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Long-term Changes in Land-use and Resource Entitlements with Resettlement in Zimbabwe

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1. Background and objectives

From independence in 1980 to the end of the 1990s, some 90,000 families were resettled under Zimbabwe's land reform programme. Now referred to as phase I of the programme, resettlement in this period acquired large-scale farms and changed their layout to accommodate smallholder or cooperative farming. The so-called model A component of the programme (under which more than 95 per cent of households were resettled) relocated individual families into villages and allocated each family a 0.4 hectare residential plot, a uniform 5 hectares of arable land and the right to use a variable amount of grazing land on a communal basis.

The criteria originally employed to choose participants for resettlement emphasized the selection of the poor, the landless and the economically disadvantaged—social groupings that would have little option but to rely heavily upon natural resources as a basis for their livelihoods. Although regulations were promulgated with the intent to ensure the sustainability of production in the new resettlement schemes—including, among others,

limits on livestock numbers and prohibitions on environmentally destructive practices—none of these regulations has yet been enforced. The project was thus to assess the longer-term environmental and related social outcomes of population resettlement in Zimbabwe over the two post-independence decades: 1980-2000.

The project was framed at a time of transition between a period of substantial stability in Zimbabwe's programme of land reform and one in which the government was moving towards an accelerated and chaotic approach for further resettlement—the so-called 'fast track' resettlement. In the event, the research took place during a period of considerable political upheaval in Zimbabwe. Indeed, the land invasions that were taking place nationally inevitably led to a number of adjustments in terms of the nature and timing of the research. DFID were advised of these necessary changes through the regular project reporting system and supported the alterations to the project. As one example, the research visit planned for August 2002 by Dr. Elliott was cancelled in light of FCO guidance against non-essential travel to Zimbabwe.

The project was built on the expertise and previous work of the 3-person team of collaborators in research relating to resettlement and natural resources. The fact that two of the researchers were resident in Zimbabwe for most of the period of the project facilitated swift adaptation to rapidly changing circumstances and enabled the team to respond in ways that largely preserved the original intentions of the project.

The principle objective was to generate and analyse objective data on changes in natural resource supply conditions over a 20-year period following resettlement. This objective was substantively achieved. In the process, the research team generated what it believes is a very valuable, rigorously constructed data set. Difficulties in conducting fieldwork compelled the researchers to give relatively greater emphasis to the remote-sensing aspects of the data-set, however this more-intensive investment in GIS analysis revealed a value in certain techniques that had not originally been anticipated as the project was planned.

The objective of integrating fully both environmental and social data has been met less well. This shortcoming arises principally from the inability to conduct fieldwork to the extent planned because of risks inherent in travel in rural Zimbabwe during the project. The consequence of the restricted scope of research activities is that our analysis at times focuses on particular aspects of the research in just selected research sites rather than across all five sites as originally planned.

Significant progress was also made towards identifying core processes that operate, particularly at the level of the landscape, to create resource problems for people in need in resettled areas. Using a small set of GIS analysis techniques, changes in the extent, distribution and spatial patterning of woodland cover were readily developed, for example. Similarly, the impact of longer term social dynamics such as of settlement expansion and cultivation activities on overall landscape features at this scale were exposed.

During the course of the project, it became increasingly clear that there was almost no interest in the intended outcomes at the level of central government. Rather, and a departure from the originally stated framework, other sets of interests were expressed far more strongly. These included the concern of donors in the long-term environmental consequences of resettlement—both as carried out originally and the unplanned resettlement taking place in 2000-03. Another audience demonstrating enthusiastic attention to the spatial mapping of long-term outcomes was the agricultural field staff in the various research sites. Thus, informal dissemination on the nature and results of the research assumed greater prominence than originally intended, a shift facilitated by the local presence of two key project staff—Kinsey and Kwesha. Finally, there was a broad-based interest in the research from within the wider southern African region, where the sustainability of rural livelihoods in the face of growing demand for land is a vital issue.

This report has 5 sections. Following this review of the project's background and objectives, section 2 reviews the methods we used, focusing, in particular, on the generation of scheme- and village-specific land cover data using remote-sensing sources. Section 3 then summarizes our findings and explores their implications for policy concurrently. Section 4 describes our dissemination activities. Finally, in section 5, we list and describe the papers that have been produced under the project.

2. Methods

In accordance with the proposal, research focused on five resettlement areas (amongst the earliest settled in the country after independence in 1980) across a range of agro-ecological zones (Table 1).

Table 1: Characteristics of the five research sites

Resettlement area	Agro-ecological zone	Size	
		(area (km^2))	(no. of households)
a. Wenimbi-Macheke	NR IIb	35.9	1,091
b. Tokwe	NR III/IV	68.0	1,030
c. Sengezi	NR IIb→III	8.4	289
d. Mupfurudzi	NR IIb→III	34.5	563
e. Mutanda	NR IV	43.9	575

As originally planned, multi-temporal panchromatic aerial photographs provided a substantial resource for the research. A minimum of 3 sets of black and white photography were secured for each scheme area. Contact prints for 1995-7 at the 1:50,000 scale were available for all areas. In addition, contacts at 1:25,000 scale were sourced for a date prior to the date of designation for resettlement and for one in the 1980s (detail contained in Appendix 1). After scanning, the photos were georeferenced using 1996 Spot imagery from the Department of Surveyor General's data archive. The georeferencing was done to the UTM co-ordinate system to match the Surveyor

General's topographic maps. The outline of village boundaries were then digitized from the photos (example in Appendix 2). Visual interpretations of the photos were then effected using the on-screen digitizing method and using well-established principles relating to tone, pattern, shape and texture to assist in feature recognition and identification. Table 2 displays the land cover types/classes that were interpreted. After interpretation, the digitised maps were assigned with attributes according to these cover classes (example output in Appendix 3). GIS analysis was performed using ArcView 3.x software.

Table 2: Land feature classes

Land classes	Characteristics
Woodland	>20% canopy; trees >5m height
Bushland	>20% canopy; smaller trees and few scattered big trees
Forest plantation	
Grassland	<20% trees/bush
Cultivation	areas showing evidence of present or recent past cultivation
Settlement	
Dam	
Bare rock	

Opportunities for dedicated social survey methodologies as originally planned were restricted for reasons detailed above. Field visits to all scheme areas were made in April 2002 when meetings with local officers and informants were made towards facilitating subsequent survey work. In the event, this did not occur. However, Dr. Kinsey's involvement in allied, DFID-funded monitoring work in three of the study areas, enabled continued discussions with households and officers at the local level. The analysis draws on some aspects of the Zimbabwe Rural Household Dynamics Study.

Semi-structured interviews with 38 Village Heads in 3 areas were held in 2002 to reveal issues of changing institutional control and management of the resource base.

In an adaptation to the research methodologies as initially proposed, original farm planning documents (some dating to the early 1960s) were sourced from central and regional Agritex and NRB offices for many of the villages under study. These proved important for confirming village boundaries and for substantial insights concerning historical assessment of resource status and land capabilities in the study areas as well as the nature of resource use and management in the past.

During the period of the project, all three researchers in the course of their wider work in consultancy, practise and academia, were engaged in conversations with donor and research agencies including CIFOR, the miombo network and UNDP.

3. Findings

- In the space of a generation, the resettlement programme in Zimbabwe has changed the landscape of the country dramatically.

Table 3 depicts the overall changes in major landscape features for four scheme areas from the time of resettlement to 1998 (Tokwe is omitted as no air photos available for 1981).

Table 3. Percentage change in major landscape features under resettlement, 1981 – 1998.

Land-feature category	Wenimbi	Mupfurudzi	Mutanda	Sengezi	Average percentage change	Annual percentage change
Cultivation	19	16	27	27	22.3	1.3
Grassland	-18	-2	-1	-21	-10.5	-0.6
Bushland	13	17	13	13	14	0.8
Woodland	-15	-31	-38	-18	-25.5	1.5

There is an evident expansion of cultivation and bushland in all areas and a loss of woodland and grassland area over the period. The figures in Table 3 suggest a certain uniformity of outcome in the aggregate, with the direction of change the same across all schemes for each land cover category and the picture that emerges is one of broadly similar forces at work across resettlement areas.

The largest transformation is in terms of woodland loss. The identified deforestation rate of 1.5% per annum is slightly higher than as assessed by the Forest Resources Assessment (FAO, 2000) that gave the deforestation rate for Zimbabwe of 1.2% per annum.

Marked differences in aggregate outcomes are seen for the different scheme areas in Table 3; Mupfurudzi and Mutanda, for example, experiencing high losses of woodland but low losses of grassland. The annual rates of deforestation in particular schemes are also very divergent; 1.1% per annum in Wenimbi and 2.23% in Mutanda, for example.

The landscape outcome of resettlement are highly varied at the village level as shown in Table 4 that has been constructed by calculating descriptive statistics for changes in major land cover categories for all villages within each scheme. Within the same scheme—Mupfurudzi, for example—some villages have lost almost all their grassland under resettlement while others have increased grassland area enormously (hence, high CV).

Table 4. Changes in selected land categories at village level, by scheme, full duration of resettlement

Scheme and land category	Descriptive statistics for percentage changes at village level					
	Mean	Std dev	Median	Max	Min	C.V.*
Mupfurudzi	9 villages (1981 to 1997)					
Bushland	903.7	506.0	908.9	1865.6	245.0	0.56
Cultivation	209.5	235.5	97.1	518.5	7.8	1.12
Grassland	79.9	271.7	20.7	683.0	-85.2	3.40
Woodland	-41.1	20.5	-34.6	-21.7	-79.1	-0.50
Mutanda	7 villages (1981 to 1997)					
Bushland	151.3	129.0	189.3	257.0	7.6	0.85
Cultivation	111.8	142.1	52.7	273.8	8.8	1.27
Grassland	20.1	30.9	19.3	51.4	-10.4	1.54
Woodland	-36.4	24.1	-33.7	-13.8	-61.7	-0.66
Wenimbi	9 villages (1981 to 1997)					
Bushland	339.6	368.3	174.7	1038.0	8.4	1.08
Cultivation	207.5	245.0	46.5	621.2	6.6	1.18
Grassland	-37.7	24.5	-36.9	0.7	-75.2	-0.65
Woodland	-54.8	32.8	-54.2	-8.5	-99.8	-0.60
Sengezi	6 villages (1981 to 1998)					
Bushland	1270.7	2095.1	277.4	4986.8	75.5	1.65
Cultivation	6610.5	12233.7	574.3	24959.1	334.5	1.85
Grassland	-43.3	21.8	-46.0	-16.7	-67.2	-0.50
Woodland	-89.2	26.5	-100.0	-35.1	-100.0	-0.30
All schemes	31 villages (1981 to 1997/98)					
Bushland	666.3	894.0	233.4	4986.8	7.6	1.04
Cultivation	1784.8	6013.3	74.9	24959.1	6.6	1.36
Grassland	4.8	123.1	-8.8	683.0	-85.2	0.95
Woodland	-55.4	5.2	-44.4	-8.5	-100.0	-0.51

*C.V., the coefficient of variation, is the standard deviation divided by the mean, and serves as an indicator of the reliability of the mean as a measure of central tendency. The smaller the C.V. the more representative is the mean.

Whilst the reduction in woodland is still the most consistent pattern seen at the village level, stark differences were identified within scheme areas as seen in Table 5, where two Tokwe villages have similar expansion of cultivation and loss of grassland, but in Devon Ranch there has been a 3.3% expansion in woodland over the period, and in Chitora a 14% reduction.

Table 5. Intra-scheme variation: Two Tokwe villages compared.
(Percentage area)

		T1	T1-T2 change	T2-T3 change	T1-T3 change
Devon Ranch	Cultivation	0.1	8.4	4.3	12.7
	Grassland	50.7	-14.9	-0.2	-15.2
	Bushland	5.2	0.4	-2.6	-2.1
	Woodland	43.9	5.6	-2.3	3.3
Chitora	Cultivation	7.8	9.9	4.5	14.4
	Grassland	64.4	-10.4	-1.6	-11.9
	Bushland	12.9	-2.1	12.7	10.7
	Woodland	14.9	1.8	-15.8	-14

It is evident that the principal output of this research, a data set encompassing 39 (randomly selected) villages across 5 resettlement scheme areas, constitutes a substantial resource not previously available concerning temporal and spatial patterns of resource use and endowment in Zimbabwe. As an inventory of resources, the hard copy maps for each scheme can be made available for practical/immediate use in guiding future administration and management at that level. The extent and quality of the data were probably underestimated in the original proposal and there are substantial opportunities for further analysis with practical/policy implications if data can be disseminated electronically (see dissemination plans).

- Multiple trajectories of change underpin current landscape feature patterns

Using the cross-tabulation function in ArcView, the dynamics underpinning the different gross outcomes of Table 3 can be exposed very readily. It is evident that the longer term outcomes of resettlement are complex and less unidirectional than is suggested by tabulations of aggregated changes. To illustrate, Table 6 demonstrates that, for four of the resettlement areas studied, transitions between the major land cover categories are occurring in all directions simultaneously. For example, while the largest share of grassland was put under cultivation, almost a third remained grassland, and more than a quarter actually reverted to bushland or woodland. In woodland areas, the woodland-to-woodland transformation dominated.

Table 6. Changes in land feature patterns under resettlement, four scheme areas

Original status at resettlement	Use in 1997-98
Of the 47% that was originally woodland:	34% remained woodland 22% was put under cultivation 27% became bushland 16% became grassland
Of the 37% that was originally grassland:	36% remained grassland 38% was put under cultivation 15% became bushland 11% became woodland
Of the 9% that was originally cultivated:	61% remained under cultivation 20% became grassland 9% became bushland 6% became woodland
Of the 4% that was originally bushland: `	34% remained bushland 24% was put under cultivation 25% became grassland 15% became woodland

Source: Data from Mupfurudzi, Sengezi, Wenimbi and Mutanda.
Note: Proportions may not sum to 100 because of rounding and the exclusion of very minor land-feature categories.

Tables 7a and b explore the multi-directional transitions underpinning the divergent outcomes in two scheme areas, Mutanda and Wenimbi. The matrices show the proportional area of each land cover class that remained in that class or made a transition to another land cover class across the period. In Table 7a, only 24% of woodland identified in 1981 in Mutanda were so classified in 1997, for example. The high aggregate losses of woodland in the scheme are seen to be occurring most significantly through transitions to cultivation. However, the trajectories are not linear as evidenced by the substantial reforestation occurring on former grassland and bushland areas. In Wenimbi, 42% of woodland in 1981 remained as woodland in 1997, but woodland gains were smaller than in Mutanda. Whilst Wenimbi experienced high aggregate losses to grassland (Table 3), Table 7b exposes that this has been due to both losses to cultivation but also significant conversions of bushland.

Table 7a. Mutanda transitions, 1981-1997 (percentage changes)

Landscape features (1981)	Woodland	Cultivation	Grassland	Bushland	Total (1981)
Woodland	24.03	36.65	19.05	20.15	58.96
Cultivation	9.84	56.91	18.74	14.07	12.69
Grassland	15.99	39.70	28.34	15.88	22.02
Bushland	27.13	30.01	23.52	18.74	5.77
Total (1997)	20.56	39.36	21.22	18.31	100.00

Table 7b. Wenimbi transitions, 1981-1997 (percentage changes)

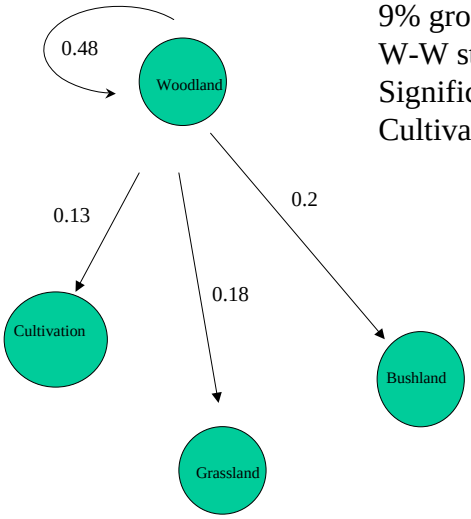
Landscape features (1981)	Woodland	Cultivation	Grassland	Bushland	Total (1981)
Woodland	41.70	10.29	11.17	33.66	29.84
Cultivation	1.58	80.61	9.37	4.50	10.01
Grassland	4.16	33.63	48.93	10.32	47.60
Bushland	7.41	15.76	26.73	42.51	5.52
Total (1995/7)	15.17	28.63	29.35	18.57	100.00

Such findings quickly expose the limitations of working solely at the aggregate level and with linear models of resource degradation in assessing the outcomes of policy and project interventions. The analysis of a third (intermediary) set of photos within this research illuminates the multi-directional changes (reforestation as well as woodland loss, for example) and also exposes the operation of different drivers of landscape change.

Figures 1 & 2 display 'transition probabilities'- the maximum likelihood estimate of the 'probability' of a given land cover class (woodland in this case) making a 'transition' to another land cover class within two periods encompassing the first 5 and subsequent 12 years of resettlement, for two scheme areas. Through such analysis, Table 8 combines data for all cover classes and summarises the different drivers and outcomes. At this scale it is evident that for particular resource areas, a number of scenarios are possible; in grassland, the drivers are the same across the scheme areas and over time, but the environmental outcomes of these weaken over time; in bushland, the drivers change over time and are different across the schemes; and in woodland, the drivers are different and change over time, but have very similar environmental outcomes.

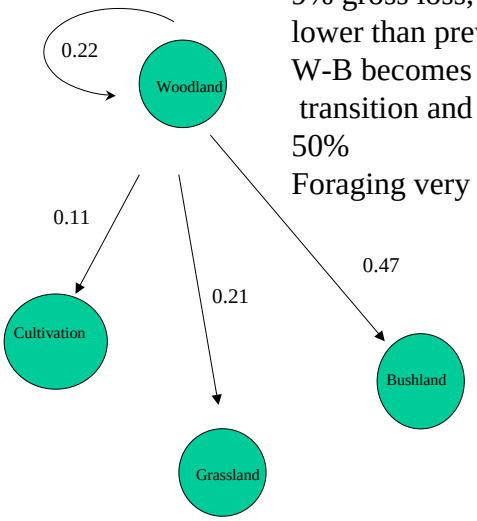
The findings have a number of practical and policy implications. The value of the substantial, electronically available data set for further analysis is again confirmed. The utility of simple methodological tools in GIS for revealing drivers and outcomes at the landscape level is demonstrated. The software and experience is available centrally in Zimbabwe and could be used to support regional officers. The findings highlight the time-dependent nature of any assessment or evaluation of the outcomes of resettlement and the importance of taking more than one snap-shot in time within future research. It is evident that the main drivers at the landscape level are as expected, however, they interact and play out in hugely different ways at different times and in particular places as shown in Table 8. This suggests that that future practices for management at this level need to be rooted in an understanding of these local dynamics and experiences.

Figure 1a. Woodland transition probabilities, Sengezi, 1981-86



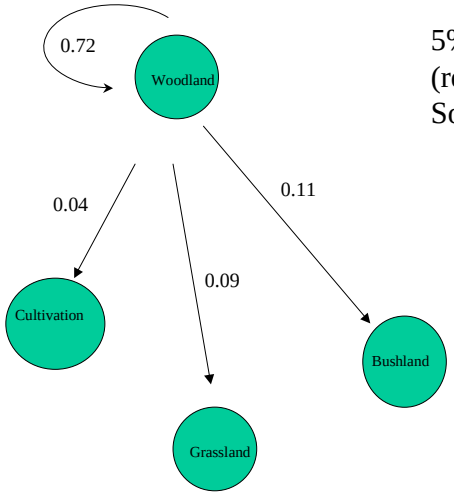
9% gross loss, 1.8% per annum
W-W strongest probability
Significant transition to bushland
Cultivation and foraging similar forces

Figure 1b. Woodland transition probabilities, Sengezi, 1986-98



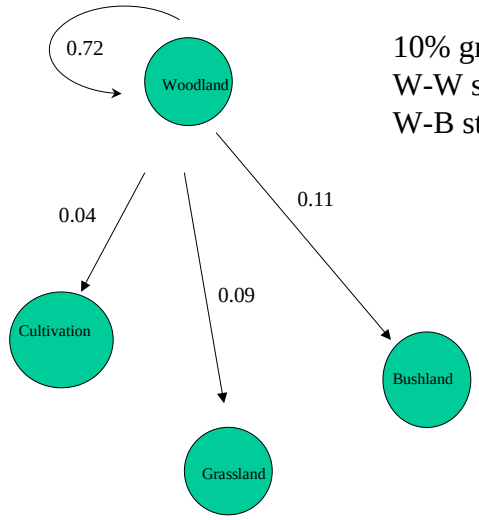
9% gross loss, 0.75% per annum (much lower than previous period)
W-B becomes strongest probable transition and W-W becomes reduced by 50%
Foraging very strong (W-B & W-G)

Figure 2a. Woodland transition probabilities, Wenimbi, 1981-86



5% gross loss, 1% per annum
(relatively small)
Some loss to foraging (W-B)

Figure 2b. Woodland transition probabilities, Wenimbi, 1986-97



10% gross loss, 0.9% per annum
W-W strongest but much reduced
W-B strengthens - foraging

Table 8. Wenimbi and Sengezi: different drivers and different outcomes

(Annual percentage change, scheme area averages)

	T1-T2				T2-T3			
	Wenimbi	**Drivers**	**Sengezi**	**Drivers**	**Wenimbi**	**Drivers**	**Sengezi**	**Drivers**
Cultivation	1.8	C-C strong. Stability	3.5	C-C strong. Fallowing significant	0.9	C-C strong. Stability	0.6	C-C strengthens. Fallowing less likely
Grassland	-2.2	G-G dominates. Opening for cultivation	-3.4	G-G dominates. Opening for cultivation	-0.7	Shift to cultivation becomes stronger	-0.4	Transitions remain similar to earlier
Bushland	0.8	Strong transition to G. Foraging.	1.2	Foraging important. Significant reforestation.	1.7	Loss to cultivation emerges in addition to foraging. Some B-W	0.6	Foraging strengthens. Reforestation weakens.
Woodland	-1	W-W strong. Some foraging.	-1.8	W-W weak. Cultivation and foraging as important.	-0.9	W-W weakens. Foraging rises.	-0.8	W-W weakens further. Foraging very strong in W-B and W-G.

- Village level resource endowments at the time of resettlement were diverse

The resources available to resettled households at the time of designation to the programme of resettlement were found to be very different across and within scheme areas. Whilst it was expected that differences would be found between scheme areas in the light of different political and agricultural histories a well as ecologies of the research areas, the range of experience between villages in the same scheme area were not anticipated. In particular the legacy of a planning model in the past which failed to make any assessment of woodland resources available to villages within a scheme, was quickly evident and as shown in case of the Wenimbi scheme in Table 9.

	14	**15**	**16a**	**16b**	**33**	**34**	**35**	**36**	**37**	**Average**	**Range**
Bushland	6.6	1.9	2.6	7.8	10.1	3.5	2.9	2.8	9.8	5.3	8.2
Cultivation	10.6	36	13.6	14.6	22.3	0	0	4.5	7.6	12.1	22.3
Grassland	70	38.1	33.6	53.5	45.3	48	49.4	67.2	50.7	50.6	36.4
Woodland	9.4	14.1	32.1	17.6	17.7	43.3	42.1	15.6	22.7	23.8	33.9
No. of HHs	28	40	20	28	43	23	45	21	24	30.2	25

Table 9. Wenimbi: Percentage land cover, 1981

Although the analysis needs extending and exploration within this project was limited by the difficulties highlighted in (1), preliminary findings suggest that the data generated will be useful for exploring a number of scenarios asserted for the future of the environmental resources of resettlement areas in Zimbabwe. For example, there was no simple relationship found between rates of woodland loss at the village level and the extent of woodland resources at time of designation, challenging ideas that in circumstances of resource plenty, 'incentives to conserve' are reduced. The varied resource functions provided by woodland resources to resettled household are explored through household data gathered as part of the Zimbabwe Rural Household Dynamics Study in Appendix 4**.** Interviews conducted with village heads (paper 8) have explored the issues of managing village resources at a village level in the context of demands from 'outsiders' including neighbouring resettled as well as communal households.

Preliminary analysis of the research findings also offers critical insight to the suggestion that the resettlement programme in Zimbabwe is leading to a 'replication of communal areas conditions' in former European farmlands. Within such a scenario, woodland areas are considered to become more diffuse through foraging and cutting for fuelwood sources, for example, and cultivation activities are considered to expand haphazardly at the expense of other resources. Paper 7 includes outputs of a simple GIS technique of quantifying the number and average area of 'patches' of land so classified over time i.e. explores the spatial patterning of resource availability and change therein. Again, it is the widening range of experience at village level that is the most striking finding, suggesting that the opportunities for resource use and management are becoming more divergent over time at this scale.

In short, these findings and in particular, the very different 'resource endowments' of resettled village areas coupled with the extreme degree of variability in village-level outcomes as illustrated in Table 4, suggest that the 'village' may be an inappropriate unit for planning purposes in future. The commercial farms on which resettlement has taken place were presumably the residual from the subdivision of the original Rhodesian land grants. In subdividing these large holdings over the years, no account would have been taken to ensure that each smaller unit had the full spectrum of resources upon which poor, post-independence settlers would need to rely. For those resettled, it was literally the luck of the draw that determined the adequacy of the resource base their new community received. Furthermore, insights of Appendix 4 give weight to suggestion that remaining woodland resources within scheme areas are expected also to meet needs of surrounding (communal populations).

- Problems in integrating multiple methodologies in assessments of resettlement outcomes

Although it is considered that the principal output of this research is a substantial and quality data set concerning landscape outcomes generated through sequential aerial photograph analysis, it is evident also through attempts to combine this data with that generated through ongoing household monitoring methodologies, that discrepancies arise which require further work to reconcile.

For example, the planned outcomes of resettlement as evidenced within farm plans for Sengezi have been compared with outcomes as reported through household surveys conducted as part of the ZRHDS and summarised in Table 10.

Table 10: Pre-settlement planning optima compared to post-settlement actualities, Sengezi Resettlement Area, 1970s - 1998

	Planned	***1971***	***1981***	***1998***	Change 1971-98		Change 1981-98	
Livestock-head	*1716*			2046	(*absolute*)	(*per cent*)	(*absolute*)	(*per cent*)
Arable area (ha)	*3025*							
Cultivated in 1998				598				
Fallowed in 1998				367				
		hectares						
Bushland		300	302	1431	1131	377	1129	374
Cultivation		1372	232	2368	996	73	2136	920
Grassland		3648	4579	2821	-827	-23	-1758	-38
Rocky outcrop		5	7	0	-5	-100	-7	-100
Settlement		5	10	82	77	1711	72	758
Water bodies		3	4	4	1	24	0	0
Woodland		1365	1571	74	-1292	-95	-1497	-95
Plantation		90	86	8	-82	-91	-77	-90

Source: Jennifer A. Elliott, Bill H. Kinsey and Dominick Kwesha. Long-term changes in land-use and resource entitlements accompanying changes in land tenure in Zimbabwe. Paper presented at the 9th Biennial Conference of the International Association for the Study of Common Property, 17-21 June 2002, Victoria Falls, Zimbabwe

Two important points are illustrated in Table 10. First, the economic planning optimum for livestock numbers under commercial farm management was 1,716 head of cattle. In only 17 years, the settlers had surpassed this 'optimum' by just under 20 per cent. The results for cropping, however, are divergent, perhaps pointing to inconsistencies in conclusions arising from different methodologies. The planning figure identified 3,025ha of land as arable, some part of which presumably would have been fallowed every year. Analysis of the remote sensing data yields a figure for area cultivated in 1998 of 2,368ha. Assuming that roughly a third of land is fallowed every year, this figure corresponds well with the planning figure. Data from another source, however, contradicts the remote sensing data. A full census of all Sengezi households was undertaken for the 1998 season by one of the researchers (Kinsey). In the census, households reported both the area cultivated and the area fallowed. Aggregated across villages, the census indicated that only 598ha were cultivated in 1998 and another 367hs were fallowed. Summing the two figures gives 965ha, only 41 per cent of the figure for cultivated area reported by remote sensing and only 32 per cent of the planning optimum.

4. Dissemination

As planned, the normal reporting procedures to DFID have been followed. Similarly, opportunities have been taken to present papers formally at the Universities of Zimbabwe, Amsterdam and Michigan State, and at international conferences including the International Association for the Study of Common Property and the Royal Geographical Society/Institute of British Geographers.

In May 2002, the Principal Investigators, Dr. Kinsey and Dr. Elliott met and reported to DFID staff in Harare.

Discussions and communications have been made with representatives including of the Institute of Development Studies (Sussex), the International Institute for Environment and Development (London), the Land Tenure Centre (Wisconsin-Madison) and the Centre for International Forestry Research (Indonesia) that are leading to greater analyses and consideration of the data. Through Mr. Kwesha's employment at the Forestry Commission of Zimbabwe, insights from the project continue to be discussed and used to inform future activities. Results of this research have been fed into the findings of the Zimbabwe Environment Assessment (UNDP, 2002) for example.

The original intention for 'systematic' dissemination of the findings through briefings with the local community became less relevant in the light of the changes made to the project and hence, were not realised.

The nature of events in Zimbabwe from early 2000 and in particular the farm invasions and the declining relations between Zimbabwe and foreign donors are considered to have underpinned the reduced interest in the research outcomes at the level of central government. In contrast, the level of interest from agricultural field staff in the spatial

mapping of longer-term outcomes was substantial and led to further 'informal' dissemination at this scale.

As detailed in the subsequent section, publishing the research more widely is proceeding as planned. One article encompassing the work has been published in an international journal and a further paper has been published online. Two conference papers are being reworked for publication in already commissioned, edited volumes. Funding has been secured (University of Brighton) for further analysis of the data set and the PIs are committed to using this and the basis provided by disseminated papers to date to publish a minimum of two further papers in international journals. Substantial thought is also being given as to how best to make available the data set as a whole for future use by other interested parties, particularly in Zimbabwe.

5. List of publications (in chronological order)

1. Bill Kinsey. After land, what? The long-term impact of land redistribution on poverty in Zimbabwe. Paper presented at the conference *Livelihoods in Distress*, 19-20 February 2002. University of Zimbabwe, Harare.

2. Jennifer A. Elliott, Bill H. Kinsey and Dominick Kwesha. Long-term changes in land-use and resource entitlements accompanying changes in land tenure in Zimbabwe. Paper presented at the 9th Biennial Conference of the International Association for the Study of Common Property, 17-21 June 2002, Victoria Falls, Zimbabwe.

3. Bill Kinsey. Food security and sustainable livelihoods in resettlement areas of Zimbabwe: An historical assessment of the impact of the resettlement programme. Paper presented at the First Annual Colloquium of the Department of Agrarian and Labour Studies, Institute of Development Studies, University of Zimbabwe: *State Labour and Agrarian Issues: Labour Regimes and Agrarian Reforms in Africa,* 24-26 July 2002. International Conference Centre, Harare.

4. Bill H. Kinsey. Survival or growth? Temporal dimensions of rural livelihoods in risky environments. *Journal of Southern African Studies* 38, 3 (September 2002).

5. Bill Kinsey. Two decades of land reform in Zimbabwe? What have we learned? Paper presented at the Center for Advanced Study of International Development—Women in International Development, Michigan State University, September 12 2002

6. Bill Kinsey. Comparative economic performance of Zimbabwe's resettlement models. In Michael Roth and Francis Gonese (Eds.). *Delivering Land and Securing Rural Livelihoods: Post-Independence Land Reform and Resettlement in Zimbabwe*. Harare and Madison, Wisconsin: Centre for Applied Social Sciences, University of Zimbabwe, and Land Tenure Center, University of Wisconsin-Madison (June 2003) [Now published—the volume is online at: **http://www.wisc.edu/ltc/zimbook.html.**]

7. (Appended) Jennifer Elliott, Bill Kinsey and Dominik Kwesha. Land cover outcomes over 20 years of post-resettlement experience in Zimbabwe. Paper presented at the

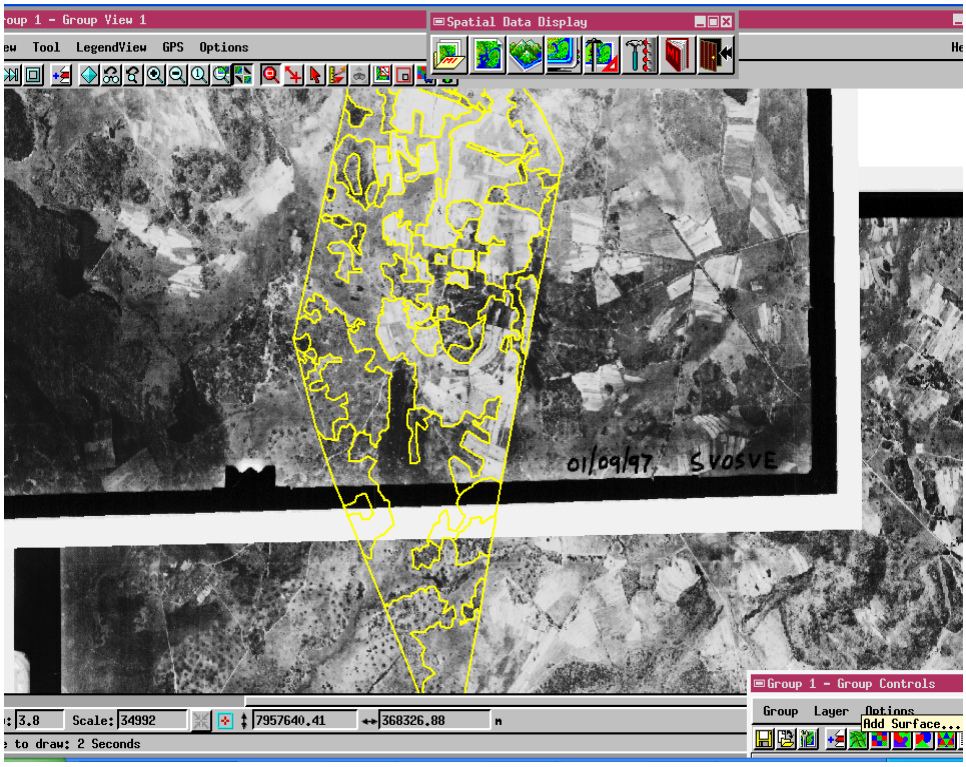
Annual Conference of Royal Geographical Society/Institute of British Geographers, London, September 3 2003. [Being revised for publication in an edited volume by Ashgate in 2004]

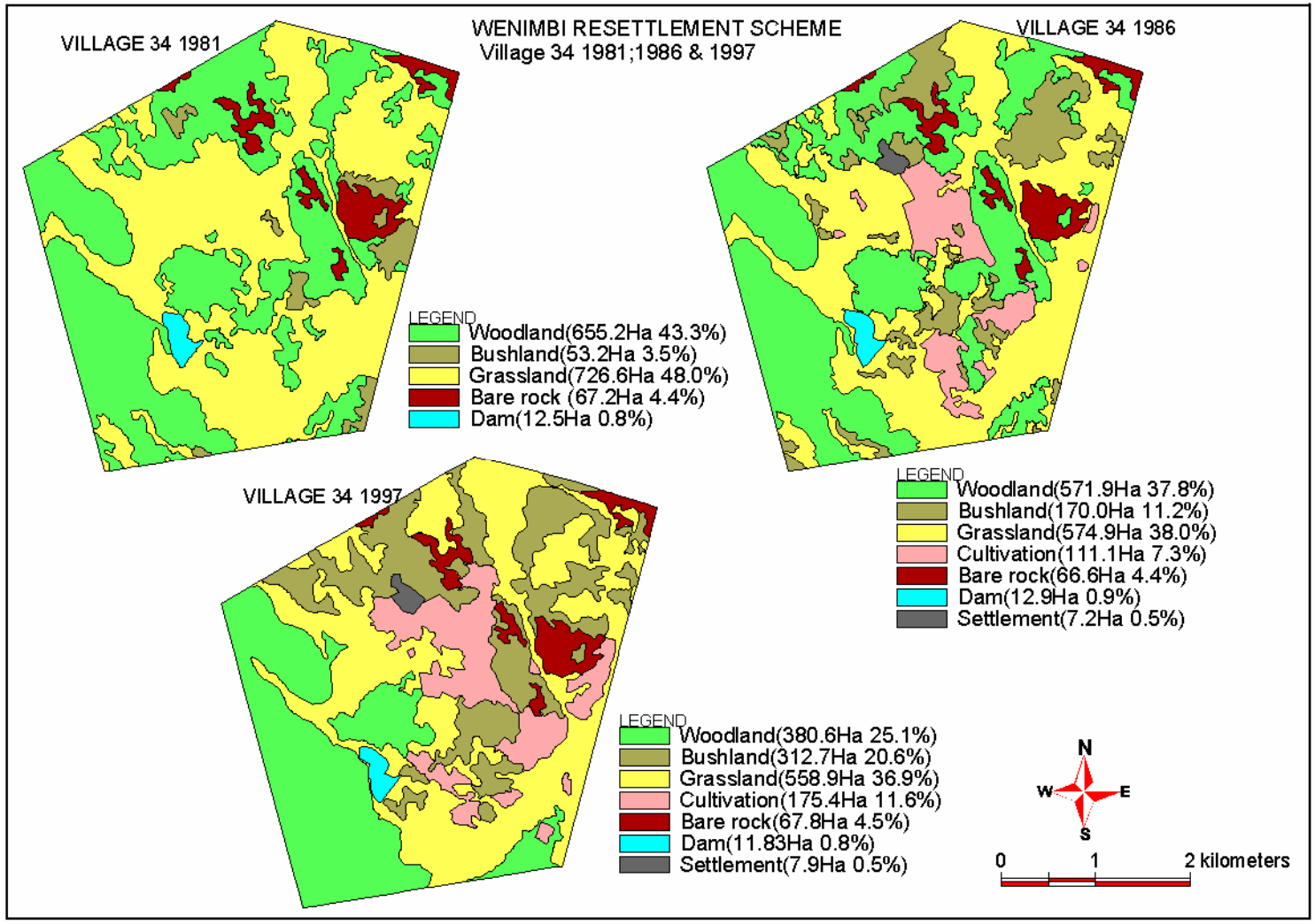
8. (Appended) Bill Kinsey. Fractionating local leadership: Created authority and management of state-owned land in Zimbabwe. Paper presented at the international conference: Competing Jurisdictions: Settling Land Claims in Africa, Free University Amsterdam, September 24-26 2003. [To be revised and published in an edited volume by Brill in 2004]

Appendix 1. Dates of air photos used in research areas

Scheme area	'Prior to designation'	'On designation'	'First 5-6 years of resettlement'	'Subsequent 10-12 years of resettlement'
Tokwe	1972	-	1985	1997
Wenimbi-Macheke	-	1981	1986/7	1995/7
Mupfurudzi	1973	1981	-	1996/7
Sengezi	1971	1981	1986	1998
Mutanda	1969	1981	-	1997

Appendix 2. Digitising village layouts.




WENIMBI RESETTLEMENT SCHEME
Village 34 1981;1986 & 1997
VILLAGE 34 1981
LEGEND
Woodland(655.2Ha 43.3%)
Bushland(53.2Ha 3.5%)
Grassland(726.6Ha 48.0%)
Bare rock (67.2Ha 4.4%)
Dam(12.5Ha 0.8%)
VILLAGE 34 1986
LEGEND
Woodland(571.9Ha 37.8%)
Bushland(170.0Ha 11.2%)
Grassland(574.9Ha 38.0%)
Cultivation(111.1Ha 7.3%)
Bare rock(66.6Ha 4.4%)
Dam(12.9Ha 0.9%)
Settlement(7.2Ha 0.5%)
VILLAGE 34 1997
LEGEND
Woodland(380.6Ha 25.1%)
Bushland(312.7Ha 20.6%)
Grassland(558.9Ha 36.9%)
Cultivation(175.4Ha 11.6%)
Bare rock(67.8Ha 4.5%)
Dam(11.83Ha 0.8%)
Settlement(7.9Ha 0.5%)
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Appendix 4. The experience of environmental change with resettlement

Natural woodland is important to households resettled in the original programme. Because their poverty was one of the chief criteria employed in selecting them for the programme, they are more reliant upon the use of natural resources to create and sustain livelihoods than households selected using other criteria might be. Settlers distinguish a wide range of uses for trees (Table 1).

Table 1: Respondents' three most important uses for or benefits from trees, 1994

Stipulated use/benefit	Cases out of 300	Percentage of 849 responses
Firewood/fuelwood	268	31.6
Building/construction	208	24.5
Comfort/aesthetic value	95	11.2
Generation of oxygen	74	8.7
Fruits	48	5.7
Yokes, tool handles & furniture	41	4.8
Windbreaks	29	3.4
Conservation	27	3.2
Medicines	26	3.1
Craftwork materials	11	1.3
Others	10	1.2
Soil fertility	6	0.7
Hydrological cycle	6	0.7
Total	300	100.0

Source: Zimbabwe Rural Household Dynamics Study, 1994, Mutanda, Sengezi, Mupfurudzi.

A decade after resettlement, resettled households were already perceiving the loss in tree cover. Just over half the households in the 22 villages covered in Mupfurudzi, Sengezi and Mutanda reported in 1994 that there had been a loss of tree cover since they were first resettled in the early 1980s.

To a small extent, the perceived loss in tree cover might be attributed to settlers' clearing additional land beyond their original arable allocation, but only slightly less than 15 per cent reported having done so up to 1994. Moreover, only two per cent of respondents perceive clearing of fields as contributing to loss of tree cover (Table 2), while the majority view is that cutting trees for use as fuelwood is the main explanatory factor behind the loss of trees.

Table 2: Settlers' explanation for the loss of tree cover in resettlement areas, 1994

Explanation for loss of tree cover	Cases out of 151	Percentage of 205 responses
Use for fuelwood	69	33.7
Indiscriminate, uncontrolled cutting/deforestation	43	21.0
Use for construction work	40	19.5
Drought	20	9.8
Outsiders' destruction of trees	15	7.3
Veld fires	4	2.0
Field clearing	4	2.0
Overpopulation	4	2.0
Use for fencing/kraals	2	1.0
Cutting wood to sell	2	1.0
Others	2	1.0
Total	151	100.0

Source: Zimbabwe Rural Household Dynamics Study, 1994.

Clearly, however, the loss of tree cover was interpreted differently by different observers. For example, only 26 per cent of households reported greater difficulty in accessing fuelwood in 1994, while some 23 per cent reported that their village had established a communal woodlot. Four years later, in 1998, the proportion of respondents reporting they lived in a village with a communal woodlot had risen to only just over 26 per cent. At the same time, settlers living in the 22 ZRHDS resettlement households reported that they travelled on average 4.3km and took 1.7 hours per journey to fetch firewood.

Ninety per cent of respondents reported that they had planted trees subsequent to their resettlement. Most tree-planting (86.1 per cent) was done solely as an individual initiative, while only 5.1 per cent was done as a community endeavour (the balance comprised households that planted both individually and communally). The pattern of tree-planting, as shown in Table 3, gives some idea of settlers' priorities for trees in the 10-12-year period following resettlement. The retrospective planting patterns for 1994 had changed somewhat by 1998, when there was less diversity and fruit trees dominated planting patterns. The mean number of trees planted per household in 1998 was 23, but there was clearly great variability as the median number was only 5.

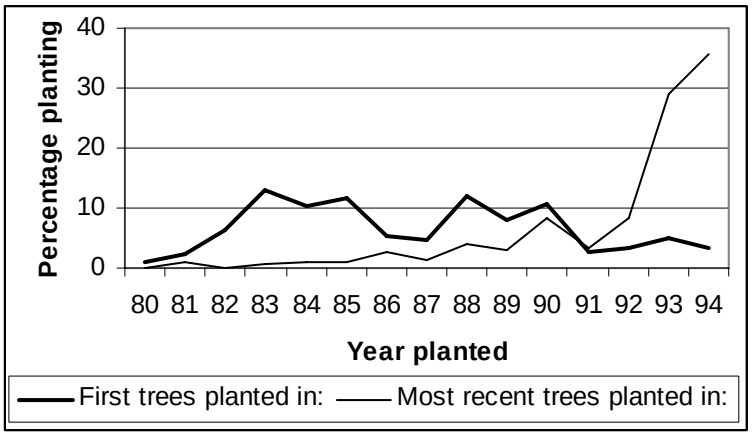
Table 3: Patterns of tree-planting, resettled households, 1994 and 1998

Type of trees planted	1994		1998	
	Frequency	Per cent	Frequency	Per cent
Fruit	141	51.8	149	79.3
Fuelwood	9	3.3	16	8.5
More than one type	88	32.4	4	2.1
Shade	5	1.8	5	2.7

Windbreaks	1	0.4	11	5.9
Other (including coffee)	28	10.3	3	1.6
Total	272	100.0	171	100.0

The planting of trees began early for some settlers—within a year of two of being resettled. Some 10-12 per cent of settlers were planting their first trees each year beginning in 1983 and continuing at this level—with slowdowns associated with droughts—until 1990, when there were few settlers left who had not planted at least some trees (See Figure 1). There is some indication that tree-planting was becoming a more regular occurrence, since 35 per cent of households had planted trees during 1993/94. This conclusion is substantiated by the findings of the 1998 round of ZRHDS, which found that 44 per cent of households had planted trees in the preceding year.

Figure 1: Timing of tree planting, 1980 to 1994



Source: Zimbabwe Rural Household Dynamics Study, 1994.

Perceptions relating to changes in the quality of grazing in resettlement areas reveal an even lower threshold of concern. Less than 15 per cent of respondents in 1994 perceived that the quality of grazing had declined since they were resettled, even though over a quarter of respondents felt that the grazing areas were being overused. Less than two percent were willing to allow outsiders unrestricted access to grazing areas in resettlement areas, however the proportion willing to share the grazing increased to over 12 per cent if the access were governed by some sort of leasing arrangement between settlers with few or no cattle and others with too many cattle for their grazing resources.

Another indicator of overuse, or poor managerial practices in the past and/or the present, is the extent of soil erosion. As indicated in Table 4, some 60 per cent of settlers in 1994 felt they had at least some problem with erosion on their primary arable plot. Further, some 36 per cent stated that they had noticed a decline in the depth of the soil on their main plots. Positively, however, over 94 per cent of settlers reported that they had received technical advice on how to prevent and/or manage erosion, and more than 65 per cent reported taking specific erosion control measures. Three years later, in 1997, 38 per

cent of households reported that the quality of their soil had changed for the worse, while some 73 per cent had taken measures during the 1996/97 season to preserve or improve their soil.

Table 4: Perceived severity of soil erosion on the main arable plot since the respondent began farming in the resettlement area

Severity of soil erosion	Per cent
Very severe	0.3
Severe	16.1
Minor	43.3
Not a problem	34.6
Not certain	5.7
Total	100.0

Source: Zimbabwe Rural Household Dynamics Study, 1994.

Across a range of other indicators of adequacy of common property resources, settlers tended to be somewhat more negative (Table 5). Only in the cases of natural craftwork materials and wild fruits did small majorities of settlers declare that things were as good as when they first arrived in the area.

Table 5: Perceived changes in the adequacy or quality of common property resources, 1994

Change in the indicator since resettlement	Yes	No
	(*percentage of responses*)	
Has there been a decline in the quality/usability of the surface water?	64.0	36.0
Has it become more difficult to obtain thatching grass in the community?	55.8	44.2
Are natural craftwork materials as easy to find now?	56.2	43.8
Is the fishing here as good as when you first came?	39.3	60.7
Is the hunting as good as when you first came?	19.0	81.0
Are wild fruits as available as when you first came?	57.3	42.7

Source: Zimbabwe Rural Household Dynamics Study, 1994.