Evolution of Social Science Research at ICRISAT, and a Case Study in Zimbabwe

Jane D Alumira, Ma. Cynthia S Bantilan and Tinah Sihoma-Moyo

Evolution of Social Science Research at ICRISAT

Background

Social science research (SSR) at ICRISAT evolved in the context of its socio-economics program, covering agricultural economics, science and technology policy, rural sociology, and anthropology (Byerlee 2001). These disciplines play complementary roles in obtaining a basic understanding of the rural economy in the semi-arid tropics (SAT), identifying priorities for research, informing policy, monitoring research impacts and helping to direct investments by ICRISAT's partners. The first part of this paper analyzes the evolution of SSR in ICRISAT. The second part is a recent case study on livelihood diversification behavior among smallholder farm communities in Zimbabwe. It illustrates how SSR contributes to livelihood analysis, targeting of research and development, and informing policy.

The structure and content of SSR at ICRISAT has been shaped by the Institute's overall research strategies over time. Before 1996, ICRISAT's major emphasis was on increasing production and food security through new technologies and new uses for our mandate crops. The strategy focused on more efficient use of small quantities of inputs and their timely application to enrich nutrient-poor soils. In the latter half of the 1990s, there was renewed effort on problem-based, impact-driven science and delivery of outputs.

By 1997, the Institute's strategy aimed to identify alternative uses of the natural resource base that could help reduce poverty, promote food security, and prevent environmental degradation. In line with these changes, socio-economics research focused on analysis of the potential of agriculture in the semi-arid tropics, alternative investment strategies, input and output markets, and policy. In accordance with the CGIAR's vision of a food-secure world by 2010, ICRISAT's vision today is to improve the well-being of the SAT poor through agricultural research for impact. The Institute has a mandate to enhance the livelihoods of the poor in semi-arid farming systems through integrated management of genetic and natural resources (ICRISAT 1980–2003).

The Need for Social Science Research

The need for SSR within ICRISAT was recognized even when the Institute was established in 1972. At that stage little was known of the socio-economic structure of the SAT, even in India, where SSR was piecemeal, mostly aggregative, partial, cross-sectional, and spatially concentrated in non-SAT areas. In response, ICRISAT initiated longitudinal Village Level Studies (VLS)[1] in India in 1974, which expanded to West Africa in the early 1980s. In India, the studies concentrated on risk attitudes, cropping patterns, nutrition, weed management, and labor market economics. Emphasis was also placed on fertilizer use and on-farm watershed research. Anthropological studies began in 1976; nutrition and health studies in 1977/78. Additional research was carried out in Sudan and Cote d' Ivoire, where ICRISAT scientists formed part of multidisciplinary teams (Walker and Ryan 1990).

These studies helped understand the behavioral, economic and technological strategies used by poor African and Asian farmers to cope with drought and population pressure. They also contributed to the ways in which technologies and information generated by ICRISAT could help mitigate these impacts on crops and livestock. The findings contributed to technology design, more efficient

1. Village Level Studies (VLS) refer to longitudinal surveys of panels of households selected from benchmark villages representative of larger production regions. These earlier studies, conducted in India and Africa, used a combination of ethnographic inquiry, farm management surveys, special purpose surveys, and on-farm research.

allocation of research resources, and government policy formulation. Perhaps most important, analysis of these datasets helped identify key areas where additional information was needed. For example VLS in West Africa on the economics of phosphorus and nitrogen fertilizer use recommended smaller quantities of fertilizer, in combination with proper crop management practices, to ensure higher yields (Spencer 1984). ICRISAT continues to promote small doses of fertilizer (in combination with improved crop management practices), both in West Africa and southern Africa. VLS also produced a significant body of academic research: between 1980 and 2000, there were 3 MSc and 40 PhD theses, 106 refereed journal articles, and over 120 publications that utilized VLS data (ICRISAT 2002).

By 1985, SSR focus shifted towards resource management, with the aim of increasing adoption of improved technologies. Studies focused on farm household income, labor availability, common property resources, soil fertility, market research (particularly price prediction), quality and standards of produce, and economic modeling. Socio-economic aspects of soil fertility work, for example the use of rock bunds to conserve water in Burkina Faso, gained widespread acknowledgment. By 1987, ICRISAT's work on soil fertility and fertilizer usage, cropping systems, and agricultural labor-saving implements in both India and Africa gained further momentum. In 1989, the focus was expanded to include partnerships with national agricultural research systems (NARS) for technology transfer. Improved varieties of sorghum, pearl millet, groundnut, chickpea and pigeonpea were promoted in Burkina Faso, Ghana, Chad, Togo and Zimbabwe in Africa; and in the states of Maharashtra, Karnataka, Andhra Pradesh, Gujarat, Madhya Pradesh, Orissa and Tamil Nadu in India.

During the first half of the 1990s, the SSR focus was to identify the factors constraining agriculture in Asia and Africa. Adoption, impact and gender studies helped identify the determinants of technology adoption in different environments and evaluate results from crop improvement and resource management research. SSR also strengthened the processes of research prioritization and management decision-making, developing quantitative techniques to compare alternative research investments on the basis of probability of success, internationality, gender concerns and other indices. This approach is now central to the development of the Institute's rolling Medium Term Plans.

After 1996, SSR re-oriented its agenda to focus on drawing lessons from previous results, and working with a broader range of partners to apply these results to stimulate agricultural development in the SAT. Key research areas were seed systems, commercialization of SAT crops, input/output markets, and resource economics, particularly in soil fertility, water, and crop management. A series of studies reviewed the current and projected outlook for ICRISAT's mandate crops. SSR has also contributed to impact assessment using standard adoption and economic surplus methods. However, this work has been basically economics-based. It was only recently, when VLS resumed in India, West Africa and southern Africa in 2001/02, that the focus was significantly extended to sociological issues including gender, poverty, livelihood sustainability, and emergency issues, especially HIV/AIDS. The importance of this approach was emphasized by a Center-commissioned external review of the Socio-economics and Policy Program, which encouraged the program to produce strategic research that provides a new understanding of processes relevant to SAT agriculture or rural livelihoods, using new analytical methods.

SSR thus contributes to ICRISAT's mission to help the poor of the semi-arid tropics: to increase agricultural productivity and food security, reduce poverty, and protect the environment. Specifically, SSR undertakes strategic assessments of future scenarios for agriculture and livelihood strategies, technology utilization strategies, strategies for diversification and commercialization of SAT crops, micro-level assessments of the dynamics and determinants of poverty, identification of new institutional arrangements for research and development, and targeting of research spillovers.

Structure of Social Science Research at ICRISAT

In the 1980s, SSR was part of the then Resource Management Program. Subsequently, in the 1990s ICRISAT's research was restructured into three major global programs, and SSR became a separate Socio-economics and Policy Program (SEPP). The other two global programs were Genetic Resources Enhancement (plant breeding, plant protection, biodiversity and genetic resources conservation) and Natural Resources Management (cropping systems, management of crops, soil, water and nutrients).

Meanwhile SAT agriculture and economies in general have continued to change due to many factors: the impact of new technologies, trade liberalization, livelihood diversification both on and off the farm, degradation of the natural resource base, feminization of agriculture, and HIV/AIDS (Ryan and Spencer 2001). Consequently, ICRISAT and its partners began to ask critical questions in the latter part of the 1990s. For instance, how significant were these changes in the SAT, and what were the implications for the research agenda? The Institute's SAT Futures initiative was launched, to address these issues. In 2001, ICRISAT's research structure was further reorganized into a systems-oriented operational framework, with integrated global themes reflecting the required inputs to achieve the Institute's new vision and strategy for the period 2000-2010. There are five global themes – Biotechnology, Crop improvement, Agroecosystems, Seed systems, and SAT Futures – for research on water and soils, genetic resources, markets, institutions, policy, and impacts.

Staff Strength

As at 2001, the staff strength of SSR stood at 39: 10 scientists who were PhD degree holders, 13 scientific officers with Bachelors or Masters degrees, 6 administrative/secretarial staff, and 10 other support staff (Table 1). ICRISAT also offered student internships and collaborative opportunities with visiting scientists. By 2003–04, the number of staff has not changed much, but there were staff transfers across regions according to research needs.

Staff trends for research scientists over the period 1974-2003 are shown in Figure 1. In the period 1974-82, twelve out of 15 scientists were economists; one was a senior economist while two were social-anthropologists – the highest number of sociologists ever employed at the Institute. In the period 1983-1990, the number of economists increased to 15 out of a total of 19 scientists, but the number of sociologists had been reduced to one.

Table 1. SR staff strength and deployment, 2001

Location	Scientists	Consultants and Visiting Scientists**	Scientific officers	Administrative, secretarial and support staff	Total
Bamako, Mali	1	1	1	1**	4
Bulawayo, Zimbabwe	5	3	3	4	15
Kano, Nigeria	-	-	-	-	-
Lilongwe, Malawi	-	-	-	-	-
Nairobi, Kenya	1	-	1	1*	3
Niamey, Niger	-	1	-	-	1
Patancheru, India	3	4	8	10	25
Total	10	9	13	16	48

Source: ICRISAT 2001 * Period ranges between 3 weeks and 1 year ** Shared staff

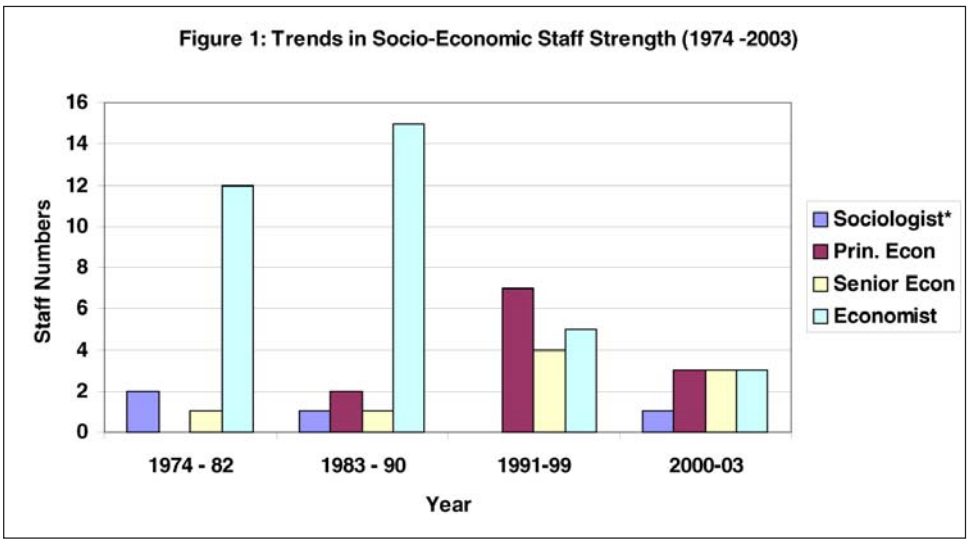


Table 2. SEPP staff strength at different research sites over time

	1996	1997	1998	1999	2000	2001	2004
India	4	3	3	4	2	3	3
Niger	2	1	1	2	1	0	2
Mali	0	0	0	0	1	1	0
Zimbabwe	2	2	1	1	3	5	3
Kenya	1	2	2	2	1	1	1
Malawi	1	1	0	0	0	0	0
Total Asia	4	3	3	4	3	3	3
Total Africa	6	6	4	5	7	7	6
Total	10	9	7	9	10	10	9

Source: Byerlee 2001; with update for 2004.

Staff numbers at economist level decreased drastically in the 1990s, from 15 in 1991 to five in 1999. But the number of economists at senior/principal level increased sharply over the same period to 4 and 7 respectively while that of sociologists declined to zero. Numbers were roughly stable from 1996 onwards (Table 2), but by the year 2000 the number of sociologists had declined to zero. In 2001, a single sociologist was recruited.

Collaboration and Partnerships

SSR activities are undertaken in collaboration with biophysical scientists and research managers. Externally, SSR partners with NARS, policy makers, NGOs, and other development agencies. These have included State agricultural universities in India, Oxford University and Natural Resources Institute (NRI) in the UK, Yale University (USA), FASID and University of Hitotsubashi in Japan, other CGIAR centers, and networks like ASARECA, INTSORMIL, SADC-FANR, CORAF among many others. Outputs from this collaborative research have contributed to impact assessment and priority setting within ICRISAT. In India, partnerships with the NARS have generated considerable quantitative evidence of economic benefits and international spillovers.

Constraints and Institutional Debates

The evolution of SSR at ICRISAT has not been without its share of constraints. The first is insufficient funding. SSR continues to be funded through a combination of unrestricted core funds and special projects, and funding has been declining over the years. Between 1990 and 2000, ICRISAT suffered serious budget cuts that led to the loss of 9 core positions within SEPP. As core funding fell, dependence on special project funding increased. Between 1998 and 2001 only 30% of the total SEPP budget and two staff positions were catered for by core funds. Consequently, allocation of SSR staff to support other programs – within the Institute and with partner organizations – has been constrained. Table 3 shows the approximate allocation of SSR staff to major program themes within ICRISAT during the period 1997-2001.

In total, 75% of staff worked on markets, policy, SAT Futures, impacts, and priority setting, which were SEPP's major areas of focus at that time. Genetic resources, seed systems, and natural resource management, received lesser shares.

SSR at ICRISAT has also been subjected to periodic evaluations of its role, objectives, and achievements. The first major evaluation was in 1996, when an external program and management review of ICRISAT also extensively reviewed SEPP. In 2001, a Center-commissioned external review (CCER) of SEPP concluded that the program had contributed many practical problem-solving products and had developed excellent partnerships. The Panel identified a number of significant impacts of the program, including "contributions to changes in ICRISAT's overall strategy, contributions to national capacity, and contributions to policy." The Panel found "a highly committed, competent and motivated team of social scientists in place." However, they stated that SSR at ICRISAT had not lived up to its potential, contributing less than it might have, to understanding the social dimensions in SAT agriculture. The review recommended that given the 'minority' status of SSR scientists, regular annual meetings be held to enhance professional interaction and knowledge sharing among ICRISAT social scientists in Asia and Africa. In addition, the review recommended that a mentoring system be developed so that more experienced SSR scientists could guide younger colleagues regardless of their location. There also was need for increased interaction with advanced research institutions to facilitate the upgrading and exchange of social science skills. These recommendations have been implemented. For example we now have collaboration with Oxford and Cambridge Universities in UK and partners in France and Japan for work on changes in the rural SAT economies, and with the University of Manchester and the Open University in the UK for work on innovation policy related to the deployment of biotechnology in India. And socio-economics scientists meet at least once a year to share experiences and strengthen synergies.

Table 3. Approximate allocation of SEPP staff (in percentage of time) to major program themes

	1997	1998	1999	2000	2001	1997-2001
Impacts and priority setting	35	36	45	28	17	33
Genetic resources /seed systems	7	5	11	10	8	8
Natural resources	15	18	18	28	19	17
Markets, policy and SAT futures	43	42	25	34	48	42
Total	100	100	100	100	100	100

Source: Byerlee, 2001

One of the recommendations sparked off debate on how best SSR could support all biophysical research at ICRISAT. The CCER recommended that a majority of SSR resources be re-allocated to soil and water, crop improvement and utilization, crop-livestock interactions, and seed systems; and that SSR staff be physically moved to locations where these research themes were centered, in order to promote greater interdisciplinary interaction. The CCER review further advocated that allocation of SSR resources to natural resource management be given first priority. This recommendation sparked off a debate – which was renewed in 2003, when an external program review of ICRISAT reiterated this particular recommendation. It has since been agreed that ICRISAT should maintain a distinct social science research agenda while providing support to (and ensuring multi-disciplinarity in) other programs. A critical mass of social scientists will be established in all geographical regions to create an appropriate balance in activities managed by the SAT Futures theme as well as other global themes. The CGIAR Interim Science Council and the World Bank have supported this conclusion.

Sociology and Anthropology Research at ICRISAT

As discussed in previous sections, ICRISAT's sociology and anthropology research has been erratic and fragmented, occasionally backstopped by short-term appointments or involvement of national and international program collaborators. These disciplines seem to have been misconstrued to be synonymous with economics and hence marginalized over the years. Since its inception, the Institute has employed a total of only three sociologists/anthropologists over 30 years, certainly insufficient given the size and diversity of ICRISAT's mandate regions. To date, staff strength remains well below requirements. At the very least, and in view of budget constraints, we ought to have three staff for the three major regions – East and Southern Africa, West and Central Africa, Asia – assisted by post-doctoral fellows. Staff limitations are likely to be more complicated if sociologists and anthropologists are not well integrated into SSR teams, which are currently dominated by economists. Deliberate efforts at mentoring can help motivate researchers and ensure smooth integration of the different disciplines.

Interaction with biophysical disciplines within ICRISAT also needs attention. What needs to be addressed is the erroneous perception of sociology and anthropology as secondary in importance relative to the other disciplines (Cernea 2001). Rather, it should be considered a fully-fledged scientific theme in itself with complementarities to offer and synergies to be developed. Only when this is understood will the other constraints such as budgets be proactively considered without marginalizing it.

All said and done, sociology and anthropology have had a profound impact within the Institute. In West Africa, anthropological research was carried out in the early 1980s. Focusing on smallholder communities, the research assessed the rate and causes of economic change; land tenure and inheritance systems; the impact of wealth differences between farmers on farm management, decision-making and technology uptake; household consumption patterns; and the determinants of labor availability (Spencer 1984). In Burkina Faso and Niger in West Africa, VLS encompassed both anthropological and economic aspects to describe community, cultural and ethnic factors influencing agricultural production decisions and trends. In India, these studies focused on social organization, group action and nutrition (Walker and Ryan 1990). VLS in southern Africa were economics-based. Studies in Zimbabwe in 1988/89 aimed to better understand the changing role of sorghum and millet relative to maize, with a focus on food security and farm-household income. VLS were resumed 13 years later in West Africa, southern Africa and India. In Zimbabwe, the current VLS have a sociological perspective, building on the 1988 panel data. The following case study – describing livelihood changes in four panel villages in Zimbabwe – is an example of how SSR can be a valuable tool for targeting and priority setting.

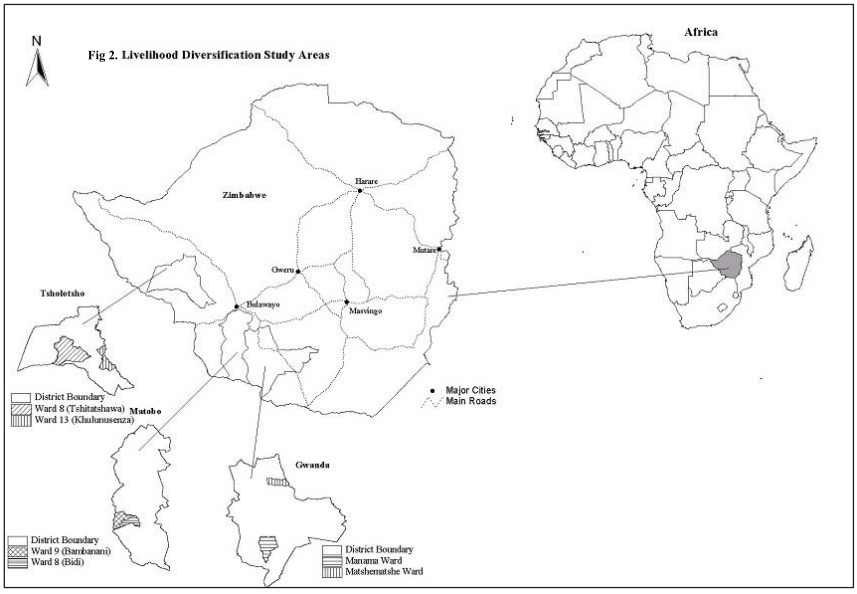
Smallholder Livelihood Diversification Behavior in Zimbabwe: a Case Study

Research Problem and Objectives

This case study contributes to the understanding of key livelihood issues in the SAT as a basis for targeting research and development. SAT environments are undergoing continuous change – economic, social, biophysical – as a result of various factors including recurrent droughts, poverty, unproductive soils, economic liberalization, and HIV/AIDS (Ryan and Spencer 2001). Given the changing SAT environment, what factors constrain rural livelihoods? How do resource-poor smallholder farm households cope, and how do their coping strategies impact on investment behavior? What are the implications for targeting of research and development? The objective of the case study was to analyze constraints to rural livelihoods and how livelihood diversification helps mitigate these impacts; and to inform policy.

Case Study Area

The SAT of Zimbabwe falls in two agro-ecological zones commonly referred to as Natural Regions IV and V[2]. The panel study was undertaken in Kezi communal lands in Matobo district (Fig 2) situated in Natural Region V. The district has an average annual rainfall of 551mm, and average temperatures of 12.5°C min and 27.1°C max. Subsistence farming is a major livelihood option. Matobo district is characterized by low productivity and widespread food insecurity (Oosterhout 1996). Kezi communal area occupies 25 administrative wards, two of which (Bidi and Bambanani, Wards 8 and 9) form Semukwe Communal Lands. Within these wards are found the four panel villages of Zamadube, Sihayi, Nhlupu, and Matshina.



2. Natural Region IV has an annual rainfall range of 350-650 mm with semi-intensive farming systems suitable for livestock and drought-resistant crops. Natural Region V is drier, with rainfall of less than 400-600 mm, with extensive farming, suitable for cattle ranching.

Methodology

The study was a re-visit of a panel of households studied in 1988/89. Sampling was similar to the approach used in the earlier study, ie a combination of multi-stage sample stratification and random selection (Hedden-Dunkhorst 1993). Initial stratification was based on official statistics on crop area, yield, expected sales and retention by communal area. This was followed by further stratification on the basis of district-level demographic and spatial statistics and grain trade, ie smallholder grain deliveries to the Grain Marketing Board. Four communal areas were then randomly selected from a total of 77, two each in Natural Regions IV and V. These included Semukwe communal area (relatively large production area and high sales of sorghum and pearl millet). Four villages in Semukwe and 12 households per village were randomly selected. The 1988/89 VLS in Semukwe covered 48 households. Semukwe was revisited in 2001/02 and forms the basis for this case study. Because of resource constraints, the other three communal areas were not studied.

The Sustainable Livelihoods perspective (DFID 1999, Ellis 2000, Ashley and Hussein 2000) guided the study. We envisaged that each farm community was composed of different socio-economic groups with differing capabilities to overcome barriers to investment, and thus different livelihood strategies (Barret et al 2001). Different strata of households made investment decisions that led them along different development pathways. Therefore, targeting was necessary (Byerlee et al 2000).

First, a reconnaissance was conducted to refine the research questions and design sample surveys. Four communities were selected (Manama, Matshetshe, Tshitatshawa and Khulumusenza) on the basis of agro-ecological zone, distance from main market centers, and whether or not they had worked with ICRISAT and partners. In Tsholotsho district, settlements were in 'lines' of 20-25 households; several lines constituted a village and several villages formed a communal area. In Gwanda, settlement patterns were random. In both districts, a village consisted of 100-200 households with household sizes ranging from approximately five to twelve resident persons. The communities studied ranged from 15 to 95 km away from the nearest major market center. Focus group discussions and key informants were used. Both spatial and temporal data were collected using participatory rural appraisal techniques (resource maps, time lines, problem ranking matrix, transects etc). The wealth ranking method was used to stratify households according to resource endowments.

During sample surveys, household listings utilized in the 1988 study were used to track down panel households. One of the enumerators used in 1988 was still living in one of the villages and was helpful in locating these households. All the 48 households were identified but there were changes in household composition and leadership. Some members had died, others had migrated, some had got married and formed their own households, while others had married into the households. Grandchildren, orphans and other extended family members added to the diversity in household composition. The first round of studies was carried out in 2001, followed by supplementary surveys in 2002. Both structured and semi-structured questionnaires were used to collect data on household demographics, crops, livestock, HIV/AIDS, drought, and strategies for their mitigation, especially livelihood diversification and the use of social capital. Follow-up discussions with key informants generated additional detail. Key informants were household heads, equally distributed among male-headed, de facto female-headed, and de jure female-headed households.

Livelihood Constraints

Poverty and gender: wealth differences in farming communities

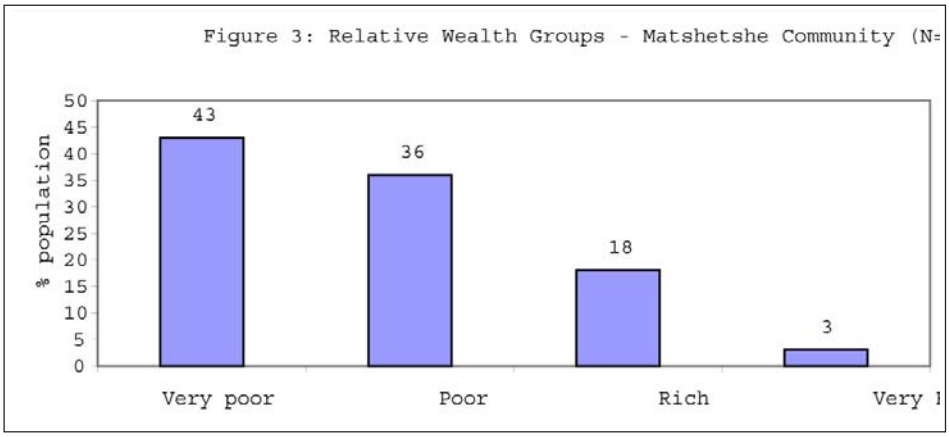
Wealth ranking criteria were used to understand the perception and relative magnitude of poverty and wealth in the study communities (Table 4). The criteria were based on asset ownership (livestock, physical assets) and sources of income. Land was not a key criterion due to the traditional land tenure system, which minimized disparities in land ownership. Each household ideally had access to 10 acres (4 ha) of land. A few wealthier households had begun to encroach on communal grazing lands.

The wealth ranking criteria were then used to classify households into relative wealth groups. Community members were asked to classify every household on the village list (provided by the headman) into one of the wealth groups, using the criteria they had developed earlier. About 15-20 households were then randomly selected from each wealth category and the household heads invited for more in-depth focus group discussions. The reconnaissance was carried out over a period of two months across four communities.

Figure 3 shows wealth categories common to all communities, generated using the wealth ranking criteria. Very poor and poor households constituted over 70% of the total population. Livestock ownership, particularly cattle, was a major determinant of wealth and social status (see also Rohrbach and Alumira 2002). Accordingly, sample survey data were later used to stratify panel households into wealth groups using cattle as a denominator (Fig 4).

Very poor households did not own any cattle, but some owned small stock, especially chickens and goats. Poor households owned 1-4 head of cattle, the medium rich owned 5-10, the rich 11-20, and the very rich owned more than 20 head of cattle. Poor and very poor households accounted for 63% of the population. These figures are comparable with results from focus group interviews conducted during the reconnaissance, in which poorer households constituted 79% and wealthier ones 21% in a community of 936 households (Fig 3). The only difference was that sample surveys identified an additional intermediate category, the medium rich.

When disaggregated by gender, 71% of the 24 women-headed households belonged to the poorer category, compared to 54% of male-headed households. A total of 30 out of 48 households were classified as poor – and 56% of these were headed by women: 43% de jure, 13% de facto female-headed. In contrast, 61% of the 18 rich households were male-headed, 21% were de jure female-headed and 18% de facto female-headed. Thus, poverty was a major livelihood constraint, especially among households headed by women.



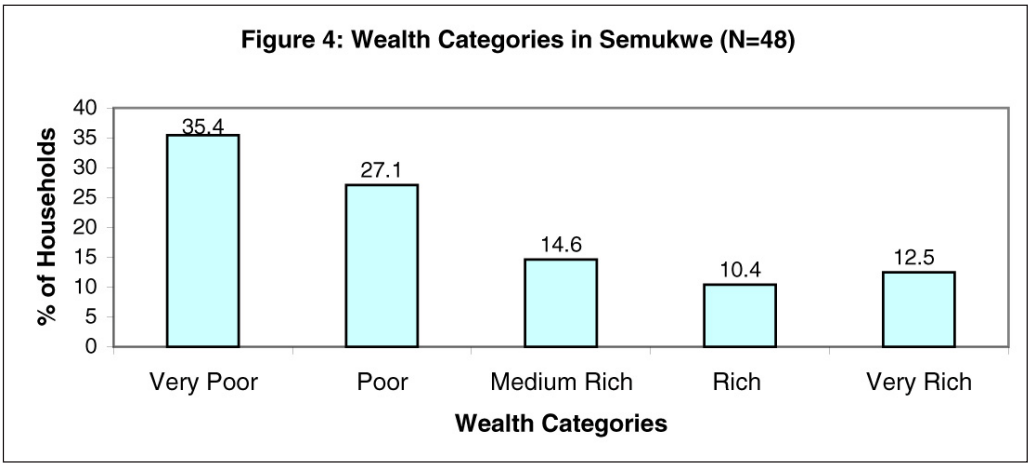


Table 4. Wealth ranking criteria

Asset	Very poor	Poor	Rich	Very rich
Cattle	0	1-4	11-20	>20
Donkeys	0	0-2	4-6	16-18
Goats	0-3	4-10	10-30	50-100
Sheep	0	0	4-10	10-20
Chickens	0-3	0-5	10-20	>50
Ploughs	0	0-1	1-2	2
Cultivators	0	0	1	1
Planters	0	0	1	1
Bicycles	0	0-1	0-1	1-2
Scotch carts	0	0	1	2-3
Harrows	0	0	1	1
Radio	0	0-1	1	1-2
Motorcar	0	0	0-1	0-1
Income sources	Labor, vegetables, traditional medicine, goats	Goats, chickens, labor, vegetables, construction, gold panning	Cattle, goats, maize, groundnuts, remittances, salaries/wages, chickens	Cattle, goats, remittances, salaries/wages, pension, maize, groundnuts, chickens

The pairwise ranking matrix method identified the major livelihood constraints as poor health, food insecurity, poverty, lack of water for crop and livestock production, poor soils, low livestock prices, and unemployment (unemployment was interchangeably used with poverty during discussions). These results compare well with sample survey findings. In 1988/89 the key constraints reported were crop pests, poverty and farm labor; and in 2001/02, drought/famine, poor harvests, unemployment, poverty, and farm labor (Table 5). Access to credit still remained low. Farmers lacked sufficient information on how to access credit. Also, because of drought and poor harvests farmers feared they would not be able to repay the loans and would lose their livestock, often used as collateral. When credit was taken, poor crop yields often caused farmers to use the credit on food and not the intended purpose. Hence risk aversion added to the list of constraints.

Table 5. Livelihood constraints in Semukwe (% of responses)

	1988/89 (n =258)	2001/02 (n =205)
Drought/famine	9.5	19.5
Unemployment	no data	13.2
Poverty (assets)	20.9	11.7
Farm labour (draught animals)	13.9	10.2
Poor harvests	no data	16.6
Crop pests	38.6	no data
Lack of credit	5.6	7.3
Other*	4.3	10.7

*Lack of credit, low soil fertility, inadequate land, illness, taxes

Widespread sicknesses culminated in distress sales of assets to meet medical expenses. As a result, most households preferred to nurse their sick at home. This in turn constrained farm labor availability and eroded the ability of poorer households to sell their labor for cash income. Focus group discussions identified common sicknesses as malaria, persistent cough, tuberculosis, AIDS, herpes, cancer, high blood pressure and diabetes – some of which are related to AIDS (Brown et al 1994).

Up to 36% of the households surveyed cared for a seriously ill member, defined as one who had been bedridden for up to three months prior to the survey. A supplementary survey 10 months later showed that 19% of study households had lost a member to death within this period while 42% were caring for at least one orphan. Poor health, mainly due to the high prevalence of HIV/AIDS and opportunistic illnesses, was an overarching constraint to rural livelihoods.

Based on a recall of two consecutive seasons, the average grain surplus for poorer households was less than 2 kg for all types of foodgrains. In wealthier households, the surplus was 13-60 kg. For a mean household of 7 resident members subsisting on 6 acres of cropped land in a dry agroecological zone, it was impossible for on-farm production alone to ensure food security. Poor crop management, eg failure to use soil fertility technologies, further reduced food production. Farmers attributed this to lack of water – they believed that in dry conditions, fertilizer would 'burn' their crops. Clarity is required on whether the limiting resource management factor to productivity in these farming systems is low soil fertility or lack of water/rain. There also is great need for investments in scaling out appropriate crop management technologies in these communities.

Between 1988 and 2002, What Changed?

Household composition and farm labor

Changes in household composition between 1988 and 2001 are shown in Table 6. Female-headed households increased from 14.6% in 1988 to 52% in 2001. Household size (resident members) declined from 7.87 to 6.83 due to out-migration and deaths. In 1988 there were a total of 425 resident household members. By 2001, 298 members were no longer resident in the households. Of these, 29 had died, 43 had set up their own homesteads within the villages. The remaining 226 had migrated: 39 were living within the same district, 49 in the same province, 56 had moved to different provinces; 77 had migrated outside Zimbabwe. The most important reasons for moving out of the original households were search for paid employment (46%), marriage or joined emigrated family members (33%), schooling (10%), or to set up their own homestead elsewhere (10%).

Despite migration, the total number of resident members in the panel villages changed little: it was 328 in 2001 and 323 in 2002. It is noted that new members were joining these households. In particular, between 2001 and 2002, extended family relations living with the study households accounted for 42% of the study population. These included orphans, the elderly and other disadvantaged relatives. Some of the orphans were assigned to herd livestock and for domestic work within the house.

Another notable finding was that feminization of agriculture was increasing. In addition to increases in female-headed households, 59% of resident adults were women in 2001/02. This implies that women were increasingly making farm-level investment decisions and also providing most of the farm labor. In summary, three major demographic changes had occurred over time:

- Feminization of agriculture had increased
- Animal labor was inadequate due to reductions in numbers of draft animals
- Human capital was increasingly being lost through out-migration and deaths.

Table 6. Changes in household characteristics, 1988-2002

	Year 1988 (N=48)	Year 2002 (N=48)
% female headed households	14.6	52.1
% male-headed households	85.4	47.9
Mean no of household members (incl. non-resident members)	10.29 (4.1)	9.96 (3.7)
Total resident household members in Semukwe	425	323
Mean no of residents	7.87 (3.8)	6.83 (3.1)
% households with at least 1 non-resident member	76.5	68.5
% of residents who were adults (>=14 years)	-	58
% of residents who were children (< 14 years)	-	42
Mean no of resident adults per household (>=14 years)	5.62 (2.65)	3.96 (1.95)
Mean no of children per household (< 14 years)	4.67 (2.36)	2.83 (1.81)
% of total resident household members who are women	-	34
% of resident adults (>=14 years) who are women	-	59
% households with head of household spent 6 or more years in school	41.7	41.8

Figures in parentheses are standard deviations

Table 7. Changes in asset ownership

	1988/89	2001/02
% households with at least one hand tool	100	100
% households with 1 or more scotch carts	52.1	54.2
% households with 1 or more ploughs	93.8	91.7
% households with 2 or more draft animals	95.8	77.1
Mean no of draft animals per household	7.4 (5.3)	3.5 (2.6)
% households ever received agricultural credit	6.3	10.4
Mean cropped land (acres)	4.9 (2.9)	8.8 (5.0)

Figures in parentheses are standard deviations

Asset ownership

Most households in Kezi used donkeys for draft power. Ownership of draft animals declined sharply (Table 7), in terms of percent of households owning at least 2 draft animals and the mean number of animals per household. According to key informant interviews, this was due to cattle deaths during recurrent droughts and also cattle diseases. Farmers employed one major coping strategy: they pooled their draft animals and plowed for each other in turns. Some of these groups also hired out their pooled draft power to other households. Ownership of farm equipment, particularly scotch carts, plows and hand tools (hoes, spades, forks), changed very little or not at all. What actually changed in this respect was the condition of these implements. Most were not functional because of lack of money for spare parts and repairs. A key coping strategy was sharing of implements. Scotch carts were considered very important, and used to transport people, manure, other farm inputs, and grain, especially during the harvest period. Households sold livestock to invest in scotch carts or purchased them using remittance income.

According to key informant interviews, increases in average cropped land were skewed towards the few wealthy farmers who had expanded their crop areas. This was confirmed by sample survey results disaggregated on the basis of relative wealth (Table 8). Poorer households owned fewer draft animals, less farm equipment, and hence cropped smaller areas (5.9 versus 10 acres) compared to the wealthy category.

As explained earlier, the majority of poorer households were female-headed. What these results have shown is that the productivity of female-headed households was most constrained by the lack of draft animals and farm equipment. For a mean household size of 6.8 residents with mean cropped land of 5.9 acres in a dry area (rainfall 350-600 mm), exacerbated by the exogenous factors explained earlier, it was almost impossible to make a living from crop production alone. This is why livelihood diversification was an important coping mechanism for these households.

Table 8. Asset ownership by wealth category, 2001/02

	Poor (N=30)	Rich (N=18)
% households with at least one hand tool	100	100
% households with 1 or more scotch cart	36.7	88.9
% households with 1 or more ploughs	86.7	100
% households with 1 or more wheelbarrow	56.7	88.9
% households with 2 or more draft animals	66.7	94.4
Mean no of draft animals per household	2.8 (2.2)	4.8 (2.7)
% households with 1 or more cultivators	6.7	55.6
% households with 1 or more harrows	3.3	38.9
% households with 1 or more bicycles	50	77.8
% households with 1 or more radios	23.3	61.1
% households ever received agricultural credit	0	27.8
Mean cropped land (acres)	5.9 (3.7)	10 (2.9)
Mode of cropped land (acres)	5	10

Livelihood diversification

In 1988/89, households derived their income primarily from on-farm activities supplemented with non-farm sources. Overall, the largest share of on-farm cash income was derived from livestock sales (70%), followed by cereals, which were marketed as both grain and beer (Table 9). The remaining 4% was derived from sale of vegetables, animal products, and pulses.

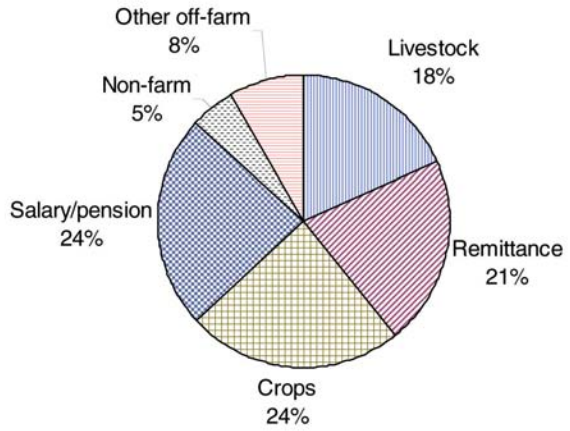
Although farm-based activities contributed significantly, non-farm activities accounted for 79% of total net cash income and the largest share was from remittances (Hedden-Dunkhorst 1993). In 2001, livestock remained the main on-farm income source (86% of on-farm income). The contribution of cereal sales in the form of local beer declined sharply, while that from other sources doubled, between 1988 and 2001. Figure 5 shows the contribution of all sources to household cash income in 2001. Cash income sources were diverse, but there were no matching data for 1988 for comparison.

Non-farm sources accounted for 50% of income. These comprised mainly remittances, salaries and pensions, gold panning, construction work (brick making), and crafts. Livestock and crops provided 18% and 24%. Off-farm activities (8%) included fencing of farm plots and homesteads, hiring out of scotch carts, and sale of firewood and thatching grass.

Table 9. Percent shares of on-farm cash income in Semukwe, 1988 and 2002

Income source	1988/89	2001/02
Livestock	70	86
Cereal (grain)	5	1
Cereal (beer)	21	5
Other	4	8
Total	100	100

Figure 5: Mean Cash Income by Source - Semukwe 2001



When these results were disaggregated on the basis of relative wealth, three major sources of cash income were identified across the board. The most important was salaries/wages and remittances, which provided 73% and 39% of the income for wealthier and poorer households respectively. Livestock, which was the most important on-farm income source, followed the same trend. Poorer households obtained a greater share of their income from livestock sales (Table 10); salaries and wages were more important for richer households. Third was a mixture of off-farm and non-farm sources including the sale of labor, bricks, beer, *mupane* caterpillars, thatching grass, and traditional herbal medicine as well as small-scale businesses, especially shops and grinding mills.

The other difference between poor and less poor households was in the type of livestock. Poorer households depended mostly on smaller stock – chickens (33%), goats (20%) and pigs (13%). Wealthier households sold cattle (61%), pigs (44%) and chickens (13%). Donkeys and sheep were sold less often: by 10% of poorer households and 12% of richer households. Livestock is therefore a key source of livelihood in these communities – and small stock are the key entry point for interventions targeted at poorer households. Existing non-farm and off-farm activities should form an important basis for support aimed at increasing incomes of the poor.

Table 10. Mean cash income by source and type of household, 2001/02

	Poor (N=30)			Rich (N=18)		
	Annual mean income		% total	Annual mean income		% total
Crops	540	(1857.07)	2.06	1889	(3508.6)	4.73
Pension	1693	(8760.84)	6.46	3333	(14142.14)	8.34
Livestock	9343	(32705.51)	35.7	5506	(8855.07)	13.78
Salary/wages	6080	(32851.16)	23.19	16944	(48913.46)	42.42
Remittances	4083	(9116.19)	15.58	8222	(14595)	20.58
Other non-farm and off-farm*	3948	(16431.68)	17.07	4053	(7066.15)	10.15
Total	262156		100	39947		100

* Includes income from sale of labor, bricks, beer and caterpillars
Values in parentheses are standard deviations

Household expenditure

Sample survey results showed changes in expenditure between 1988 and 2002 (Table 11). Food items represented a major share of out-of-pocket expenditure, 38% in 1988/89 and 31% in 2001/02. Households spent more on food because of low production caused by drought; 2001 and 2002 were drought years. Although NGOs distributed relief food, this was only once a month and the quantities were reported to be limited. Expenditures on school fees declined sharply, because fees were so high (especially at the beginning of the year when school uniforms and stationery also had to be purchased) that some households could no longer send their children to school. There were general reductions in spending on clothing, again due to competition with other needs.

Table 11. Household expenditure shares in Semukwe, 1988/89 and 2001/02

	1988/89 (N=47)	2001/02 (N = 48)
Food and other groceries	38 %	31 %
Livestock	2 %	20 %
School fees	15 %	5 %
Seed/farm inputs/equipment	4 %	22 %
Clothing and personal items	19 %	9 %
Home improvement	10 %	5 %
Farm labour	no data	3 %
Sickness	no data	2 %
Other	11 %	3 %
Total expenditure, Z$*	1248	10,000

* In 1989, Z$100 = US$ 46. In 2002, Z$100 = 10 US cents

Expenditure on procurement of assets had also increased. There was more investment in livestock, from 2% in 1989 to 20.4% in 2002. But according to key informants this increase was due to high livestock prices, not purchase of more animals. Key informants believed that a few wealthy farmers were responsible for increases in expenditures on livestock purchases. Expenditure on seed, other inputs and equipment also increased sharply. Little cash income was spent on hiring farm labor, because most households could not afford it. Instead they combined resources as explained earlier. In general households had diversified their expenditure patterns with a shift from food, school fees, clothing, and home improvement in 1988/89 to increased investments in livestock and farm inputs in 2001/02. However, food remained an important expense.

Lessons Learned and Policy Implications

Evolution of social science research at ICRISAT

Over the years, SSR at ICRISAT has been skewed towards economics. Sociological and anthropological work has been erratic and fragmented, occasionally backstopped by involvement of national and international program partners. This paper recommends that SSR be proactively incorporated into ICRISAT's socio-economics research. This will require deliberate efforts to hire well-qualified scientists in these disciplines. At the moment, there is only one such scientist in the whole Institute.

Such staff limitations are likely to be more complicated if the integration of sociologists and anthropologists in existing SSR teams (currently dominated by economists) is not well backstopped and mentored. Current efforts to better integrate various disciplines into socio-economics teams have started to bring in gains, but a lot still has to be done. In addition, collaboration with advanced research institutes, especially in sociology and anthropology, should be strengthened.

Interaction with biophysical disciplines remains a work in progress. Perhaps what needs to be addressed is the erroneous perception of SSR (particularly sociology and anthropology) as secondary in importance relative to the other disciplines (Cernea 2001). Rather, it should be considered a contributing expertise, with complementarities to offer and synergies to be developed. Only when this is understood will the other constraints such as budgets be proactively considered without marginalizing SSR.

Smallholder Livelihood Diversification

This case study was undertaken at a time when southern Africa was experiencing severe drought. The impact on agricultural production was devastating. In Zimbabwe alone, cereal production declined from 2.15 million tons in the 1999/00 season to 1.47 million tons in the 2000/01 season, compared to an average of 1.9 million tons for the previous 10 years. In 2002, cereal production fell a further 57% below 2001 levels (FAO 2002). In Matabeleland South Province where this study was carried out, maize production in the 2000/01 season was estimated at 10,034 tons. In 2002, this dropped to only 234 tons (FAO 2001, 2002).

The results of this study reflect these harsh conditions. Primary livelihood constraints were identified as food insecurity, drought, poor health (HIV/AIDS) and poverty with high levels of unemployment. Secondary constraints were lack of draft animals and gender-related challenges, particularly those posed by feminization of agriculture. Levels of out-migration remained high and contributed to the mining of human capital out of the farms and to agricultural feminization.

Based on a recall of two consecutive seasons, the average grain surplus for these households was less than 2 kg for any type of food grain. Wealthier households had food surpluses as high as 60 kg at the onset of the next harvesting season. For a mean household of 7 resident members subsisting on 6 acres of cropped land in a dry zone, it was impossible for on-farm production alone to ensure food security. Food-insecure households belonged to the poor wealth category. They did not have regular remittances, owned limited numbers of livestock, and were constrained by lack of draft labor and farm implements.

Poverty in these villages was concentrated in households headed by women. Poorer households accounted for 62.5% of the population, and 56% were women-headed. Poverty in Zimbabwe is attributed to several causes, among them declining economic growth, increasing unemployment, high dependency burdens and low farm productivity. These are worsened by the impacts of HIV/AIDS and related illnesses. Poor health was identified as an overarching constraint to rural livelihoods. This remains an emergency issue in sub-Saharan Africa as a whole.

Because of poverty and risk aversion, 90% of households did not benefit from agricultural credit. Generally farmers knew about credit but lacked information on how to access it. They also lacked (or were wary of losing) collateral. These households should be targeted with interventions aimed at increasing food security and incomes, for example social welfare support, government and humanitarian assistance. Although there already was heavy reliance on relief food and farm inputs distributed by humanitarian organizations, such interventions ought to be better targeted as stop gaps. The relative wealth approach can be useful in this respect.

Clarity is required on whether the limiting resource management factor to productivity in these farming systems is low soil fertility or lack of water/rain. There also is great need for investments in scaling out appropriate crop management technologies in these communities.

One of the main sources of livelihood in these communities was livestock, supplemented with remittances. Crop production contributed significantly to household food security but was supplemented with food purchases using income from remittances or sale of livestock. Poorer households depended most on small stock, especially goats and chickens; wealthier ones more on cattle. Small stock are therefore an important entry point for interventions to improve the livelihoods of poorer households. Livestock remains a major source of income in the SAT (Ryan and Spencer 2001, Sieff 1999).

Livelihood diversification was a key coping strategy. Households diversified their income sources on-farm, non-farm and off-farm, with increased investments in livestock and farm inputs in 2001/02 compared to 1988/89. Poorer households diversified mainly non-farm and off-farm. Richer households

depended on on-farm sources (particularly livestock) and non-farm sources (salaries and pensions). Food remained an important household expenditure item. Existing non-farm and off-farm activities should form an important basis for support aimed at increasing incomes of the poor.

These lessons have profound implications for policy and targeting of investments. First, not all households are food insecure. As such, interventions to increase food security ought to identify and target poorer households – which are predominantly headed by women. Therefore gender must be mainstreamed into R&D strategies. Wealthier and more food-secure households, headed mostly by men, are suitable for commercialization of agriculture. But commercialization of crops alone is likely to be insufficient since livestock is the main agricultural source of cash income among these households. Commercialization should therefore target interactions between crops and livestock and explore synergies between the two. Livelihood diversification behavior by different types of households will impact differently on investment strategies promoted among these communities. Poorer households deriving their livelihoods mainly from non-farm and off-farm sources will require incentives to invest in agriculture so as to meet their food needs. Such incentives must include farm inputs especially provision of draft animals and seed. In the meantime, stop-gaps in form of relief food and inputs will continue to be important.

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