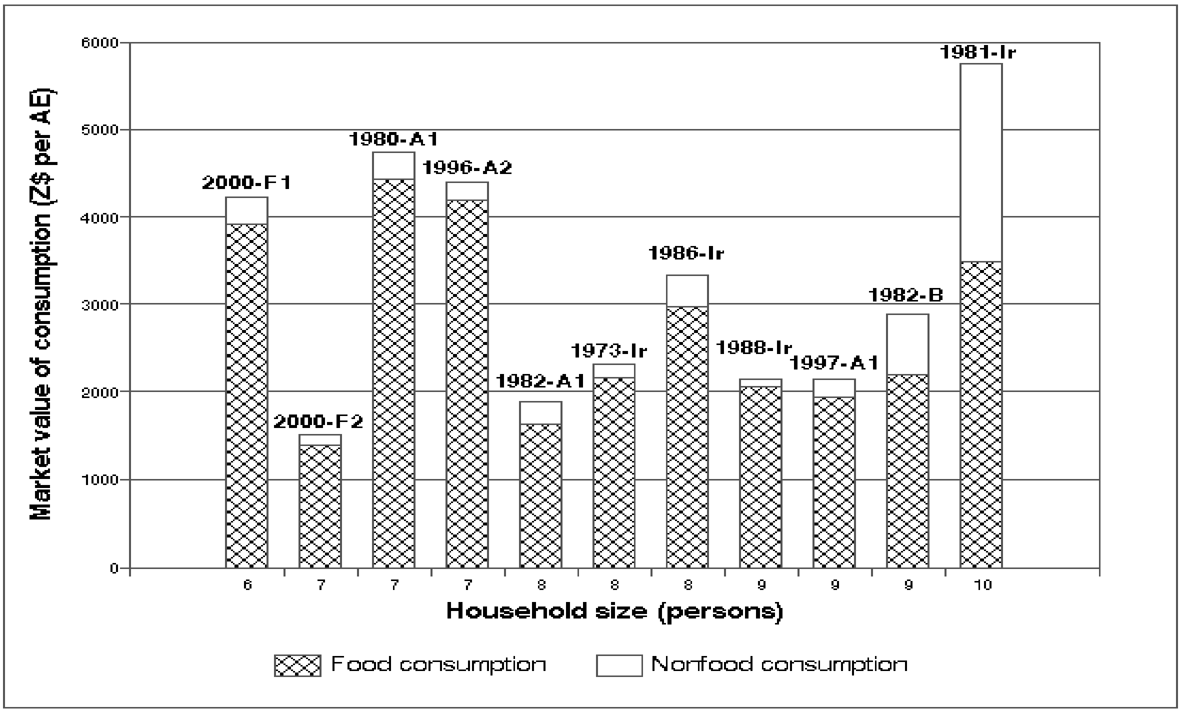


Source: AMS fieldwork 2002.

Considering only food consumption first, Figure 5 plots data for mean per-capita food consumption and breaks this down into food purchases and the market value of food consumed from own production. One thing is clear: there is a linear relationship between the value of food produced and food purchased. The more home-produced food is consumed, the more food is purchased. The two fast-track schemes, which consumed almost nothing from own production, are anomalies, as they had to feed themselves almost entirely from purchases or transfers. Nyamazura and Mkwasine are also exceptions to the common pattern because cash cropping both reduces availability of own-produced food and provides the means to purchase food. Nyagundi is exceptional both in terms of consumption from production and from purchases.

Broadening the perspective on consumption, Figure 6 combines both food and nonfood consumption and presents these in terms of medians and adult-equivalent values. The figure also compares consumption for the schemes by the mean household size in each scheme. The value of food consumed per adult-equivalent tends to be greater among the smaller households. For households with a mean size below eight persons, for example, median food consumption is valued at $3484, whereas it is only $2353 among the larger households. The opposite is true for nonfood consumption. In this case, households with a mean size below eight persons have a median consumption per adult-equivalent valued at $235, whereas the nonfood consumption of larger households is valued at $579.

Figure 6: Median value of food and nonfood consumption per adult-equivalent, by mean household size, March-May 2002



Source: AMS fieldwork 2002.

Measured in terms of total consumption and corrected for household size and composition, Mkwasine then stands out above the other schemes. Consumption in Mkwasine is some 20 percent higher than in the next closest scheme—Nyagundi, one of the earliest A1 schemes. Consumption in two of the new 'commercial' schemes—Lancashire Circle V and Mavhumashava—is also relatively high, an indication that the households sampled did not come from the poorer strata of Zimbabwean society. The second fast-track scheme—Runde—has the lowest levels of consumption. There is also little difference between the oldest and newest irrigation schemes, as well as between the two most recently established A1 schemes.

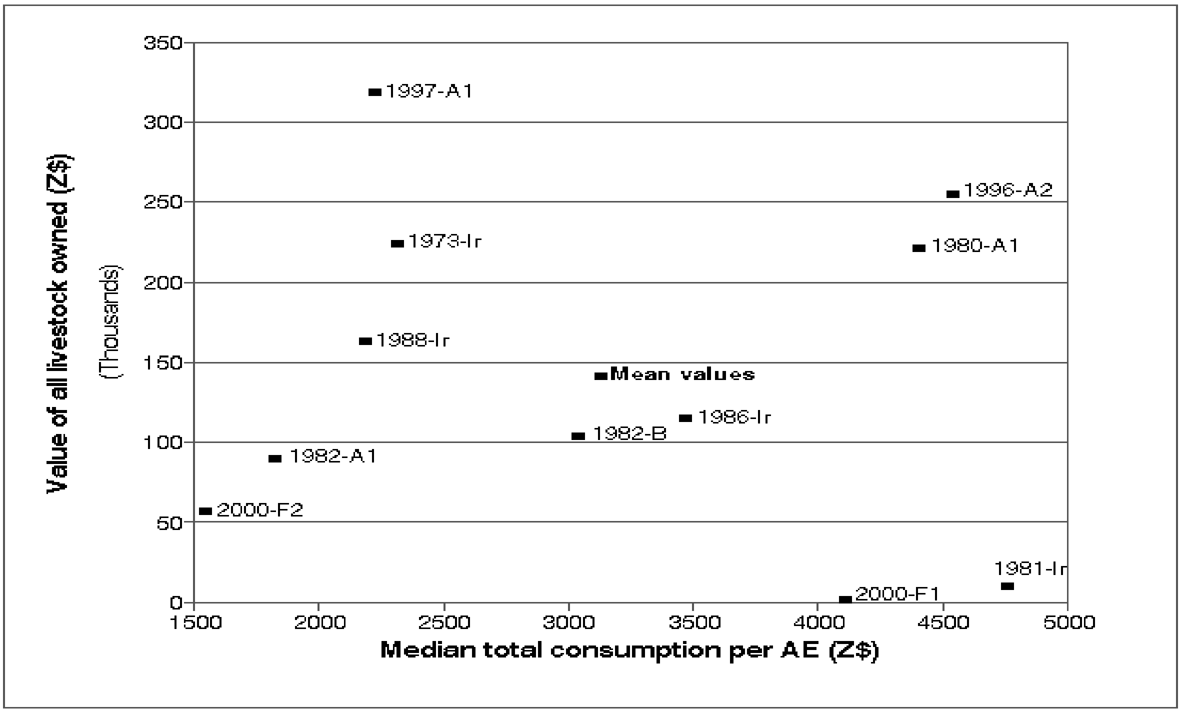
Conclusion.—This section attempts to construct a 'league table' for the eleven schemes where data were collected in 2002. There is huge variability in the data, reflecting not only both enormous variations in the populations but also the small sample sizes. Thus, the choice of a particular representative statistic for any given criterion signals different schemes as the best performer. Nevertheless, some broad conclusions are possible. The preceding section flags two schemes as outstanding performers using median values for total consumption and one possible measure of capital accumulation. These are Nyagundi, one of the very first A1 schemes, and Mavhumashava, one of the early commercial farm resettlement schemes. In the case of the latter, it is likely that the new farmers entered the scheme already well endowed with capital and savings adequate to maintain consumption until earnings commenced, whereas farmers in Nyagundi will have struggled to generate earnings and reinvest them into capital formation. This interpretation is also supported by the evidence in Table 5 for example.

It is the task of the next section to examine the evidence available as to why these variations in outcomes exist.

AGRICULTURAL PERFORMANCE

Zimbabwe has always expected her resettled farmers to be productive; indeed, in the early years, they were required to earn their living entirely from agriculture. How well have the farmers across the different resettlement models done in terms of successfully managing their farming enterprises?

Figure 7: Schemes ranked in both asset and consumption space, total value of livestock and total consumption per adult-equivalent, median values for March-May 2002



Source: AMS fieldwork 2002.

We really do not have the data to answer this question convincingly. Instead, we need to approach it indirectly. For example, we have data on only a single farming season—2000/01, which will have varied across the different sites where data were collected. In order to approach an answer to our question, we begin by looking at an indicator—income—that was rejected earlier as a criterion for judging success. We do so because income measures may tell us something useful about the capacity of the different resettlement models to enable farmers to enhance consumption levels and accumulate assets. In a normal agricultural economy, today's asset holdings and consumption are largely a consequence of past income and/or borrowing. Surplus income, and savings, in turn, are outcomes of enterprises well run.

Income Streams.—The opening discussion made the point that, for several reasons, income is an inappropriate indicator of performance or changes in socio-economic welfare. Nevertheless, having examined asset accumulation and consumption, it is useful to draw comparisons between these two indicators and household income. Here we examine briefly three income streams: *i*) the gross revenue earned from crop sales in the 2000/01 agricultural season, *ii*) the gross revenue from sales of livestock and livestock products and services in the 12 months preceding April-May 2002, and, *iii*) income in the preceding year from non-agricultural sources (transfers and remittances, off-farm and non-agricultural enterprises and employment, and labouring on the farms of others). These three components are then taken to represent total household income.

The outcomes for the first two of these components are set out in Annex Table 2 and then summed to provide figures for total gross agricultural revenue. One scheme—Mkwasine—stands out strikingly in terms of its ability to generate revenue from cropping. Not only is revenue of $1 609 500 from crop sales four times higher (on the basis of means) than the next closest scheme—Nyamazura—but also it is far more consistent. The median value for revenue is close to the mean, an indication that revenues are high among most farmers. Another indicator that the level of earnings is fairly uniform is the small coefficient of variation (the standard deviation divided by the mean).

Indeed, on this same basis, there is a striking divergence in Annex Table 2. For cropping revenue, there is far more variation across schemes than within them.[9] For livestock revenue, the variation across all schemes is virtually identical to the average variation for the individual schemes. What this means is that, as one would expect, the ability to generate

[9] The coefficient of variation for all schemes together is more than double the mean coefficient of variation for the individual schemes.

revenue from cropping is scheme-specific. Schemes in more favourable areas, with irrigation, or longer established, tend to out-perform others. In contrast, the ability to earn revenue from livestock tends to be household-specific. And livestock ownership in Zimbabwe is known to be highly skewed.

The revenues earned from the activities shown vary enormously, as do participation rates. Just under half the settlers interviewed reported that their households earned some revenue from nonfarm enterprises, just under a quarter reported remittances, and around ten percent earned from farm work or benefited from transfers.

Perhaps the most striking pattern in Annex Table 3 is the fact that Mkwasine farmers do not participate in off-farm activities at all, even though some family members clearly live and work elsewhere in order to remit. This evidence, together with that in Annex Table 2, points to the conclusion that Mkwasine farmers focus exclusively on their agricultural activities. A contrasting pattern is seen in the case of the two fast-track schemes—Runde and Lancashire Circle V, where reported off-farm earnings average more than 8000 times as much as agricultural revenue.

It is easier to appreciate the data set out in Annex Tables 2 and 3 when the schemes are compared in a graphical format. Treating revenues as income, Figure 8 shows there is a loose clustering of schemes according to the proportion of total household income that derives from agriculture. The households in four schemes—including the two fast-track schemes—earn less than 30 percent of household income from farming. Households in five other schemes earn more than three-quarters of their income from farming. This latter grouping includes two older irrigation schemes, the two oldest A1 schemes, and the single A2 scheme. This group includes, of course, Mkwasine, where families rely upon farming for almost all their income. Aside from the group of outliers comprising the three most recently established schemes, there is a generally positive relationship between total income and the proportion of income that comes from farming.

It is also abundantly clear from Figure 8 that provision of irrigation alone is no guarantee of high farm incomes or even that irrigated farming will contribute substantially to household income. Zananda (1988-Ir) and Makonese (1973-Ir) do surprisingly poorly compared to schemes where rain-fed farming is the norm.[10]

[10] Regression analysis that explains gross crop revenue by whether or not a scheme is irrigated reveals that irrigated schemes have revenues 178 percent higher than those without irrigation (with a standard

In Figure 9, the schemes are arrayed from left to right in order of total household income, and the shadings of the bars indicate the proportion of total household income derived from the six different components set out in Tables 10 and 11. Mkwasine (1981-Ir) and Nyamazura (1982-A1) are particularly striking for the dominant role played by cropping, while crops and livestock combined are important in Nyagundi (1980-A1), Mushandike (1986-Ir) and Mavhumashava (1996-A2). At the other extreme, from this portrayal it is hard to recognise as agricultural resettlement schemes Zhaugwe (1997-A1), the two fast-track schemes (2000-F1 & F2), and Zananda (1988-Ir).

Even though cropping contributes the major share of income across the schemes as a whole, there is clearly enormous variation among schemes and models. Both because of this wide variation, and because the success of resettlement is predicated upon success in cropping, it is important to look in some detail at cropping activities. This is the task of the following section.

Crops and Cropping Activities.— The ability of resettled farmers to contribute to exports and domestic commercial production is critical. During the fieldwork in 2002, farmers were asked to provide details on the five most important crops—as defined by them—that they grew the previous year. In addition, those who grew cotton were asked to provide details on this crop.

Using a somewhat arbitrary classification system, the crops reported have been grouped into those that are primarily cash crops (tobacco, sunflower, cotton, sugarcane, paprika and wheat) and those that may be cash crops but that are grown primarily for home consumption (maize, groundnuts, rapoko, mhunga, sorghum, nyimo, vegetables and fruit, legumes, rice, and roots and tubers). The results are presented in Table 10.

Table 10: Classification of crops

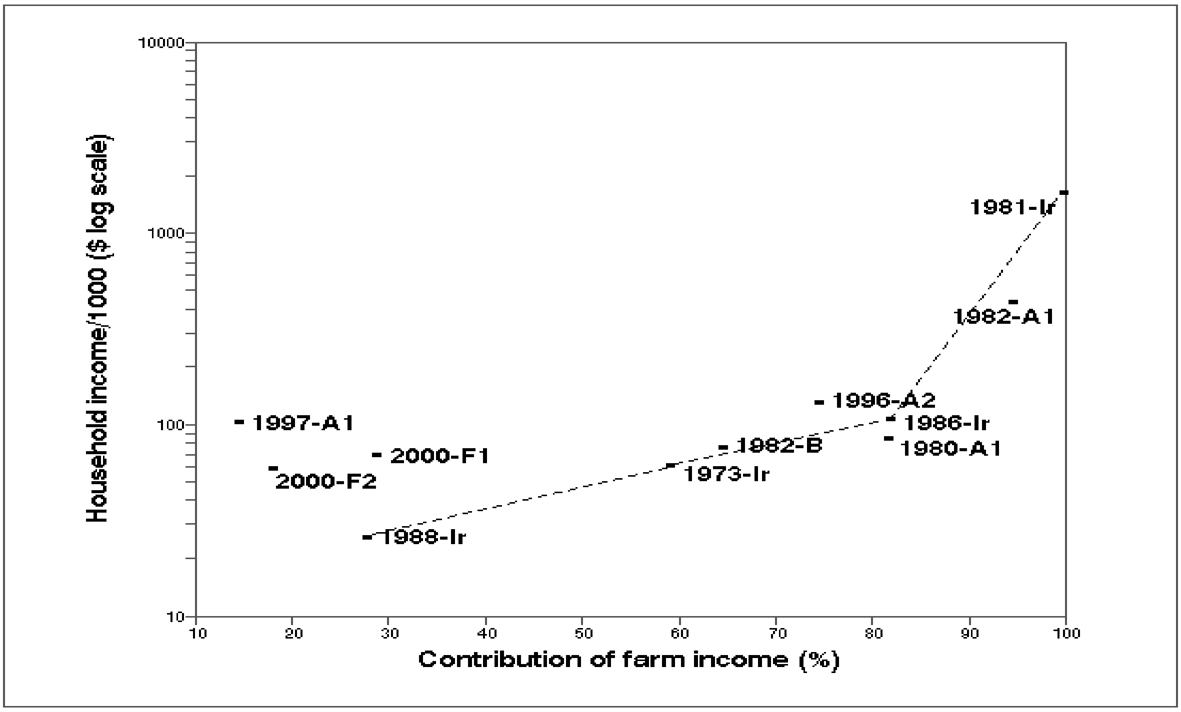
Category	N	Percent
Cash crop	153	25.8
Food crop	439	74.2
Total	592	100.0

Source: AMS fieldwork 2002.

error of 88 percent), however the presence or absence of irrigation explains only five percent of the total variation in revenues.

According to this classification, about one-quarter of the crops grown by resettled farmers are cash crops.

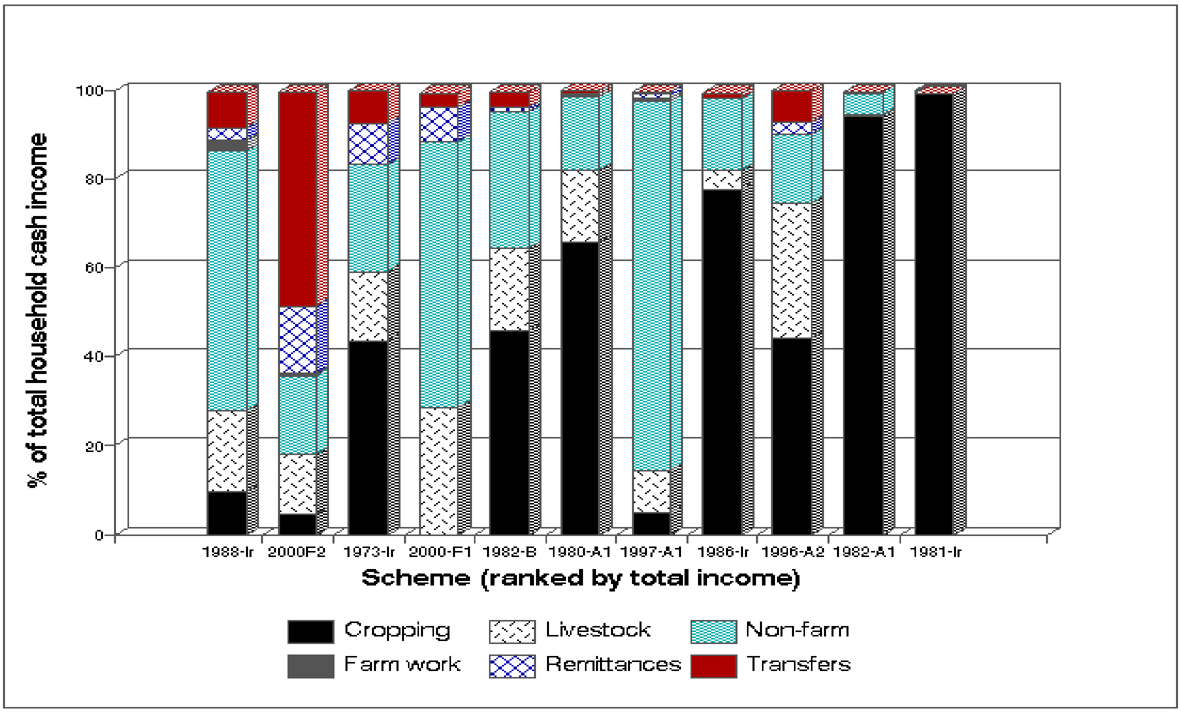
Figure 8: Farm 'income' as a percentage of total household 'income', 2001-2002



Source: AMS fieldwork 2002.

Note: The dotted line connects the four irrigation schemes.

Figure 9: The composition of total household cash income, 2001-2002



Source: AMS fieldwork 2002.

A breakdown according to actual cropping patterns sheds more light on crop selection. Table 11 lists all crops or crop categories grown by the surveyed farmers. To some extent, of course, the patterns shown are a consequence of the schemes selected for study. Thus, wheat and cotton are the most common cash crops, followed by sunflower, sugarcane and tobacco.

Table 11: Most important crops grown, 2000/01 season

	Growers	
Crop	Number	Percentage
Maize	165	27.9
Groundnuts	105	17.7
Rapoko	14	2.4
Sorghum	10	1.7
Nyimo	44	7.4
Tobacco	21	3.5
Sunflower	27	4.6
Cotton	51	8.6
Vegetables/fruit	34	5.7
Beans/nyemba/soya	56	9.5
Rice	3	0.5
Potatoes/sweet potatoes	8	1.4
Sugarcane	22	3.7
Wheat	29	4.9
Other	3	0.5
Total	592	100.0

Source: AMS fieldwork 2002.

The wide range of crops grown and the relatively small number of growers for each—aside from maize—makes comparison of performance in terms of yields difficult. Complete details of the crops grown, the number of growers, the area planted to each, and yields are given in Annex Table 4.

Eighty-eight percent of farmers grew maize. The mean reported yield across all schemes is just under two tonnes per hectare—1960kg. The validity of this figure is called into question, however, by the very high maximum yields reported in Zhaugwe (15 tonnes/ha) and Mushandike (20 tonnes/ha). A more representative figure, therefore, is likely to be the median maize yield of 1081kg/ha, a figure that more closely resembles maize yields in communal areas than those in commercial areas. Even if this yield reflects the outcomes from maize planted with a mixture of marketing and consumption objectives, it is still abysmally low. While in each scheme (except the fast-track schemes) there are farmers achieving creditable maize yields, only two schemes—Mushandike and Zhaugwe—achieve mean yields that are anywhere close to those that would be found on commercial farms. The small number of farmers interviewed from Zhaugwe appear to achieve strikingly high mean yields.

The only other crop grown by a majority of the farmers interviewed is groundnuts, and yields for this crop are even more variable than those for maize. The median yield for 105 growers is only 140kg/ha, although some farmers on two schemes are achieving up to four tonnes per hectare.

Can the data collected tell us something about the reasons for the wide variability in performance in cropping? As suggested by the data in Table 12, there is as much or more unevenness in the factors associated with agricultural productivity as there is in the observed outputs, whether in terms of yields, production or revenue. It is impossible even to calculate the percentage variation in cropped area, credit received, wages paid or days of labour hired, and fertiliser use because the minimum in each case is zero. If it were possible to narrow the wide disparity in results by improving the performance of those near the bottom of the distribution, the gains would be substantial. For example, the maximum revenue per hectare is some 111 times the median revenue, which is itself less than one-third the mean revenue.

Table 12: Factors influencing overall performance, all schemes, 2000/01 season

Variable	Mean	Std dev	Median	Maximum*	No.
Total area cultivated (*ha*)	7.9	9.1	5.0	66.0	179
Total amount borrowed (*$*)	20 403	71 879	0	565 000	185
Total wage bill (*$*)	11 990	48 969	0	516 000	183
Total labour-days hired	54	173	0	1 080	183
Labour-days hired per hectare cultivated	4	11	0	88	172
Total revenue per day of hired labour (*$*)	367	429	200	1 900	69
Rate of fertiliser use (*kg/ha cultivated*)	205	238	115	1 000	173
Total fertiliser use (*bags*)	31	75	7	550	184
Gross crop revenue (*$*)	231 296	650 782	32 000	6 024 000	185
Gross crop revenue per cultivated ha. (*$*)	20 235	55 187	6 185	684 545	174

Source: AMS fieldwork 2002.
* All minima are zero.

It is, however, beyond the scope of the treatment here to explore further the factors underlying the observed variation in use of inputs and value of outputs. One relevant observation can, however, be made. The selection of beneficiaries for land reform is a topic of perennial debate in Zimbabwe, and the world-wide literature in agricultural economics has addressed the issue of the role of management for many decades. Our data do not allow us to develop even a rudimentary model to explore the impact of management on agricultural performance because the data on the key education variables are unreliable. What we do instead is to estimate in very simple terms the returns to skill, where skill levels are proxied by years of farming experience. A simple OLS model employed years of farming experience as the dependent variable to explain differences in the median gross revenue from cropping. This formulation explained 25 percent of all variation in median revenues, and the increase in gross revenue with each additional year of farming experience was $13 794 (with a standard error of $2 618). At the sample mean of 16.8 years of farming experience, this experience was worth some $232 000 in additional revenue.

In parallel with previous discussion, the treatment here concludes by identifying the schemes with the best performance according to the indicators employed. At the same time, comparative data on a more limited set of indicators are provided for all schemes.

The upper section of Table 13 uses seven indicators of performance to identify the best-performing scheme. Six of the seven indicators select the same scheme—Mkwasine, a large-scale irrigated scheme specialising in sugarcane. The other outstanding scheme is Zananda, a small-scale irrigated scheme, where the intensity of cropping results in the highest fertiliser application rates observed.

Table 13: Indicators of superiority by scheme

Indicator	Scheme	Value (*mean (median)*)
Highest level of performance indicated by mean/median values		
Area cultivated (*ha*)	Mkwasine	28.9 (26.0)
Total value of credit for cropping (*$*)	Mkwasine	168 611 (150 000)
Total wage bill for cropping (*$*)	Mkwasine	120 963 (114 000)
Total labour days employed (*days*)	Mkwasine	467 (365)
Total gross crop revenue (*$*)	Mkwasine	1 609 530 (1 475 000)
Total employed labour days per cultivated hectare (*days*)	Mkwasine	17.7 (14.5)
Fertiliser use per cultivated hectare (*kg/ha*)	Zananda	535 (500)
Highest level of performance according to efficiency indicators		
Gross crop revenue per hectare cultivated (*$*)	Mkwasine	59 397 (57 692)
Gross crop revenue per labour day employed (*$)*	Mushandike	28 760 (23 575)
	Nyamazura	89 830 (7985)
Gross crop revenue per kg. of fertiliser applied (*$*)	Nyamazura	251 (134)

Source: AMS fieldwork 2002.

The lower section of Table 13 uses efficiency criteria rather than maximum values to identify superior performance. In spite of the relatively large areas cultivated, Mkwasine farmers again excel in terms of revenue per hectare cultivated. Two different schemes are identified when the criterion is the highest returns per day of employed labour. Nyamazura has the highest mean returns, but the median return for another irrigation scheme—Mushandike—is three times the median for Nyamazura. Despite the fact that Nyamazura ranks sixth of eleven schemes in fertiliser application rates, Nyamazura farmers achieve the highest returns per kilogram applied.[11] In contrast, Zananda farmers, who apply fertiliser at a rate three to four times that of farmers in Nyamazura, earn a return from fertiliser only about one-sixth that of the Nyamazura growers.

CONCLUSION

In an effort to differentiate among the ability of different resettlement models to unleash the capacities of farmers, this paper has examined asset accumulation, consumption and the stream of revenues from both farming and non-farming activities alike. The major conclusion here is that, in aggregate, the resettlement schemes and models examined are failing to meet their original objectives in terms of agricultural productivity. The single exception to this generalisation appears to be Mkwasine—an irrigation scheme with exceptional levels of organisation and management.

While in each scheme there are outstanding farmers, overall performance—as we have remarked repeatedly—is extremely heterogeneous. Abject poverty may or may not exist in all the schemes, but it is clearly present in both the old and the new schemes. In concluding, therefore, it is worth returning briefly to comment on the role of resettlement schemes as vehicles not only for enhanced agricultural production but also for evidence of their actualised potential in terms of the wide distribution of the benefits of land reform.

The indicators of performance considered heretofore have been subjected to further analysis to assess how evenly the outcomes of resettlement are distributed. Table 14 compares the distributional equity of three revenue measures, two asset measures and one measure of consumption—all on a per-capita basis. As before, the best and worst performing schemes have been identified.

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[11] See Annex Table 5 for a comparison of efficiency indicators across all eleven schemes.

Some of the results in Table 14 have to be interpreted in a specific context. For example, the high variation and inequality for the livestock asset for Mkwasine relates, as noted earlier, to the prohibition on holding livestock in the irrigation scheme plus the fact that Mkwasine farmers are fully engaged in cropping. Similar arguments apply in the case of non-farm incomes for Mkwasine. Similarly, generally positive results for Zhaugwe are undoubtedly influenced by the very small sample size—only eight households. This is certainly the case for the Theil index, which depends upon the size of the population.

Although there are a few exceptions, the three measures generally concur in identifying schemes with greater or lesser variation and distributional equity. The separation of the indicators into those connoting performance over a longer period, in the top panel of Table 14, and those measuring revenues and income, in the lower panel, shows why it is hazardous to rely solely on the latter to evaluate performance. Indicators based on current revenue/income reveal much more erratic outcomes. For example, the overall coefficient of variation for total revenue/income is triple that for total consumption, while the overall distributional equity of revenue/income is some two to four times worse than for consumption.

Table 14: The distributional equity of performance indicators

Per-capita indicators of overall resettlement performance

Scheme	**Total value of livestock**			**Total consumption**			**Sleeping rooms**		
	CV	Gini	Theil	CV	Gini	Theil	CV	Gini	Theil
Gutsaruzhinji	1.03	0.54	0.49	0.70	0.34	0.19	0.49	0.26	0.13
Mavhumashava	0.74	0.39	0.28	0.45	0.24	0.09	0.51	0.26	0.11
Makonese	**0.68**	**0.36**	**0.22**	0.68	0.36	0.21	0.43	0.23	0.09
Mkwasine	2.11	0.79	1.27	0.60	0.31	0.16	0.66	0.35	0.21
Mushandike	0.75	0.41	0.27	0.84	0.37	0.27	0.54	0.27	0.12
Nyagundi	1.38	0.57	0.62	0.74	0.39	0.25	1.02	0.45	0.36
Nyamazura	1.44	0.59	0.67	1.08	0.50	0.44	0.90	0.43	0.31
Zananda	1.39	0.56	0.59	0.49	0.26	0.10	0.68	0.32	0.18
Zhaugwe	0.76	**0.36**	**0.22**	**0.39**	**0.21**	**0.07**	**0.27**	**0.14**	**0.03**
Lancashire	1.52	0.70	0.98	1.10	0.43	0.37	1.30	0.49	0.51
Runde	1.43	0.68	0.88	1.44	0.56	0.61	0.56	0.29	0.14
Total	1.26	0.57	0.60	0.83	0.40	0.28	0.83	0.37	0.25

Per-capita indicators of revenue/income

Scheme	**Gross farm revenue**			**Non-farm income**			**Total gross revenue/income**		
	CV	Gini	Theil	CV	Gini	Theil	CV	Gini	Theil
Gutsaruzhinji	1.13	0.54	0.53	1.24	0.55	0.57	1.12	0.50	0.46
Mavhumashava	0.76	0.40	0.33	**0.59**	**0.31**	**0.21**	0.64	0.35	0.20
Makonese	0.85	0.47	0.42	2.20	0.73	1.15	1.22	0.51	0.50
Mkwasine	**0.44**	**0.24**	**0.09**	3.59	0.93	2.45	**0.44**	**0.24**	**0.09**
Mushandike	0.68	0.36	0.20	2.39	0.83	1.51	0.71	0.37	0.22
Nyagundi	1.33	0.58	0.63	1.11	0.57	0.59	1.23	0.55	0.53
Nyamazura	3.23	0.82	1.77	2.57	0.84	1.61	2.91	0.79	1.56
Zananda	1.07	0.54	0.54	1.30	0.60	0.68	0.91	0.49	0.41
Zhaugwe	1.03	0.49	0.42	1.49	0.67	0.85	1.07	0.50	0.45
Lancashire	3.00	0.88	1.98	2.23	0.82	1.51	2.10	0.80	1.39
Runde	2.40	0.84	1.57	2.61	0.85	1.66	2.48	0.80	1.42
Total	2.79	0.80	1.47	5.25	0.88	2.33	2.43	0.76	1.26

Source: AMS fieldwork, 2002.

Notes: Most-equitable values are in bold; least-equitable values are underlined. *CV* is the coefficient of variation—the standard deviation divided by the mean. *Gini* is the Gini coefficient, one of the most commonly used indicators of income inequality. The Gini is derived from the Lorenz curve, which plots the cumulative share of total income earned by households ranked from bottom to top. If incomes were equally distributed, the Lorenz curve would follow the 45° diagonal, and the Gini would be zero. As the degree of inequality increases, so does the curvature of the Lorenz curve, and thus the area between the curve and the 45° line becomes larger. The Gini is calculated as the ratio of the area between the Lorenz curve and the 45° line to the whole area below the 45° line. The larger the Gini, the greater the degree of inequality. *Theil* is Theil's entropy index. This measure of inequality, proposed by Theil (1967), is a weighted geometric average of income relatives. Under perfect equality, i.e. everyone receives the mean income, the index has a value of zero. There is no upper limit for the inequality index since the measure depends on the size of the population.

That said, what patterns emerge from the presentation in Table 14? First, it is obvious that distributional equity is very poor in the fast-track schemes. Because they are so recent, these schemes reflect more the pre-settlement history of the 'new farmers' than performance based on agriculture. The schemes are also at that early stage, shown in Figure 1, where they are struggling to cope and welfare is less than what it was prior to resettlement. But those in these schemes are not suffering uniformly.

Second, certain schemes—Makonese, Zhaugwe, Mavhumashava, Mkwasine, and Zananda—tend to exhibit a more even distribution of performance indicators than do others. It seems that farmers in these schemes have been able to attain over time results that are more uniform.

Third, the levels of within-scheme distributional inequity in revenue/income indicators are astonishingly high in certain cases, as well as overall. Runde, Lancashire and Nyamazura all have Ginis above 0.80, indicating extreme concentrations of revenue.[12] As noted previously, Runde and Lancashire are fast-track schemes, with all their attendant problems. In the case of Nyamazura, three-quarters of the sample grew tobacco, but with very inconsistent results (see Annex Table 4), while the remaining quarter more closely resembles subsistence producers.

These results can be compared with those from an analysis of some 400 farmers resettled under model A1 and 150 communal area (CA) farmers across three agro-ecological zones. For the 1995/96 season, the Gini coefficient for cropping revenue was 0.58 and for the value of livestock 0.47 for the resettled households (Kinsey 1999). These results closely resemble those for Nyagundi, resettled under the same model and at the same time. In contrast, the comparable results for the CA households in 1995/96 were Gini coefficients of 0.74 for crop revenue and 0.54 for value of livestock.

On the strength of the analysis in this paper, what can one conclude about the relative economic performance of different models of resettlement? In fact, very little. A single scheme appears clearly to be a success story in terms of economic outcomes and consistently impressive agricultural results. But is this finding generalizable? It is clearly not the provision of irrigation alone that is the key ingredient explaining success, for the other irrigated schemes do not turn in such impressive results. Rather the explanation is likely to lie within a complex of factors including, among others, irrigation, technology, choice of crop,

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[12] A Gini of 1.0—perfect inequality—would indicate that all wealth was held by a single person.

management, and selection of beneficiaries. How widely can Zimbabwe replicate the Mkwasine story?

In terms of the models as policy interventions to boost agricultural output and improve rural welfare, we would have to label them all as—at best—partial successes and—at worst—failures. And considerable elements of failure seem inherent in resettlement *per se* as much as in any given model. The performance outcomes both within and across all models is so patchy that it is clear that the resettlement experience is failing to enable large numbers of households to achieve what is hoped and expected of them.

Poverty in resettlement areas remains high, perhaps just as high as it is in the communal areas—from which resettlement was to have provided such a contrast.[13] In this context, a policy intervention that would have major benefits would be simply to raise the incomes of the less-well-off in existing resettlement areas to the level of the mean income. Such incremental improvements, let alone the current ambitious expansion of resettlement, are however unlikely to bear fruit without a complete turn-around in macroeconomic fundamentals. Resettlement will not be the engine of growth for Zimbabwe's economic recovery—but it has an integral role to play in terms of beneficial interactions with other sectors of the economy.

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[13] Three recent analyses explore in detail the extent and long-term trajectory of poverty among model A1 and communal area households. See Burger, Hoogeveen, Kinsey and Sparrow (1999). Deininger, Hoogeveen and Kinsey (2002) and Hoogeveen, Kinsey and Bouwmeester (2003).

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ANNEX

Annex Table 1: Selected characteristics of livestock ownership, individual schemes, 2002

Scheme, sample size and stock ownership	Mean	Median	Standard deviation	Range	Proportion with zero
Gutsaruzhinji (*n=21*)					
Total cattle owned	5.5	4.0	5.3	0-19	19.0
Total smallstock owned	23.3	14.0	28.7	0-130	5.0
Total value of all livestock	148,624	104,094	153,862	153,862-601,000	5.0
Mavhumashava (*n=11*)					
Total cattle owned	12.8	12.0	8.4	0-29	9.1
Total smallstock owned	26.3	26.0	14.5	0-43	9.1
Total value of all livestock	249,492	254,768	161,156	0-507,587	9.1
Makonese (*n=18*)					
Total cattle owned	8.4	8.0	5.1	0-18	5.6
Total smallstock owned	30.0	24.5	20.1	7-83	0.0
Total value of all livestock	226,802	224,125	131,603	20,000-467,490	0.0
Mkwasine (*n=18*)					
Total cattle owned	10.3	0.0	20.7	0-85	61.1
Total smallstock owned	75.0	20.0	119.0	0-400	22.2
Total value of all livestock	110,264	10,000	263,142	0-1,115,250	22.2
Mushandike (*n=27*)					
Total cattle owned	7.0	6.0	5.2	0-18	11.1
Total smallstock owned	14.7	11.0	11.3	3-52	7.4
Total value of all livestock	169,048	114,600	122,325	2500-406,000	0.0
Nyagundi (*n=20*)					
Total cattle owned	9.5	9.5	7.3	0-21	20.0
Total smallstock owned	25.2	21.5	14.8	6-49	5.0
Total value of all livestock	199,976	221,410	155,399	2450-613,400	0.0
Nyamazura (*n=20*)					
Total cattle owned	6.1	5.5	6.4	0-26	30.0
Total smallstock owned	17.3	13.5	11.5	6-43	10.0
Total value of all livestock	136,230	90,100	186,903	2280-856,700	0.0
Zananda (*n=16*)					
Total cattle owned	7.8	7.5	5.8	0-20	12.5
Total smallstock owned	21.2	19.0	11.8	4-52	6.3
Total value of all livestock	187,140	163,550	164,164	7768-542,050	0.0
Zhaugwe villages (*n=8*)					
Total cattle owned	14.3	13.0	7.8	3-26	0.0
Total smallstock owned	22.0	19.0	13.4	6-48	0.0
Total value of all livestock	338,223	318,400	211,265	43,100-702,800	0.0
Lancashire Circle V (*n=14*)					
Total cattle owned	3.7	2.5	4.5	0-15	42.9
Total smallstock owned	16.6	5.5	32.9	0-124	28.6
Total value of all livestock	80,621	3000	122,430	0-394,900	36.4
Runde (*n=15*)					
Total cattle owned	4.7	2.0	6.0	0-17	46.7
Total smallstock owned	24.7	15.0	31.1	3-130	0.0
Total value of all livestock	137,998	10,800	188,591	1800-582,400	0.0

Source: AMS fieldwork 2002.

Annex Table 2: Gross Revenue from Sales of Crops, Livestock and Livestock Products and Services, 2000/01 Season and 2002

Scheme	Gross revenue from crop sales (*$'000*)				Gross revenue from livestock (*$'000*)				Total gross agricultural revenue (*$'000*)			
	(*n*)	Mean(*std dev*)	Min-max	Median	(*n*)	Mean(*std dev*)	Min-max	Median	(*n*)	Mean(*std dev*)	Min-max	Median
Gutsaruzhinji	21	34.9(31.0)	0-118.0	34.5	21	14.3(27.4)	0-105.0	0	21	49.2(54.7)	0-223.0	40.0
Mavhumashava	11	57.7(82.6)	0-267.0	32.0	10	**44.2**(54.4)	0-170.0	**25.0**	10	107.7(130.2)	0-437.0	61.5
Makonese	18	26.7(25.0)	0-78.0	22.1	18	9.6(17.4)	0-54.0	0	18	36.3(32.1)	0-112.8	39.0
Mkwasine	18	**1,609.5**(477.6)	1,000.0-2,500.0	**1475.0**	18	6.6(21.9)	0-90.0	0	18	**1616.1**(473.4)	1000.0-2500.0	**1475.0**
Mushandike	27	83.3(56.7)	8.0-256.0	70.5	27	4.4(7.5)	0-23.0	0	27	87.8(57.0)	15.0-256.0	73.3
Nyagundi	20	58.1(63.7)	0-228.3	40.4	18	15.0(18.5)	0-52.0	7.5	18	72.3(60.7)	0-228.3	59.2
Nyamazura	20	409.9(1324.9)	0-6,024.0	116.3	20	1.4(2.9)	0-12.0	0	20	411.3(1325.2)	0-6026.0	116.3
Zananda	16	6.4(6.3)	0-17.5	5.4	15	5.0(8.4)	0-24.9	0	15	11.6(11.1)	0-38.5	13.0
Zhaugwe	8	35.0(43.6)	0-135.0	21.0	8	10.0(22.2)	0-64.0	0	8	45.0(50.0)	4.5-135.0	21.0
Lancashire CV	12	0(0)	0-0	0	14	21.4(60.2)	0-226.0	0	12	21.3(64.8)	0-226.0	0
Runde	15	2.6(5.5)	0-15.3	*0*	15	8.1(20.0)	0-7.6	0	15	10.7(21.2)	0-76.4	0
Total	185	231.3(650.8)	0-6,024.0	32.0	184	11.0(27.3)	0-226.0	0	182	245.6(654.6)	0-6026.0	43.5

Source: AMS fieldwork 2002.

Note: Highest values are in bold and lowest values are underlined. See text for definitions.

Annex Table 3: Revenue derived from activities off respondents' own holdings, 2001-2002

Scheme	Total nonfarm cash income	Total earnings from farm work	Total transfers, pensions, gifts	Total remittances
Gutsaruzhinji	(*16*)	(*2*)	(*1*)	(*3*)
Mean (*std dev*)	30731 (32505)	750 (1061)	20000 (..)	19000 (16523)
Median	20000	750	20000	20000
Minimum-maximum	1700-30731	0-1500	20000-20000	2000-35000
Mavhumashava	(*8*)	(*1*)	(*1*)	(*7*)
Mean (*std dev*)	28375 (23421)	1000 (0)	41000 (..)	14286 (16670)
Median	23000	1000	41000	8000
Minimum-maximum	4000-70000	1000-1000	41000-41000	0-40000
Makonese	(*10*)	(*2*)	(*3*)	(*6*)
Mean (*std dev*)	26878 (29867)	250 (354)	33667 (43616)	13721 (17680)
Median	20000	250	10000	7500
Minimum-maximum	180-100,000	0-500	7000-84000	2825-49300
Mkwasine	(*0*)	(*0*)	(*0*)	(*3*)
Mean (*std dev*)	0 (0)	0 (0)	0 (0)	20667 (29939)
Median	0	0	0	7000
Minimum-maximum	0-0	0-0	0-0	0-55000
Mushandike	(*7*)	(*0*)	(*0*)	(*4*)
Mean (*std dev*)	69886 (84937)	0 (0)	0 (0)	8875 (6408)
Median	42000	0	0	9000
Minimum-maximum	1200-250,000	0-0	0-0	1500-16000
Nyagundi	(*13*)	(*6*)	(*2*)	(*7*)
Mean (*std dev*)	21623 (18230)	1983 (1177)	200 (0)	1829 (2767)
Median	20000	2450	200	300
Minimum-maximum	1000-65000	400-3000	200-200	0-7500
Nyamazura	(11*)*	(*6*)	(*3*)	(*6*)
Mean (*std dev*)	40673 (62767)	4167 (5554)	2517 (3887)	950 (1475)
Median	15000	2500	450	100
Minimum-maximum	2000-200,000	200-15000	100-7000	0-3500
Zananda	(*11*)	(*1*)	(*1*)	(*6*)
Mean (*std dev*)	21805 (29051)	**10000** (0)	12000 (0)	5583 (6168)
Median	21805	**10000**	12000	5000
Minimum-maximum	50-98000	10000-10000	12000-12000	0-12500
Zhaugwe	(*6*)	(*1*)	(*1*)	(*1*)
Mean (*std dev*)	114,000 (149,324)	6000 (0)	12000 (0)	**25000** (0)
Median	25000	6000	12000	**25000**
Minimum-maximum	10000-324,000	6000-6000	12000-12000	2500-2500
Lancashire Circle V	(*5*)	(*0*)	(*2*)	(*2*)
Mean (*std dev*)	**125,200** (125,550)	0 (0)	41486 (26183)	18000 (25456)
Median	**150,000**	0	**41486**	18000
Minimum-maximum	1000-300,000	0-0	22972-60000	0-36000
Runde	(*4*)	(*1*)	(*3*)	(*1*)
Mean (*std dev*)	39550 (46106)	5000 (0)	**45333** (64694)	2000 (0)
Median	31500	5000	10000	2000
Minimum-maximum	200-95000	5000-5000	6000-120,000	2000-2000
Total	(*91*)	(*20*)	(*17*)	(*46*)
Mean (*std dev*)	43003 (65874)	3045 (3755)	24290 (33780)	9333 (3250)
Median	20000	2200	10000	13898
Minimum-maximum	50-324,000	0-15000	100-120,000	0-55000

Source: AMS fieldwork 2002.

Note: Italicised figures in parentheses are the number of valid observations. See text for definitions

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Annex Table 4: Cropping patterns and yields, 2000/01 season*

Scheme	Crop																	
	Maize		Groundnuts		Legumes		Cotton		Nyimo		Sunflower		Wheat		Sugarcane		Tobacco	
	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield
***Gutsaruzhinj*i**																		
Mean	4	1809	1	63	1	150	3	568	1	118	1	2083	1	450				
StdDev	3	1509	1	81	.	.	3	741	0	152	0	3948	.	.				
Min-max	0-	0-6000	0- 2	0-248	1-1	150-150	0-10	70-2200	0-1	0-375	0-1	0-8000	1-1	450-450				
N	15	20	14	14	1	1	11	9	6	6	4	4	1	1				
	21																	
Mavhumashava																		
Mean	10	1153	2	324	1	0			1	283	1	2000						
StdDev	7	1276	2	468	.	.			2	337	.	.						
Min-max	3-25	0-4500	1-8	0-1333	1-1	0-0			0-5	0-900	1-1	2000-2000						
N	11	11	10	10	1	1			6	6	1	1						
Makonese																		
Mean	2	1424	1	641	0	1235	2	2116	1	239	1	768						
StdDev	2	1231	1	1091	0	1440	2	3324	1	134	1	1142						
Min-max	0- 7	50-4000	0-3	0-4000	0-1	50-4000	0-5	375-12000	0-2	80-400	0-2	0-2750						
N	18	18	15	15	6	6	15	15	4	4	5	5						
Mkwasine																		
Mean	5	889	5	400	0	360	17	300			4	1000			26	27244		
StdDev	8	1018	.	.	0	556	.	.			.	.			3	34175		
Min-max	0-15	0-2000	5-5	400-400	0-1	0-1000	17-17	300-300			4-4	1000-1000			23-33	3939-88462		
N	3	3	1	1	3	3	1	1			1	1			18	18		
Mushandike																		
Mean	1	4084	0	0	1	825	1	2442					1	3794	0	4000		
StdDev	1	4771	0	0	0	827	1	1476					1	2310	0	.		
Min-max	1- 4	0-20000	0-0	0-0	0-1	0-4000	1-4	243-6000					0-4	1200-8000	0-1	4000-4000		
N	26	26	0	0	23	23	22	22					19	19	2	1		
Nyagundi																		
Mean	5	929	2	630	1	137	3	720	1	478	1	826	1	1050			3	1092
StdDev	4	746	2	688	0	195	.	.	0	510	1	894	0	849			2	1860
Min-max	0-15	30-3150	0-6	0-2464	1-1	0-360	3-3	720-720	0-1	150-1500	0-3	120-3000	1-1	450-1650			1-6	0-4800
N	20	20	17	17	3	3	1	1	6	6	10	9	2	2			6	6
Nyamazura																		
Mean	3	953	1	384	1	313			0	426	2	211					3	408
StdDev	2	768	1	460	1	459			0	337	2	46					2	529
Min-max	1-8	0-3281	1-3	0-1672	0-3	50-1000			0-1	0-1000	1-5	165-257					0-8	0-1867
N	19	19	13	13	4	4			9	9	3	3					15	14

Annex Table 4, continued.

	Maize		Groundnuts		Legumes		Cotton		Nyimo		Sunflower		Wheat		Sugarcane		Tobacco	
	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield	Ha.	Yield
Zananda																		
Mean	0	2522	0	277	0	446							0	2138	0	1200		
StdDev	0	1973	0	265	0	398							0	998	0	909		
Min-max	0-0	0-7200	0-0	0-800	0-0	0-1000							0-0	900-3150	0-0	0-2000		
N	16	15	13	13	13	13							5	4	4	4		
Zhaugwe																		
Mean	2	7129	1	247	0	625			0	700								
StdDev	1	5068	0	243	0	884			0	797								
Min-max	1-3	1333-15000	0-1	0-667	0-0	0-1250			0-0	0-1800								
N	8	8	8	8	2	2			4	4								
Lancashire Circle V																		
Mean	3	49	1	22					0	0								
StdDev	2	54	0	38					.	.								
Min-max	1-6	0-175	0-1	0-66					0-0	0-0								
N	9	9	3	3					1	1								
Runde																		
Mean	2	172	1	105			2	700	0	259	0	0						
StdDev	1	306	0	226			.	.	0	477	0	0						
Min-max	1-5	0-1100	0-1	0-660			2-2	700-700	0-1	0-1400	0-1	0-0						
N	13	13	11	11			1	1	8	8	3	3						
Total																		
Mean	3.1	1960	1.1	349	0.5	649	2.2	1883	0.7	340	1.1	894	0.8	3200	19.9	21704	2.9	613
StdDev	4	2928	1	584	0	796	3	2205	1	422	1	1664	1	2261	12	31913	2	1098
Median	2.0	1081	0.8	140	0.5	490	1.3	960	0.5	250	1.0	278	0.5	2900	25.0	880	2.5	332
Min-max	0-25	0-20000	0-8	0-4000	0-3	0-4000	0-17	70-12000	0-5	0-1800	0-5	0-8000	0-4	450-8000	0-33	0-88462	0-8	0-4800
N	164	162	105	105	56	56	51	49	44	44	27	26	27	26	24	23	21	20

Source: AMS fieldwork, 2002.

* Crops are listed in the order of the number of growers for those crops grown by 10 percent or more of the households. In addition to the crops listed, seven percent of households grew and listed rapoko among their five most important crops; five percent grew sorghum; and less than two percent grew rice. See text. Crop yields are in kg/ha. Totals are based only on those growing each crop

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Annex Table 5: Indicators of agricultural efficiency by scheme/model, 2000/01 season

Scheme	Fertiliser use (*kg/ha*)	Employment intensity (*ld/ha*)	Gross revenue in dollars per: hectare cultivated (*$*)	kg. of fertiliser used (*$*)	labour-day employed (*$*)
Gutsaruzhinji B					
Mean (SD)	42 (46)	0.7 (2.3)	4645 (4292)	133 (96)	4953 (4454)
Minimum-maximum	0-143	0-9.4	0-14,750	0-315	1573-10,000
Median	26	<u>0</u>	4141	105	3286
N	20	20	20	16	2
Mavhumashava A2					
Mean (SD)	44 (35)	0.7 (1.3)	3494 (3563)	103 (133)	5618 (8102)
Minimum-maximum	0-100	0-3.9	0-11,609	0-411	0-21,333
Median	34	<u>0</u>	3113	69	2750
N	10	10	10	8	6
Makonese Irr					
Mean (SD)	201 (352)	3.5 (6.8)	4910 (4488)	120 (228)	6361 (12,225)
Minimum-maximum	0-1000	0-28.0	0-13,263	0-780	0-39,000
Median	18	0.1	3642	21	1014
N	18	18	18	11	10
Mkwasine Irr					
Mean (SD)	424 (173)	**17.7** (13.2)	**59,397** (21,571)	179 (174)	8259 (12,220)
Minimum-maximum	120-917	0.9-41.5	21,955-100,000	44-833	1194-46,154
Median	412	0.3	**57,692**	122	5240
N	18	18	18	18	18
Mushandike Irr					
Mean (SD)	333 (199)	0.8 (1.6)	27,341 (19,669)	91 (56)	28,760 (24,908)
Minimum-maximum	72-667	0-5.7	2222-74,737	15-244	1256-75,000
Median	238	**14.5**	24,778	82	**23,575**
N	25	23	25	27	7
Nyagundi A1					
Mean (SD)	74 (89)	3.4 (11.7)	7166 (8157)	128 (108)	5774 (6414)
Minimum-maximum	0-333	0-51.4	0-26,440	0-353	0-13,514
Median	29	<u>0</u>	5300	9	2108
N	19	7	19	16	7
Nyamazura A1					
Mean (SD)	147 (105)	2.2 (3.3)	53,532 (153,576)	**251** (554)	**89,830** (244,500)
Minimum-maximum	20-467	0-10.5	0-684,545	0-2510	250-860,571
Median	132	0.4	20,015	**134**	7985
N	18	19	19	19	12
Zananda Irri					
Mean (SD)	**535** (223)	<u>0</u> (0)	18,387 (23,064)	39 (52)	na
Minimum-maximum	115-875	0-0	0-72,000	0-175	na
Median	**500**	<u>0</u>	9333	23	na
N	15	15	15	16	0
Zhaugwe A1					
Mean (SD)	232 (220)	11.2 (31.1)	13,553 (15,751)	85 (125)	6252 (8394)
Minimum-maximum	29-735	1-88.2	0-45,000	0-386	317-12,188
Median	176	<u>0</u>	7189	41	6252
N	8	8	8	8	2
Lancashire CV FT					
Mean (SD)	71 (57)	1.0 (2.6)	<u>0</u> (0)	<u>0</u>	<u>0</u> (0)
Minimum-maximum	0-200	0-7.8	0-0	0-0	0-0
Median	67	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
N	9	9	9	8	2
Runde FT					
Mean (SD)	<u>9</u> (17)	3.6 (11.8)	1117 (2291)	40 (69)	1000 (2000)
Minimum-maximum	0-50	1-42.9	0-6120	0-120	0-4000
Median	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
N	13	13	13	3	4
TOTAL					
Mean (SD)	205 (238)	4 (11)	20,235 (55,187)	121 (230)	22,494 (102,455)
Minimum-maximum	0-1000	0-88	0-684,545	0-2510	0-860,571
Median	115	<u>0</u>	6185	82	4000
N	173	172	174	150	71

Source: AMS fieldwork, 2002.
Note: Highest values are in bold, and lowest values are underlined.