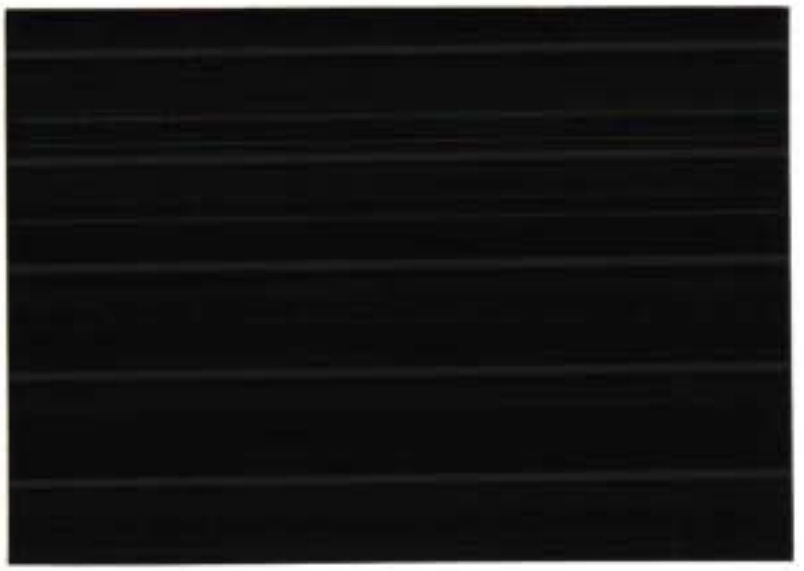

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R2315(S)

Household Food Security Study: Rapid Rural Appraisal of Villages in Three Communal Lands of Zimbabwe

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Project No. A0441

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CONTENTS

GLOSSARY OF ACRONYMS

AGRITEX	Department of Agricultural Technical and Extension Services
ARDA	Agricultural and Rural Development Authority
CPHP	Crop Post-Harvest Programme
CSO	Central Statistics Office
DNPWM	Department of National Parks and Wildlife Management
DR&SS	Department of Research and Specialist Services
DTC	Development Technology Centre
ENDA	Environmental Development Agency
EU	European Union
GMB	Grain Marketing Board
GOZ	Government of Zimbabwe
GTZ	Deutsche Gesellschaft für Zusammenarbeit, Germany
HRC	Horticulture Research Centre
HRI	Horticulture Research Institute
IAE	Institute of Agricultural Engineering
ITDG	Intermediate Technology Development Group
IUCN	International Union for the Conservation of Nature
LGB	Larger Grain Borer *(Prostephanus truncatus)*
LSC	Large-scale commercial (farmers)
LWF	Lutheran World Federation
MOA	Ministry of Agriculture, Zimbabwe
MSU	Michigan State University, US
NORAD	Norwegian Agency for Development
NRI	Natural Resources Institute, UK
ODA	Overseas Development Administration, UK
ODI	Overseas Development Institute, UK
PPRI	Plant Protection Research Institute
ROMA	Rural Oil Manufacturers Association
SSC	Small-scale commercial (farmers)
USAID	United States Agency for International Development, US
UZ	University of Zimbabwe
ZFU	Zimbabwe Farmers Union
ZOPP	Zimbabwe Oilseed Press Project

Approximate exchange rates (at the time of the study)

£1 Sterling	=	Zimbabwe $ 14.00
US $1	=	Zimbabwe $ 9.00

ACKNOWLEDGEMENTS

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Numerous organisations, from the private sector to Government organisations, involved in the planning of, and marketing of agricultural commodities in Zimbabwe were very co-operative with the study team and we acknowledge the valuable information they freely gave during interviews.

Without the logistical and administrative support from DR&SS headquarters, we could not have completed the field work. The participation of staff from DR&SS, AGRITEX, ARDA, ITDG, and UZ at the local working group meeting which was held after the field work was completed, proved to be invaluable in focusing the priority areas of research which are presented in the recommendations of this report.

INTRODUCTION

1. Zimbabwe has been described as having gone through two agricultural revolutions (Eicher and Rukuni, 1994). From 1950 to 1980 commercial farmers increased production of maize, cotton and tobacco by using hybrid seed (maize) and nitrogen fertilisers. However, the benefits of this first agricultural revolution were restricted to a few thousand commercial farmers who controlled half the arable land in the country.

2. Zimbabwe's second agricultural revolution occurred after the country gained independence in 1980. It was spearheaded by small-scale communal farmers growing maize and cotton in the higher rainfall areas (1980-85) and came about by the political support for this sector, peace that allowed abandoned land to be brought back into production and access to government credit and marketing depots. The contribution by the small-scale sector of the total maize marketed between 1980 and 1990 has risen steadily from 10% to 50% (Eicher and Rukuni, 1994).

3. The agricultural institutions in the country (research, extension, credit and marketing) have changed their priorities and are now devoting primary attention to the needs of the smallholders and secondary attention to the needs of commercial farmers.

4. Despite the achievements of the smallholder sector since 1980, many questions remain about the sustainability of smallholder production, malnutrition, land hunger, wealth instability and managing national grain reserves during drought and bumper harvests, problems which are common throughout the region. The introduction of market liberalisation and the impact of two droughts in the last four years has introduced additional stresses on the smallholder sector, which is resulting in subsistence farmers failing to maintain their household food security.

5. The UK Government's Overseas Development Administration (ODA) bilateral aid programme is providing institutional support to the Zimbabwe Department of Research and Specialist Services (DR&SS) and the Ministry of Agriculture (MOA) wishes to increase its support for post-harvest activities. With DR&SS as the lead collaborator, ODA's Crop Post-Harvest Research Programme aims to identify and develop research programmes in Zimbabwe, focusing on:

- post-harvest operations with maize, sorghum, millet, beans, cowpeas, sweet potatoes, cassava, fruits and vegetables, particularly in Natural Regions III, IV and V, with the objective of improving household food security and adding value to crops;
- opportunities for improving small-scale processing of oilseeds;
- better access to working capital for rural traders and small-scale millers; and,
- improving farmer access to markets.

6. Zimbabwe, with a land area of 390,900 km² and a population of 10 million, is divided into eight administrative provinces (Figure 1). The country is also divided into five agro-ecological zones known as Natural Regions (NR, Figure 2). They relate climate, soils and topography to appropriate farming systems. While soils in Zimbabwe generally allow a variety of crops to be grown, rainfall decides the type of farming system in any particular part of the country, with NR IV and V being the driest parts. The land distribution between commercial, communal and state owned areas for each of the NR is given in Table 1.

Figure 1: Zimbabwe's Administrative Provinces

Figure 2: Zimbabwe's Natural Regions

Table 1: Land distribution by Natural Region

Natural Region	Average annual rainfall (mm)	Area (km^2)	Total (%)	Communal and resettle-ment [1] (%)	Commercial (LSC, SSC)[2] and Urban (%)	State (DNP WM)[3] and Forest (%)
I	>1,000	7,050	1.8	19 (1)	64	17
II	750-1,000	58,750	15.0	21 (8)	77	1
III	650-1,000	72,900	18.6	39 (17)	52	9
IV	450-650	147,700	37.8	50 (45)	29	21
V	<450	104,500	26.7	46 (29)	36	18
Total		390,900	100.0	42 (100)	43	15

Source: Eicher and Rukuni (1994)

7. The table shows that more than 90% of the communal population live and farm in NR III, IV and V. These areas are the focus of ODA's research programme and therefore this study concentrated in these areas, across the range of commodities commonly produced and marketed in Zimbabwe. This initial field study was undertaken to assist all collaborators in identifying and verifying the major constraints in the post-harvest systems of communal farmers.

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1 The figure in brackets gives the proportion of communal area located in each Natural Region.

2 Large-scale commercial, Small-scale commercial.

3 Department of National Parks and Wildlife Management.

METHODOLOGY

8. The objectives of this study were to:

- gather information on post-harvest commodity systems in selected communal areas of NR III, IV and V;
- identify constraints to increased food security and adding value to food crops;
- identify priority research areas in understanding and addressing those constraints; and,
- identify appropriate geographical locations for research work.

9. A literature search was made of the Natural Resources Institute (NRI) and Overseas Development Institute (ODI) libraries and from a selection of CD-ROM databases. Relevant literature in Zimbabwe was identified with the assistance of the University of Zimbabwe (UZ), DR&SS and The Department of Agricultural Technical and Extension Services (AGRITEX) staff.

10. Following advice from AGRITEX staff at head office, three communal areas were selected for the field study: Chivi (South Central), Mutoko (Central) and Zimuto, all located within the semi-arid regions of Zimbabwe (NR III, IV and V). The location of the sites is shown in Figure 3 and background information on them is in Annexes 1 - 3. The commodities to be considered under the Crop Post-Harvest Programme (maize, sorghum, millets, sunflower, groundnuts, cassava, sweet potato, cowpeas, soya and a range of horticultural crops) are all grown in the three areas.

11. A 'post-harvest commodity systems' approach was adopted by the field team to include harvest timing, drying, shelling/ threshing/ chipping, pre-storage treatments, storage, marketing by small-scale producers, trading and final processing destinations (see Figure 4). The field team split into three working groups (Annexe 4) and, with the assistance of AGRITEX field staff, visited randomly selected Wards and villages within each communal land (communal lands are divided into administrative Wards, which are further sub-divided into village development co-operatives known as ViDCos which are made up of several villages). The list of Wards and villages were provided by the AGRITEX District Offices. Two groups interviewed farmers about on-farm post-harvest practices for a variety of crops using an informal questionnaire (Annexe 5). The third group interviewed farmers to identify which crops were being marketed, to whom, how and where, and then interviewed merchants, traders, processors in local markets and the urban centres of Mutoko, Masvingo and Harare (Annexe 6). The field work took place between 5 and 20 February 1996.

12. Two four-wheel drive vehicles provided by DR&SS allowed the teams to travel around the survey sites and a total of 50 farmers were interviewed by the on-farm teams.

Thirty traders, transporters, processors and policy makers were interviewed by the marketing team (Annexe 7).

13. The following sections summarise the literature review; report on the results of the field study, highlighting the constraints faced by farmers in post-harvest processes for each crop; and make recommendations for future research. A seminar was held on 23 February 1996 at DR&SS in Harare to obtain feedback of the study results from Zimbabwean research staff and their comments have been incorporated into the final parts of this report.

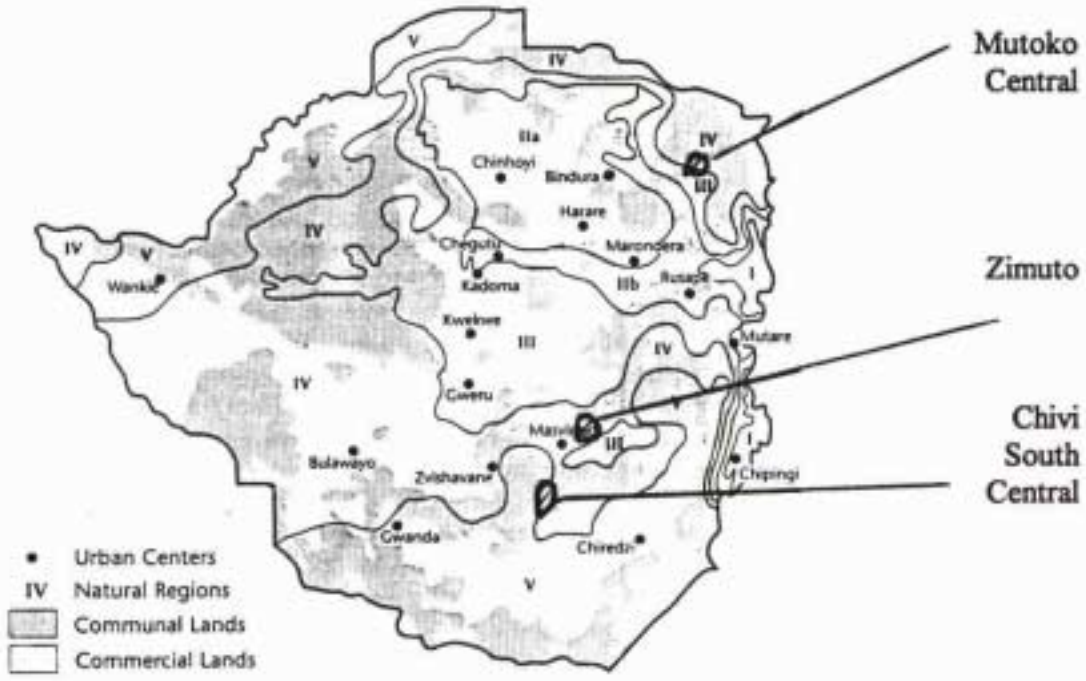

Figure 3: Location of the three communal lands visited during the study

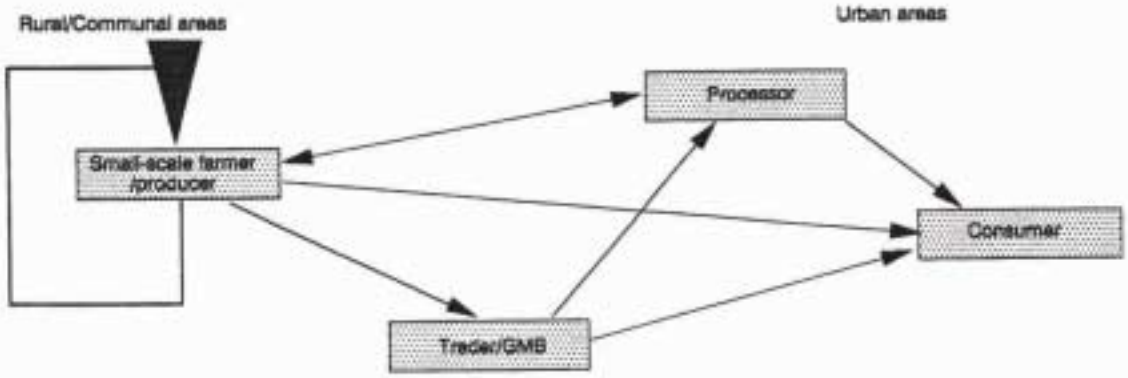

Figure 4: Post-harvest commodity systems studied

LITERATURE REVIEW

Grain Storage Losses

Results from Surveys

14. Four surveys were conducted between 1986 and 1992 which assessed post-production grain losses in communal areas of Zimbabwe. The first (Giga and Katerere, 1986) covered four provinces and focused on maize. The second (Tshuma, 1989) covered all eight provinces of Zimbabwe and included small grains as well as maize. The third was a baseline survey conducted in 1990 in Wedza, Zimuto and Nyajena and was followed by a national survey in 1991-92, reported in Mvumi *et al.* (1996). All these surveys looked at harvesting and drying practices, shelling, threshing and storage of grain to determine the extent and cause of losses.

15. The baseline and national surveys reported that most farmers cut and stook their maize in the field for two to four weeks prior to picking; losses at this stage were attributed to termites and rodents[4]. After harvest, the dehusked maize is dried either in traditional cribs, on the ground or on rocks. Most farmers preferred crib-drying to drying on the ground.

16. In all surveys, manual rather than mechanical methods were used to shell the maize. The two methods most commonly used were hand shelling and beating the cobs with a stick. In some areas, shelling by rubbing the cob against a stone was also practised. The 1989 and 1991-92 surveys noted that 24% of farmers stored their maize unshelled, a practice which will have to be discouraged should the larger grain borer (LGB) become established in Zimbabwe. The 1990 survey noted that maize destined for home consumption was not properly cleaned and sorted before being placed into storage; while, in contrast, the 1991-92 survey reported that most farmers clean and sort their maize before storage. Whether the latter refers only to grain for sale is not clear.

17. Structures used for storing grain were traditional 'pole and dagga', usually with a thatched roof, and brick structures, which Tshuma (1989) speculated would become increasingly common as availability of timber declines in many areas. Brick structures comprised 26% and 13% of the stores used in the 1989 and 1991-92 surveys. A third method was storage of grain in bags (8% in the 1989 survey and 16% in the 1991-92 survey). The 1989 survey noted that most farmers clean and replaster the internal walls of their structure prior to filling with grain. However, the area around the storage structures was overgrown and attractive to rodents. The 1986 survey found that farmers store, on average, 1 to 1.5 tonnes of grain on the farm and sell the surplus as soon as transport is

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[4] The 1990 baseline survey remarked that the stooking and picking activities resulted in the crop being in the field for about two months after physiological maturity.

available. Farmers are generally unable to store maize for more than a year because of storage losses. In the 1986 survey, 50% of respondents reported losing 90-100 kg of grain during storage. Insects and rodents were the main causes of loss in all surveys, with moulds reported to cause only minor losses. Most farmers used chemicals to minimise losses, with malathion (earlier surveys) or malathion and pirimiphos-methyl 2% dust (1991-92 survey) being the most commonly applied insecticides. The 1991-92 survey reported that over half the farmers were using insecticides incorrectly, citing instances of failure to incorporate the insecticide in the grain, poor timing of application, using crude measuring devices, applying wrong rates and applying the material with bare hands. Availability and cost of chemicals was mentioned as being a problem in the 1989 survey. A small (1986, 1989) to medium (1991-92) proportion of farmers reported using 'traditional' protectants in storage, such as wood ash and eucalyptus leaves.

18. Tshuma (1989) concluded that farmers are aware of storage losses and would like to take measures to reduce them. Constraints appeared to be problems with pesticide use and lack of extension information.

19. Information on storage of grain legumes is much more limited than that on maize; one survey (Giga *et al.*, 1988) found that beans and cowpeas were much less likely to be treated with storage protectants than maize, and that cowpeas suffered a loss of 60% in storage. Another survey (Chinwada, in press) looked at storage and storage losses of beans in 14 districts between 1990 and 1992. Findings of the survey were: most households store beans in bags or tins, for a period of two to six months; bruchid infestation was the major storage constraint reducing production to a small scale; some farmers (47%) used chemical control methods, and some (10%) used natural products or sun exposure prior to storage. Non-chemical methods of control appeared to be more effective if they were applied at higher rates.

Experimental Work on Methods of Controlling Storage Losses

20. Malathion was the most commonly used chemical in grain storage in the late 1980s and was found to be the least effective in reducing storage losses in two different studies. Giga and Biscoe (1989) found grain treated with malathion suffered losses of 30% after nine months in storage (vs. 8% for pirimphos methyl and methacrifos), while Mutiro *et al.* (1992) found malathion had no effect on reducing storage losses. In the latter study, treated grain stored in traditional pole and dagga structures had significantly less damage than grain stored in brick storage structures (approximately 5% and 28%, respectively). This difference was attributed to the higher humidity and lower aeration assumed to be found in the brick structures.

21. Several studies have examined the effect of natural substances in reducing grain storage losses. In an experiment where four chemicals and finger millet (rapoko) chaff were used in stored maize, the rapoko chaff gave fairly good control (low percentage damage and weight loss) in the first four months of storage. Insect damage was about the

same as in the untreated control after 10 and 24 months, although weight loss was less than half that in the control. It was concluded that farmers unable to afford conventional chemicals could still achieve some degree of control using rapoko chaff (PPRI Annual Report, 1986-87). Another experiment examined the effect of ground bark *of Spirostachys africana*, ground trunk of *Spirostachys africana* and ground fruit of *Melia azadarach*) in controlling *Sitophilus zeamais*. Significantly less damage was observed after seven months storage in grain treated with the ground bark of *Spirostachys africana* compared to all other treatments (including methacrifos 2% dust) (PPRI Annual Report, 1987-88). In a subsequent study, ground material of three traditional substances (*Spirostachys africana*, *Melia endulis* and *Croton megalobotrys)*, extracts of two traditional substances (*Spirostachys africana* and mukwiniti) and amorphous silica were tested on *Sitophilus zeamais* in stored grain. Mean percentage damage after 24 weeks was highest in grain treated with *Melia endulis*, which was approximately the same as the untreated control (90% and 94%, respectively), followed by grain treated with *Spirostachys africana* (40%). All other treatments showed less than 10% damage (PPRI Annual Report, 1989-90).

22. The effects of grain moisture content and genotype on maize storage losses have also been investigated. One experiment was conducted to determine the relationship between insect infestation trends and the moisture content of maturing maize. Peak infestation activity occurred when moisture content was around 14% to 15%, but dropped after moisture content fell to 13%. The authors concluded this has implications for late planted maize (PPRI Annual Report, 1986-87). In another study, a newly introduced hybrid maize variety (SC501) was compared to established hybrid varieties for its resistance to *Sitophilus zeamais*. No significant differences in resistance were observed and all were damaged (PPRI Annual Report, 1987-88).

23. The use of natural substances to control bruchid beetles in stored beans was tested and it was found that admixtures of wood ash applied at the rates of 1:4, 1:2 and 1:1 all reduced the amount of damage. Other admixtures (sand, finger millet husks and ground neem leaves) were also effective, but only at the 1:1 rate (Chiwanda and Giga, in press).

Processing Of Small Grains

24. The methods used by most farmers for threshing small grains (sorghum and millet) rely on manual labour. The most common are flailing or beating the grain and using cattle in an enclosed pen. These methods are very slow and labour intensive and the grain becomes contaminated with sand and (in the case of using cattle) dung. Commercial processors in Zimbabwe regard sand admixture to be the primary disadvantage to milling small grains. Furthermore, grain threshed by these methods must be at a low moisture content, which encourages producers to leave the crop in the field for long periods where it is exposed to losses from birds and armoured ground crickets.

25. The Development Technology Centre (DTC) at UZ investigated the feasibility of using a motorised grain thresher. The study was conducted in the Chiredzi area, where

significant quantities of sorghum are grown. The project utilised a Bourgoin multipurpose thresher[5] hired from the Institute of Agricultural Engineering (IAE) and demonstrated it in the Chilonga area. The thresher was transported to the homesteads of farmers who requested its service, a charge of Z$5 for 50 kg threshed grain was made and farmers were expected to provide the labour to feed the thresher. The thresher was operational for 62 days and the following observations were made.

- Demand for the thresher was very high, being used each of the 62 days. However, the actual number of hours it was in operation was reduced due to the time it took to transport it from one location to another.

- Through-put was 190 to 230 kg/hour for sorghum. Variations in through-put were attributed to differences in ear quality and rate of feeding ears into the thresher.

- Efficiency was greater than hand or cattle threshing. Less than 1% of the grain was broken and no unthreshed grain remained on the ears (cf. losses of 2 to 5% with hand and cattle threshing).

- Farmers paid in cash or grain equivalent. Cash was more popular because of the difficulty of transporting grain.

26. While the potential for using the motorised thresher looked good, the researchers noted several factors affecting its viability.

- It is only operational for four months of the year and, therefore, it has to operate at full capacity over this period to cover capital and other costs incurred.

- With service threshing, idle time accrues while the thresher is being transported. This is a particular problem when ox-cart is the method of transport.

- To compensate for the idle time, the equipment should be used in the evenings, as well as during the day.

- Since the threshing costs for maize and sunflower are lower than for sorghum, the profit margin can be increased to compensate for the higher costs incurred with sorghum.

27. Most purchase enquiries came from local shop owners rather than the farmers themselves (Rukuni, 1994).

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[5] This thresher is capable of threshing maize, sunflower and sorghum; it winnows as well as threshing the grain.

Processing Of Oilseeds

The Ram Press

28. In rural areas the price of cooking oil, which is produced by large-scale commercial processors, is significantly higher than in urban areas (Chiuswa *et al.*, 1994). Production of sunflower seed, by communal and small-scale farmers (90%), has grown rapidly in recent years and there is potential for adoption of inexpensive oilseed presses in the rural areas. The ram press has been introduced to several parts of Zimbabwe. However, it has not so far made a positive impact on the lives of rural people (Rukuni, 1994). As a result, a study (reported in Rukuni, 1994) was undertaken by UZ, AGRITEX and Intermediate Technology Development Group (ITDG) to determine the constraints to its adoption.

29. While the ram press was found to be highly profitable, with press owners finding a ready market for the oil, numerous problems were identified.

- The press had to be active all year for it to be economical.
- Profitability is much higher with thin-hulled, high oil content sunflower varieties (to date only available as hybrids). However, most local cultivars tend to be thick-hulled, open pollinated types (or an assortment) and the price of hybrid seed is high and supplies limited. There is a need to develop more short season, high-oil, thin-hulled cultivars which are either open-pollinated or three-way hybrids.
- Marketing the seed cake presented a problem in that volumes produced are generally not large enough to warrant commercial farmers (who use it for livestock feed) arranging for transport to their farms.
- There is a need to establish a network for distribution of the machine and its spare parts, and to improve the availability of repair and maintenance services.
- Procurement of seed (to press) by owners of the machines was hindered by lack of money to purchase seed throughout the year and instances of large-scale processors purchasing all the stocks from the GMB.
- Dissemination of the ram press technology was assisted by subsidies (e.g. through provision of transport and training) which were unsustainable and comparative advantage was neglected. The dissemination process did not involve extension workers and, as a result, the extension workers lacked knowledge of the press and could not assist farmers.

- The Rural Oil Manufacturers Association (ROMA) lacked infrastructure and facilities to communicate with all its members and was unable to deal with policy issues, marketing and training. (Establishment of ROMA would require a large financial input).

30. The researchers stated that ram press hardware has been modified to the point where it is easily operated and no longer in need of further research. However, most operators report that a major constraint is the strength required to operate it (a long handle attached to a piston is used to squeeze seeds within a perforated cylinder) . Modifying the operation, possibly into a two step process where the seed is crushed to break the hulls, and then pressed, may be a research priority.

Small-scale Production of Peanut Butter

31. The DTC is in the process of developing a small-scale peanut butter making machine. The basic machine is at present not manufactured locally, but must be imported from the USA. The cost of the basic machine plus transport from the USA is approximately Z$1820 (US$200). The frame and belts (purchased locally) cost Z$1200. The machine can be operated manually, or with a motor costing approximately Z$3000. There are plans to take the machine for testing at the village level (Rukuni, *pers.comm.*).

Storage and Utilisation of Root and Tuber Crops

Storage of Sweet Potato

32. Mansungu (1993) describes the harvesting and storage of sweet potatoes by small-scale farmers. The larger tubers are removed first, leaving the others to grow for later harvests. The last tubers are harvested 'long after' growth has ceased and stored in prepared pits for up to three months. This system is believed to minimise losses from animals and theft. The author questions whether new, virus-free varieties which are being introduced will have good storage characteristics. However, it should be noted that there has been no work done to date on the storage characteristics of any of the varieties of sweet potato currently grown in Zimbabwe. This is a potential area for research.

33. A further problem is whether the tubers are being harvested prematurely, which may predispose them to storage rots and whether curing is practised prior to storage. Different types of storage structures should be investigated, similar to the pit and clamp structures tested by Devereau (1996) in Uganda.[6]

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[6] Devereau states that dried sweet potato chips have a short shelf life; this and the high price fetched by fresh sweet potatoes some months after the main harvest make storage of fresh roots attractive.

34. Two references in a review by Devereau (1994) mention sweet potato storage in Zimbabwe. The first (Anon, 1949) states that sweet potatoes put into a drum with alternating layers of wood ash can be stored for five months. The second (Woolfe, 1992) mentions pit storage of sweet potatoes in Zimbabwe, which is the most common method.

Potential for Cassava

35. In a rapid rural appraisal, Kleih (1994) found little cassava being produced in the communal areas of Masvingo, Mashonaland East and Manicaland. Farmers questioned about their potential interest in growing cassava gave food security and cash income as the main incentives for them to produce the crop. Kleih's assessment of the potential for cassava in these areas was that it could be a cash crop competitive with cotton on an income per labour day basis, but not on a net income per season basis. Cassava would be more competitive than groundnuts or sunflower on both bases. Stockfeed is the product most likely to be profitable for farmers, although research is needed to develop a balanced product. Two forms of mechanised processing could be used: on-farm chipping with manually operated machines; and motorised chippers run by private entrepreneurs operating at the village level. The latter type would require at least 250 tonnes fresh cassava per processing unit to be more profitable than the manually run unit. Kleih expressed doubts that such quantities of cassava could be produced in the next few years due to shortage of planting material.[7] Both processes would need drying floors.

36. Processing methods found by Kleih were:

- peeling and boiling the fresh roots;
- drying and grinding roots to make a flour used in the preparation of sadza; and,
- straight cassava flour.

37. Farmers seemed to be willing to use manual chippers and some indicated they could process the roots by hand. Kleih concluded that development of appropriate processing technologies has to develop alongside increases in production.

Processing of Fruits and Vegetables

The Smallholder Horticultural Sector

38. The smallholder horticultural sector in Zimbabwe comprises communal farmers, resettlement farmers, small-scale commercial farmers and some plot holders. The majority have a very poor resource base. Most smallholder horticulture is practised in vleis (approximately 20,000 ha are estimated to be under vegetable production) and in irrigation

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[7] Much of the previously existing cassava was lost during the 1991-92 drought.

schemes (approximately 8490 ha are under small-scale irrigation schemes and over 90% of this area planted to horticultural crops). Production data for smallholders is almost non-existent, except under special projects such as the Agricultural Rural Development Authority (ARDA) fruit and vegetable growers schemes. According to Utete and Tembo (1996), the major vegetables grown in communal areas are tomatoes, rape, cabbage, onions, carrots, peas, green beans, sweet potatoes and squash. The most popular vegetables are rape, cabbage, tomato, onions, pumpkins, peas, nyevhe (*Cleome gynandra)* and derere (*Corchorus* spp.).

39. Vegetable production takes place between April and July and fruits are harvested from December to March. It is important, therefore, to store for use when fresh produce is in short supply. The extreme seasonality of vegetable and fruit production is compounded by lack of market information. As a result, much production rots for lack of a market or is sold at low prices. Post-harvest losses are estimated to be between 35% and 45% (Masanganise, 1994, cited in Utete and Tembo, 1996).

40. Very little processing is done by smallholders due to poor access to markets, lack of knowledge about modern processing techniques and lack of finance to purchase the technologies (Chiuswa, 1996, cited in Utete and Tembo, 1996).

Processing Techniques Currently Practised by the Smallholder Sector

41. The small amount of processing undertaken at village level is described by Utete and Tembo (1996).

- *Dried vegetable products* - solar drying is common and is a traditional and understood technology, as well as being inexpensive[8].

- *Vegetable and fruit juices* - watermelons, bananas, oranges and marula (*Sclerocarya birrea*) are used although there was no mention of how long these juices can be stored).

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[8] A variety of leafy vegetables are commonly dried, some of them cultivated (rape, Swiss chard which is known as 'spinach' in Zimbabwe), some of the indigenous vegetables gathered from the fields ('nyevhe', 'derere') and some leaves of crops grown for other products (pumpkin, beans). Various pre-drying processes are utilised: leaves are generally washed and sliced; they may then be dried directly, or boiled in water for five minutes before drying, with or without the addition of salt, onions and tomatoes. The most common drying method is to lay the leaves on a flat surface (such as a rock outcrop) in the sun. There are a couple of drawbacks to this technique: the product is often contaminated with sand and by insects, and domestic animals may eat the product. Dried leafy vegetables are mainly produced for home consumption and local markets; however, some of the product is exported to neighbouring countries. Other vegetables which are dried in this way (generally without any pre-drying processing) are; tomatoes (which are often then pounded and stored as a powder), mushrooms, pumpkins, sweet potatoes and onions.

- *Dried fruits* - indigenous fruits such as musau (*Ziziphus mauritiana*), munhacha (*Berchemia discolor*) and tomatoes are sun-dried.

42. Preliminary work has been done on ways to improve solar dehydration of products. One project, sponsored by the Dutch and conducted by ARDA, is testing a box-type drier with a glass top and holes for ventilation. ARDA installed the drier at an irrigation scheme near Mutoko and is using it to dry mangoes. ARDA would like to sell the product in the urban market, but has yet to develop appropriate packaging. Supermarkets have not yet shown interest (Marovatsanga, *pers. comm.*).

43. Students at UZ have been testing improved solar driers which improve the retention of ß-carotene, the precursor to vitamin A (vitamin A deficiency is a serious problem in Zimbabwe). The first drier was designed and tested by Chizengeya (1995) who found that solar dried tomatoes were of higher quality than tomatoes dried in the traditional way. The ascorbic acid content was higher, but it was not possible to obtain accurate measurements of ß-carotene. The cost of the drier is approximately Z$2000 and there are plans to set it up in one of the ARDA irrigation schemes and test its use by communal farmers. A second, simpler, drier is being made from a black-painted metal drum.

44. A method for preserving tomatoes was described by Musukutwa, a communal farmer in Chinamora specialising in vegetable production. She peels the fruit, removes the seeds, adds onion, salt and a little oil, and then boils the mixture. This is then cooled, vinegar added and stored in a jam jar in a cool place for up to one month.

Marketing

45. Since the adoption of the Economic Structural Adjustment Programme (ESAP) in 1990-91, the Government of Zimbabwe has gradually been liberalising the country's grain marketing and pricing. Prior to the ESAP, horticultural produce markets had been allowed to operate freely and were supported through the provision of city and town council producer, wholesale and retail market places. However, other types of agricultural produce markets, notably grain markets, were subject to varying degrees of control and regulation with those on maize being the most constantly applied. In part, because of these different historical trajectories, the constraints to increased productivity faced by producers and traders engaged in marketing horticultural and field crops are very different.

46. After independence, grain marketing and pricing policies became the primary instruments in the government's efforts to increase incomes among smallholder farmers, ensure food security of the rural and urban poor and stabilise prices and supplies of basic food stuffs. The number of Grain Marketing Board depots expanded from 42 in 1980 to the current 74, and most of the new depots were located in or near communal areas. In addition, producer prices for maize were usually set at levels above export parity and disbursements of agricultural credit were massively increased, with repayments being tied

to crop sales to the GMB. The Grain Marketing Board Act of 1966 was used to essentially establish a single-channel marketing system for grain, thus enabling the effective control of grain movements and prices. The Act divided the country into two areas or zones - 'A' and 'B'. Area A covered large scale, commercial farms; small scale commercial farms and urban centres. Area B covered communal farms and game reserves. Buying and selling of controlled crops was permitted within Area B without reference to the GMB, provided that the produce did not leave Area B. Controlled crops could only leave Area B if they were sold to the GMB via approved and registered buyers, which included farmers, co-operatives or approved wholesalers. Moreover, approved buyers could only sell the grain they had bought from producers to the GMB, although they were free to sell grain they had bought from the GMB to any buyer.

47. This marketing system, together with the government's agricultural credit and other support programmes, resulted in a dramatic increase in output and marketed surpluses from the smallholder subsector (Rohrbach, 1989; Jayne and Chisvo, 1991). It has been estimated that smallholder production of maize trebled in the decade after independence. However, a large body of work produced at the end of the 1980s and beginning of the 1990s also demonstrated that the beneficiaries of the system were a small group of surplus producing smallholder farmers. The majority of communal farmers remain net consumers of grain, despite the rapid expansion of production in the smallholder subsector. It has been estimated that 15% of communal households in NR II and 100% in NR V are net buyers of grain (Jayne *et al.*, 1990).[9] Not only were these farmers unable to respond to higher producer prices, because they lacked the productive assets or non-farm income to do so, but they were also taxed by the system through higher consumer prices. The explicit attempt to keep producer prices above export parity adversely affected consumer prices, while the establishment of an oligopoly in grain milling by large-scale industrial companies producing very fine meal[10] and the concentration of GMB storage in the urban centres also added to the tax on grain consumers. Most grain bought by the GMB was either stored in the urban centres for resale later in the season or sold to the large-scale, industrial millers

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[9] Countrywide, it is estimated that between 50 and 100% of communal farmers are net consumers, depending on the weather conditions generally and the area in which they are farming.

[10] There are 4 major grain milling companies in Zimbabwe, of which one accounts for 65% of the maize meal market and a second 23%. They produce super-refined maize meal, with a 60% extraction rate and roller-mean with an 85% extraction rate. Conversely, small-scale millers generally produce dehulled meal 'mudzvurwa' with a 90% extraction rate and 'mugayiwa' or straight-run meal with a 96-99% extraction rate. The latter two forms of meal are preferred by poorer consumers because they are more filling and nutritious, and if available, are cheaper than the more refined meals.

located in urban centres.[11] Grain was then shipped back later in the season to GMB depots (but not the more rural collection points) for sale to consumers or food-for-work programmes, and highly refined and packaged commercially produced maize meal was sold through urban and rural approved retail outlets. This resulted in local shortages of grain and grain meal in rural deficit areas, inflated prices for net food consumers and hugely increased costs to the GMB and the national economy.[12]

48. Rapid appraisals of farmers' grain market participation (February 1996) suggested that the position has not changed much despite the reforms which have been implemented since 1991. Farmer interviews confirm that the pattern of grain and grain product purchases that held in the late 1980s and early 1990s still holds. Communal household purchases of grain or grain meal from informal traders are small, except in deficit areas that are immediately contiguous with surplus areas. In surplus areas, deficit households buy most of their additional food from neighbours and in deficit areas not near surplus ones, purchases of grain from the GMB or of grain meal from its approved buyers are dominant, depending on the household's distance from a GMB depot. Seventy four percent of households in one survey stated that they bought commercial maize meal because they could not find grain to buy when they needed it (Chisvo *et al.*, 1990). This pattern of purchases is perverse, given that consumer prices on the informal market are considerably lower than those on the formal market. For example, in 1990, the controlled price for maize obtained and milled through informal channels was 10-80% lower per kilogram than commercial maize meal (Chisvo *et al.*, 1990). While such price differentials are likely to have been reduced since liberalisation and the informal processing of maize into meal has expanded considerably, formal sector product prices remain higher than those in the informal. However, communal households in some areas still have no choice but to purchase commercially milled maize to make up their consumption requirements, because grain or informally produced grain meal is not available for sale in these areas when it is needed.

49. Likewise, the pattern of farmers' grain sales appears to have been little altered by liberalisation policies. All the maize surplus producing farmers interviewed in February 1996 sold their surplus immediately after harvest, either to the GMB or, if they were pressed for cash and could not shoulder the delayed payment this implies, to a GMB approved buyer. None sold to informal traders. Farmers stated that either there were no informal traders operating in their area or that, whilst there were a few people who occasionally came to their areas looking for crops, they paid lower prices than the GMB

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11 Between 1980 and 1989, 77% of GMB sales went to urban millers and stockfeed manufacturers.

12 Jayne *et al.* provide a comprehensive explanation of the perverse incentives produced and means through which the single-channel system suppressed rural-rural trade and led to local rural food shortages and higher consumer prices, as well as high GMB costs.

and they could not be relied upon. Farmers never knew when private traders would come to their area nor what products or volumes they would be willing to purchase.

50. Much research has been done on the costs of the controlled marketing system to smallholder farmers and the national economy, in terms of both income and food security. The research undertaken by the University of Zimbabwe and Michigan State University, as part of their Southern African Food Security Research Project, is the most comprehensive work done in this area.[13] It highlighted the fact that the consumer end of the marketing chain may be more critical to smallholder farmers' food security, than the producer end, since most farmers living in the semi-arid areas sell little or no grain. For example, it is estimated that 10% of communal farmers, mainly those living in the higher rainfall areas, have accounted for 90% of GMB's maize purchases since 1983 (Jayne and Chisvo, 1991). Likewise, this research revealed that the majority of communal area households run out of food before the next harvest and have to acquire additional food from off-farm sources.[14] One survey, undertaken in a near normal agricultural season, revealed that not only had 60% of communal households in NR IV and V depleted their own stocks before the next harvest began, but that 25% had done so 6 months before the harvest (Chisvo, 1992).[15] Thus, private market failure in the context of liberalisation is likely to tax net consumers more than surplus producers. The implications of this food insecurity are serious.

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[13] This project has led to a large number of publications, many of which have focused on grain marketing performance and constraints. See for example, Chisvo et al (1990), op cit.; Jayne T.S. et al (1990) op cit. (as well as others in this volume); Rukuni and Wyckoff (eds.) (1990) op. cit.; Jayne T.S. and M. Chisvo (1991), Unravelling Zimbabwe's Food Insecurity Paradox, in Food Policy 16(5); Jayne T. S., M. Rukuni, M. Hajek, G. Sithole and G. Mudimu (1991) Structural Adjustment, Maize Marketing and Food Security in Zimbabwe in Toward An Integration National Food Policy Strategy, Proceedings of the Second National Consultative Workshop, Nyanga, June 1991, University of Zimbabwe Harare; Jayne T. S. and M Chisvo (1991) op. cit.; Takavarash T (1991) Agricultural Pricing Policy for Zimbabwe, in Wyckoff and Rukuni (eds.) op. cit..

[14] A number of studies, the results of which were published at the end of the 1980s, stressed that the assumption that most of Zimbabwe's communal farmers were net producers, on which government food marketing policies had been based, was inaccurate. See for example, Chigume S. (1989) Grain Marketing Patterns and Household Food Security in Low Rainfall Areas of Zimbabwe. MPhil Thesis, Department of agricultural Economics and Extension, University of Zimbabwe; Hedden-Dunkhorst B. (1990) The Role of Small Grains in Semi-Arid Smallholder Farming Systems in Zimbabwe. Mimeo, SADCC/ICRISAT, Matopos; Rohrbach (1989) op. cit.;; Stanning J. (1989) Grain Retention and Consumption Behaviour among Rural Zimbabwe Households, in Mudimu G. and R. Bernsten (eds.) Household and National Food Security in Southern Africa, Proceedings of the Fourth Annual Conference on Food Security Research in Southern Africa, UZ/MSU Food Security Research Project, Department of Agricultural Economics and Extension, Harare.

[15] Sixty percent of the communal population lives in Natural Regions IV and V.

51. Some research has also been undertaken into the impact of the liberalisation process on communal farm household food security - the largest body of work being that conducted under the MOA/USAID Zimbabwe Grain Market Reform Research Project.[16] MOA/USAID will continue monitoring the effects of food market liberalisation until 1998, but the focus to date, understandably, has been on the liberalisation of grain processing. Much less work has been done on the buying, selling and transportation functions of grain, pulse and oilseed markets. In addition, the storage function is likely to be become more prominent in private sector markets as the GMB moves away from pan-seasonal pricing. Further research into the constraints on the development of these market functions in the private sector is needed if the potential benefits of liberalisation are to be realised.

52. Research to date, together with farmer, trader and miller interviews undertaken in February 1996, indicate that the main constraints on the development of competitive and efficient private field crop markets and improved farmer access to them are policy uncertainties and access to capital and transport services. As policy reforms proceed, some of the constraints previously identified have been lifted or, alternatively, are likely to be lifted in the short term. For example, much attention has been paid in the past to the inefficiencies of preventing private grain trade between Areas A and B, supporting an industrial milling oligopoly and prohibiting the expansion of the small-scale hammer milling sector. These restrictions have now been lifted. With maize meal supplies unable to keep up with demand, and a consequent rocketing of prices in the early 1990s, the government relaxed its controls on the small-scale milling sector. This has resulted in a huge expansion in the number of hammer mills being operated (especially in city suburbs). Consequently, other marketing constraints have become more binding on efforts to increase household food security and incomes. As each constraint is lifted, and others become more binding, further research is required into the precise nature of the latter and the best means through which they in turn can be lifted.

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16 Some twenty seven studies of various aspects of the liberalisation process were undertaken by the Zimbabwe Grain Marketing Reform Research Project managed by Coopers and Lybrand. The most significant of these for the purposes of this work are the four impact assessments conducted on behalf of the project - see for example Mazvimavik K. (1996) Assessment of Household Grain Consumption, Grain Milling and Trading in Communal Areas of Natural Regions IV and V', Report Prepared for ZGMAAR, Impact Assessment task A2, Phase IV; Probe Market Research (1995) Evaluation of Grain Market Reform Impact in the Semi-Arid Regions of Zimbabwe (Phase 3); Probe Market Research, and (1995) Evaluation of Grain Market Reform Impact in the Semi-Arid Regions of Zimbabwe (Phase 2) and Jimat Consult (Pvt) Ltd (1995) Pilot Study on Hammermillers for USAID and Status Study and Survey of Hammermillers for USAID.

53. In the horticultural sub-sector, less research appears to have been undertaken on marketing efficiency issues.[17] This is probably due to the fact that traders have always been allowed to operate freely and are thus well established. Horticultural marketing has also been supported through public provision of urban market place infrastructure managed by city and town councils. Probably due to these factors, it appears from the literature and from rapid appraisal, that fresh horticultural produce markets are functioning in a dynamic and competitive manner and the detailed analysis of their economic performance would not be justified at present.

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[17] One notable exception to this is a detailed ethnography of female horticultural produce traders in Harare, which includes some analysis of the economics of horticultural markets - Nancy E. Horn (1994) Cultivating Customers: Market Women in Harare, Zimbabwe, Lynne Rienner, Boulder, London.

MAJOR FOOD CROPS GROWN

54. The results of the Rapid Rural Appraisal (RRA) of the practices of farmers and the activities of traders and processors are reported in the following section. These results are based on informal interviews and farm visits to 50 homesteads, and discussions and visits to 30 traders and processors, and is reported by commodity group.

Maize

Production

55. The majority of farmers grow at least two varieties from PNR 473, R201, R215 and SC501 and SC601. SC501 is more common in NR III while R201 is dominant in NR V. The major seed source is the Government Drought Recovery Crop Pack Programme, supplemented by local purchases.

56. The factors considered by farmers in selecting the seed variety are:

- time to maturity;
- grain yield;
- drought tolerance;
- adaptability to different agro-ecological conditions;
- availability of the seed;
- susceptibility to storage insect pests.

57. Half of the respondents indicated early maturity as the most important parameter whereas drought tolerance combined with adaptability were mentioned by 28%. The third most important factor was yield (25%).

58. The cost of hybrid seed is prohibitive according to 64% of farmers while 21% considered timely availability as a problem. Packaging is a problem since sometimes only 50kg packs are available, when packs of less than 20kg would be more appropriate.

59. The major production constraint is availability of cash for seed, fertiliser and grain protectants as indicated by 51% of the respondents. Availability of draft power was the second most important constraint overall (31%), although it was cited by 44% in NR V. Other problems include poor transport system at marketing, labour shortages (especially in NR III), insect pests during storage, rodents in the field and at the homestead, crop drying, termite attack in the field and at the homestead (during drying and storage), waterlogging, land shortage and availability of seed.

Handling

60. Most of the harvesting is carried out between April and May. In Mutoko, harvesting is spread over a much longer period (April to July) whereas in Chivi and Zimuto it is confined to April and May for the highland crop. The vlei crop in Zimuto is harvested in January and February mid-way through the rainy season.

61. All farmers cut and stook the maize plants for about 2 weeks (range 1 - 4 weeks). The cobs are then picked, dehusked and dried in traditional cribs, on a prepared ground surface or on a rock surface. Shelling is carried out mainly by beating the cobs with sticks, on a timber/wire platform and supplemented by hand shelling. The grain is winnowed after shelling.

Storage

62. The grain is put in store between July and September with most of the crop in store by August. In Zimuto and some parts of Chivi, the cobs are stored in temporary holding structures (*tsapi*) until shelling time after which the crop is moved to granaries (*hozi* or *dura* depending on the design). Only 5% of farmers practice permanent cob storage and shell at withdrawal for milling. Most farmers in Zimuto and Mutoko produce enough grain to last at least eight months whereas in Chivi the storage period is six months or shorter due to grain deficit resulting from poor harvests.

63. Insects, rodents and the store structure were indicated by 87%, 59% and 21% of respondents as major storage problems. About 13% claimed they experienced no problems during storage. Losses due to insects and rodents were estimated to be 10% (<20%) with higher losses being reported in Chivi. Problems associated with the storage structure included moisture ingress through the walls, floor (for structures built directly on the ground) or roof; scarcity of construction material such as thatching grass and timber (especially in Chivi and Zimuto); and fire hazards.

64. Insecticides are widely used. At least 80% of farmers questioned in Mutoko and Zimuto stated that they used synthetic insecticides for grain protection whereas in Chivi only 38% were using them. In all three areas, 23% mentioned use of natural grain protectants such as wood ash from *Lippia javanica* (Zumbani), *Spirostachys africana* (Tamboti; Mutovhoti), leaves of *Eucalyptus* spp., finger millet (rapoko) chaff, and muhoza and bvumvu leaves.

65. Synthetic grain protectants in use include pirimiphos methyl 2% dust (62% of farmers), malathion 1% dust (13%), methacrifos 2% dust (3%) and phosphine fumigant (8%). Phosphine was being applied in structures which were not air-tight.

66. Some farmers (36%) expressed dissatisfaction at the efficacy of the chemicals they are using. About 5% of farmers have abandoned chemicals because of their ineffectiveness.

67. Almost 50% of farmers are applying grain protectants incorrectly. Some are applying at the correct rate, but using the wrong technique such as layering or sprinkling bagged grain with insecticide dust. Some farmers were found to be using five times the recommended dose. During the temporary cob storage phase, insecticidal dusts are often sprinkled liberally on the cobs.

68. Rodent control is mainly non-chemical using traps, cats and exclusion though a few farmers do use rodenticides.

69. 44% of farmers have received grain storage advice from some source with the main source being AGRITEX. Farmers indicated that they need advice on effective chemicals for grain protection, termite prevention in storage, construction of improved stores and re-treatment of grain.

70. There are almost equal proportions of brick-walled structures and pole and mud-walled structures, either built directly on the ground or on a timber and mud base raised on stones. There is significant bag storage in Zimuto with the bags raised on dunnage or placed on plastic sheets to prevent moisture uptake.

71. The traditional basket granaries with a single compartment were found in Mutoko. This structure has an access hole at the top which is closed with a stone slab. The roof is either independent of the structure or detachable for access to the grain.

72. Single compartment structures are wide-spread in Masvingo built directly on a rock surface or raised rock slabs, and at least two structures were found at most homesteads. The structures have one access hole usually on a side wall.

73. The walls of most structures were rain-damaged due to a short roof overhang and a few structures had collapsed in the heavy rains during the 1995-96 season. The majority of structures which had multiple compartments (*hozi*) had no ceilings and, in most cases, access holes were left open allowing free movement of pests.

Sale and Consumption

74. At least 50% of production is retained in all three areas with higher retention in Chivi (72%) and Mutoko (64%). Retained maize is used for consumption, local sales and assisting relatives in hard times.

75. Most maize marketing takes place between July and September and up to October in Mutoko. In Zimuto, Mutoko and Chivi, 75%, 50% and 38%, respectively, sell their maize. Most of the crop is sold in one batch to the GMB and to private buyers such as National Foods and Metro Peach. Local sales are common in Zimuto and Chivi and staggered depending on the demand for grain. Nearly all farmers selling maize experience

transport problems such as high hiring costs and unreliability. Availability of bags was also mentioned as a constraint in some areas.

76. 49% of farmers withdraw their maize monthly from the store for milling, while 41% mill weekly.

Small Grains

77. Sorghum, pearl millet and rapoko are grown in Chivi, Zimuto and Mutoko and are given the same importance as maize in Chivi (NR V), while the importance as a staple food crop is greatly reduced in NR III and IV.

Production

78. In all the three study areas interviewed farmers planted retained or traditional varieties of rapoko and pearl millet. In the case of sorghum about 67% of the farmers grow retained seed. The remaining 33% grow hybrid varieties.

79. The seed selection criteria used by farmers are:

- early maturity;
- drought tolerance;
- resistance to bird damage;
- taste.

80. The main sources of seed are:

- traditional varieties;
- own previous crop or crop of neighbours and relatives;
- sorghum SV2 hybrid variety from ENDA-Zimbabwe seed multiplication schemes or from Government of Zimbabwe (GOZ) drought relief programmes.

81. Retained seed is usually selected at harvest and stored either as heads hung under eaves or as threshed grain in bags, tins, earthen pots and drums. In some cases grain is simply withdrawn from the store prior to planting.

82. There appeared to be no problems in sourcing traditional sorghum seed, but there is a lack of money to buy hybrid varieties. Pearl millet and rapoko seed is normally available except in a season following a drought year.

Handling

83. Small grains are harvested from April to July and:

- harvested by cutting heads using sickles or knives;
- dried on rocks;
- threshed using sticks (when there are free periods);
- winnowed; and,
- transported to the homestead in sacks, wheelbarrows or Scotch carts.

Storage

84. 70% of farmers store their grain in a granary. The remainder use sacks, drums and earthen pots in their houses. The most common granary structure is mud-walled and thatched built on a pole platform raised on stones. In some structures, burnt or sun-dried bricks are used instead of poles. In Mutoko, some farmers construct a basket which is thatched, raised on stones and covered at the top with a stone slab or metal. The store is mud-plastered inside and out.

85. In relatively high production areas, like Zimuto and Mutoko, farmers store from one harvest through to the next (approximately 12 months). In some cases rapoko is stored up to three years. In Chivi, farmers do not store small grains beyond January because of the low production in the area.

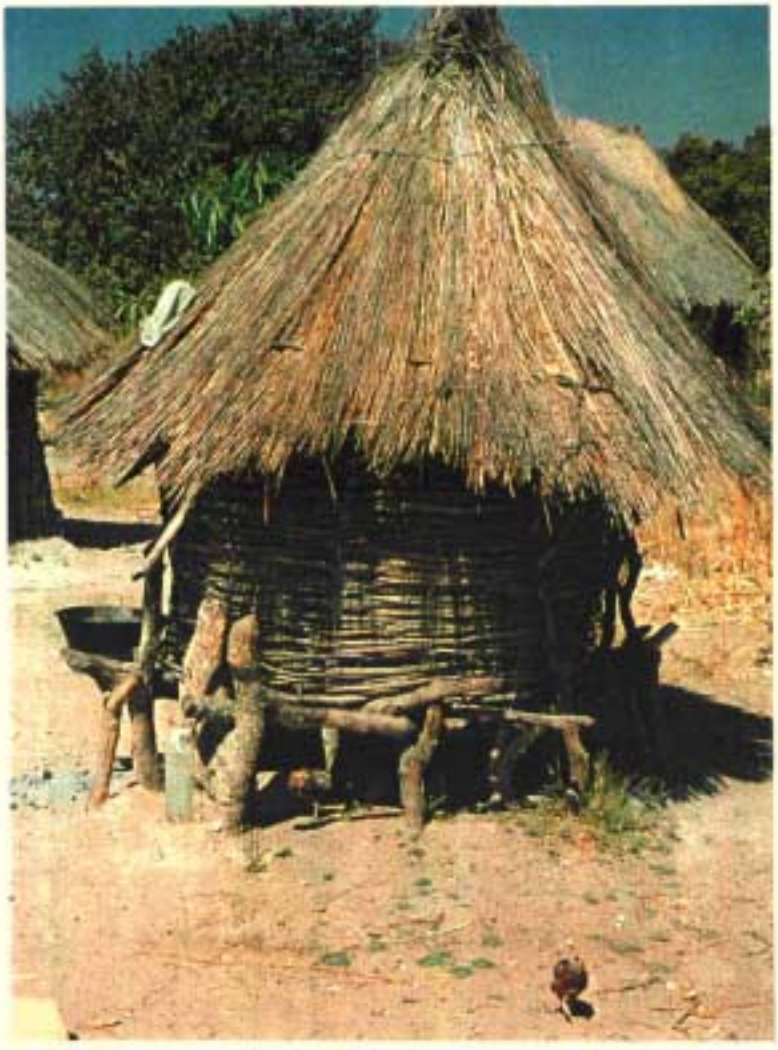
86. Farmers did not report storage problems or losses with rapoko or pearl millet and no control measures are taken. However, farmers in Zimuto and Mutoko indicated that insects are a problem during the storage of sorghum, especially the hybrid varieties. The following natural grain protectants are sometimes used.

- Wood ash
- Mubayamhondoro burnt leaves
- Eucalyptus leaves
- *Spirostachys africana* (Mutovhoti) wood or bark
- Muhoza leaves
- *Lippia javanica* (Zumbani) leaves

87. These products were rated ineffective, but better than nothing, although farmers were not able to estimate losses. Rodents appear to be attracted to sorghum storage and cats are encouraged.

88. 17% of farmers received storage advice from extension workers.

Typical mud and basket storage structures found in the region



Marketing and processing of maize in southern Africa

Sale and Consumption

89. Sorghum, pearl millet and rapoko are grown for food, feed, brewing and gifts.

90. In all three areas sorghum and pearl millet, more than rapoko, are used to prepare thick porridge (sadza). In Chivi (NR V) small grains are important staple foods. In Mutoko and Zimuto (NR IV and V) there is less dependency on small grains. Sorghum and pearl millet are grown for food security and sale. Rapoko is consumed at irregular intervals and is not regarded as a maize substitute. It is important to note that in all the survey areas people consume small grains when they run out of maize. In some cases, producers sell small grains to raise money to buy maize.

91. The withdrawal pattern from the store depends on the size of household. Maize is withdrawn at regular intervals in quantities ranging from 15 to 30 kg/week.

92. Rapoko is usually sold locally and, in Zimuto and Mutoko, it is marketed from June onwards in a staggered pattern. It is used mainly for brewing beer for sale and in traditional rituals and ceremonies. The proportion marketed depends on:

- production of current season;
- need for cash;
- previous season's production since people tend to store a greater proportion after a poor harvest.

93. In NR V (Chivi), which is a chronic food deficit area, there is no marketing of sorghum. Even farmers given the hybrid seed SV2 by ENDA-Zimbabwe in the seed multiplication schemes harvest very little and end up not fulfilling their obligation to sell to ENDA. Transport and sacks are provided at collection points on fixed dates to all farmers selling to ENDA. Sales to GMB are from July to September.

Oilseeds

94. The two main oilseed crops grown by communal farmers are groundnuts and sunflower. In the study areas groundnuts were ubiquitous and sunflowers grown by a small proportion of farmers. Both crops are described in this section.

Production

95. Groundnuts are grown by 32 of the 50 farmers interviewed. All grow short season varieties and, from their description of the varieties, the majority grow Natal Common. This variety is preferred for its:

- adaptability to semi-arid areas and length of the growing season;

- adaptability to sandy soils and where farmers believe the soils are exhausted;
- ability to stay dormant when it reaches maturity (nuts of other varieties germinate in the field).

96. The majority of farmers use retained seed or seed purchased from a neighbour.

97. 64% of farmers, mainly in Zimuto and Chivi, store planting seed with the rest of the produce in the granary or unshelled in bags. Just prior to planting time, the nuts are shelled and graded. In Mutoko, more than half the farmers select seed at the picking and winnowing stages. Pods are stored separately in bags and no further selection is done after shelling. Except for a single farmer in Mutoko, no other instances of seed treatment were recorded[18].

98. Four out of the 32 farmers pointed out that seed availability is a problem, particularly following bad seasons. Other major agricultural constraints were:

- draft power shortages - 22% of groundnut farmers interviewed faced this problem, most of them in Chivi- lack of draft results in lower cultivated areas and late planting;
- money shortages to buy fertilizers, and insufficient manure (18% of farmers);
- labour shortages, particularly at planting and picking (1%);
- aphids, theft, land shortages and transport costs to GMB depots (1% for each).

99. Groundnuts stored at home are kept in the granaries. Frequent withdrawals are made to eat the nuts raw or roasted, give to relatives as gifts or process into peanut butter. The frequency of withdrawal is variable ranging from small daily amounts to monthly withdrawals of larger quantities.

100. Processing groundnuts into butter is time-consuming and tiring and involves:

- roasting shelled nuts and removing the testa;
- pounding the roasted nuts into a coarse paste;
- grinding the coarse paste to a finer paste;
- storing the butter in a closed tin or bottle.

101. Seven out of 50 of the interviewed farmers grow sunflower. Two farmers grow open-pollinated varieties, while the other five grow hybrids (three grew Pannar hybrids; one grew G101 and the fifth farmer grew an unidentified hybrid). Two farmers growing hybrids purchase seed every season while the other three use retained hybrid seed. The

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18 Mr Kanyanganise of Mutoko mixes shelled nuts with a little paraffin to guard against weevils and discourage children from pinching the nuts.

latter got their seed from the Government Drought Recovery Crop Packs or from the Deutsche Gesellschaft für Zusammenarbeit (GTZ).

102. Of the 5 farmers retaining seed, one selected at harvest heads with big seed, threshed them and stored the seed in a bag. The remainder separated the amount of seed needed for planting from the rest of the produce and kept it in a bag. No seed treatment was done.

103. The major agricultural constraints are:

- that seed is expensive (2 farmers);
- lack of money to buy fertilisers (3 farmers);
- transport cost to GMB (3 farmers);
- draft power shortage (2 farmers);
- termites attacking the crop before it even matures (1 farmer).

Handling

104. Harvesting ranges from March to May and 50% of farmers harvest during the period end of March to April. In Zimuto, 55% harvest early to end of March and this could be attributed to early planting in vleis.

105. Harvesting procedures are similar in the survey areas. All farmers:

- lift the plants by hand and put in windrows for partial drying;
- put the plants on A frames for 2 to 4 weeks; and,
- remove the pods and complete drying.

106. Harvesting of sunflower is done in April and May. When mature, the heads are cut and carried to a drying place (rock or prepared surface) at the homestead. When dry, sticks are used to thresh the heads and the crop is winnowed and bagged.

Storage

107. Groundnuts are stored unshelled. Half of the farmers interviewed store groundnuts loose in granaries whilst the other half put them in bags and keep the bags in the house or kitchen. The period of storage depends on family size, frequency of withdrawals and the quantity of groundnuts put in store. After a good harvest, sufficient groundnuts are kept to carry over to the next harvest.

108. Rodents were singled out as the major cause of losses during storage (65% of farmers). Eight farmers estimated losses ranging from 2 to 16% (average loss was 7%)

although some farmers could not quantify the losses. Half the farmers use traps or cats for rodent control. 10% sometimes use rodenticides.

109. Three-quarters of farmers have not received any advice on proper storage of their produce. The remainder had some advice either from local extension workers, neighbours, farmer meetings or through reading (e.g. posters in buses).

110. Half of the farmers' granaries are constructed from pole and dagga while the remainder are built of either burnt or unburnt bricks. The granaries are mostly grass-thatched (80%) while 20% had asbestos or zinc roofs. Some farmers seal their granaries, before putting on the roof, to guard against fire and entry by rodents. The seal called *Hwikiyo* is made from sticks and mud.

111. 72% of the granaries have multiple compartments. More than 80% of the granaries were not fully rodent proof. Entry points for rodents were between wall and roof and through loosely fitted doors and windows. Most were at least 10 years old, but farmers with brick walled granaries believed they would continue to be used for another 15 to 20 years or even last a life-time with some repairs.

Sale and Consumption

112. 65% of groundnut producers sell part of their crop as nuts or peanut butter. 35% grow for home consumption. Crop sales range <10 to 80% of production. In Mutoko, 50% of sales are to the trader Metro-Peach at Mutoko growth point, while the other half sell the crop locally. Peanut butter is sold in Harare.

113. In Chivi, farmers sell less than 10% of their produce, mostly locally for seed. Three farmers sell peanut butter in Masvingo, Bulawayo and Beitbridge. Only one farmer sells to the GMB.

114. Of the eight farmers in Zimuto who sell groundnuts, seven sell unshelled nuts locally, two sell peanut butter and one sells to GMB. Local sales are often staggered, commencing in May, although most sales are made in August and September when farmers need cash for seed. Sales to GMB and traders are made once during July and August. No problems were encountered during marketing, because there is strong local demand for groundnuts.

115. All the 7 farmers sell most of their produce to the Grain Marketing Board (GMB). The amount that is retained is either for planting seed (little = 5 - 15% of total produce) or for feeding chickens (30 - 45% of total produce). Sales are mostly made in July/August and everything is (sold at time one). The seed that i~ used to feed chickens is normally kept in bags and is kept of as long as it available - There are no storage problems. Planting seed is also stored in small bags and no storage problems are experienced.

116. Seed used for chicken feed is mixed with maize and the mixture is crushed at the grindmill.

Horticultural Crops

Production

117. In all districts, tomato and rape are the most important crops, followed by onions (or shallots). The most common constraints were pest and disease problems. Other constraints were money (for inputs), water (shortage or no access) and transport (to take produce to the markets).

118. The production season for tomato begins with late summer sowing[19] (or summer sowing, depending on the level of water logging in the soil, and the status of the maize crop). Rape and onions were only produced in winter.

119. The major fruits are mango (a lot sold), some orange and pawpaw, and minor fruits such as tangerines, mulberry, lemon, apple and peach. More fruits were produced in Mutoko than Zimuto and Chivi.

Handling

120. The criterion used to judge maturity of tomatoes was fruit colour and, in all areas, the fruit are picked when they are at least pink. For sweet potatoes, most farmers indicated that they waited for some leaves to start yellowing before harvesting.

121. Most farmers carried out grading before marketing (23 farmers said they grade and 4 said they do not). The most common criterion was size, although colour and blemishes were also commonly used. Other grading criteria were ripeness and general appearance. A number of farmers, especially in Zimuto, did not practice any grading.

122. Sweet potatoes intended for storage are selected for freedom from weevils and obvious infections. Curing to heal skin wounds is not common and only two farmers mentioned sun-drying as a means of healing wounds arising from harvesting.

123. In Zimuto, one farmer mentioned losses of 25% for sweet potatoes during storage and handling. Losses during harvesting and marketing of tomatoes were also around 25% (range of 10 to 40%) for all areas. However, while most farmers recorded no losses, one farmer in Zimuto said that he had experienced losses of up to 100% for rape.

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[19] In Zimuto, however, sowing of tomato occurred in winter.

124. Transport involved hired trucks or the EEC/ARDA scheme and most produce is packed in wooden boxes or 20 litre tins. Sacks are used for sweet potato, rape and onions.

Storage

125. Sweet potato is stored in all three districts, but a few farmers in Mutoko and Chivi also store onions. Sweet potatoes are either left in their beds in the field or lifted and stored in specially constructed pits. Four farmers used beds, eight used pits and three stored indoors. Pit storage is usually associated with a high level of production. Onions are stored in cool, shady areas under roof overhangs or indoors hanging from the roof.

126. Sweet potatoes are stored for four or five months (except in Zimuto, where the storage period is one or two months). One farmer had stored sweet potatoes for up to seven months. Onions are stored for up to three to four months. Storage tends to be limited by the onset of the rains and the main problems mentioned were: rotting of onions; and, for sweet potatoes, were rotting, sprouting, pests and shrivelling.

Sale and Consumption

127. Most of the production was for home consumption, but some Mutoko farmers sold large quantities of tomatoes, while a few Chivi farmers sold large quantities of sweet potatoes. Rape and sweet potato were grown more for home consumption than sale in all areas.

128. Drying of tomatoes and leaf vegetables is carried out. Tomato was dried by 6 out of 13 farmers in Mutoko, 3 out of 9 in Chivi and 2 out of 7 in Zimuto while leafy vegetables were dried by 3 out of 7 farmers in Mutoko, 4 out of 7 in Chivi and 2 out of 7 in Zimuto. It appears that the more successful growers (those who grow a crop year round) do not dry as much as the smaller or more seasonal growers. Pre-drying processes simply involve slicing the product and spreading it to dry in the sun. Leaf vegetables may or may not be cooked before drying.

Marketing of Crops

Field Crop Markets

129. Private marketing of grains, pulses and oilseeds remains undeveloped, particularly with respect to communal farm produce, despite some response by the private sector to the government's liberalisation policies. With deregulation, an indeterminate number of new private operators has entered trade in these commodities. Interviews with farmers suggest that the increase in the number of private buyers remains small, their scale of operations, with few exceptions, very limited and with patchy geographical coverage. Previous

research, as well as interviews with practising traders, suggest that two major constraints are faced by the sector.

- Continued uncertainty on the future role and activities of the GMB, supported by interviewees, newspaper articles, debates and public statements by politicians

- A lack of proactive management of the transition from a controlled to an open market system on the part of the public sector.

130. Given the structure of the current market, these two constraints pose the serious and dangerous possibility of local private monopsonies and monopolies replacing public ones. For example, unless the development of private trade is actively encouraged and invested in, previous GMB-approved buyers could continue to be local monopolists in the buying and selling functions despite liberalisation, due to their established capital bases, knowledge of the market, easier access to means of transport and credit lines. There appears to be a similar danger of local transport monopolies developing. All farmers interviewed in any one area in the rapid appraisal exercise often stated that there was only one transporter whose services were available to them in taking their produce to GMB depots. If local monopolies do develop, the communal farmers are likely to bear the brunt of the cost, both in terms of reduced producer prices and increased consumer prices.

131. Currently there is no system in place for monitoring private grain, pulse and oilseed market developments. USAID has sponsored the design of a market information system, which is being adapted to better suit the needs of the MOA. It is likely that the system adopted will focus on price and traded volume variables. Although these provide some indication of the performance of markets, given the underdeveloped state of private trade, additional monitoring mechanisms would also be beneficial, at least in the short to medium term. Currently, no data is being collected on even the number of private traders operating in the communal areas, let alone how much produce they are buying and selling, the costs and prices at which they are doing so and the precise areas in which they are operating. In order to explore the possibility of monopolistic and segmented market developments, and to highlight them if they emerge, research could usefully be undertaken into:

- the economic efficiency of the total private field crop marketing system (including that of spatial and temporal arbitrage); and,
- means of continuously monitoring the function and performance of private grain, pulse and oilseed markets that would be acceptable to the MOA.

132. Simultaneously, research into means of facilitating the development of more competitive and dynamic private grain, pulse and oilseed markets needs to be undertaken. There is some work being done in this area, but it is relatively small-scale and by no means comprehensive in terms of coverage of the options. For example, MOA/USAID, under the Zimbabwe Grain Marketing Reform Programme, have invested in some training for traders.

The Southern Africa Foundation for Economic Research is doing some research into the economics of constructing physical market places and has undertaken some pilot construction. The MOA has done research into the use of intermediate transport technologies. However, there are many other, possibly more binding, constraints on the development of competitive markets and other means of lifting them which could be explored and, if successful, greatly increase communal farmers' food security and incomes.

133. Previous research (e.g., that undertaken by the UZ/MSU Southern Africa Food Security Research Project) has clearly indicated the main constraints to the further development of private grain trade in Zimbabwe. Certain government policies referring to cross-zone trade and the establishment of private, small-scale hammer mills in urban areas have now been changed, but others uncertainties remain resulting from lack of clarity in government policies and intentions, and capital, transport and storage constraints. Interviews suggest that the limited availability and high cost of rural transport services constitute market participant's primary constraint to increased and expanded trade.

134. The nature of these constraints needs to be understood more fully if the best means of addressing them are to be identified. For example, does the lack of availability and high cost of transportation services emanate from a capital constraint or the poor condition and sparse distribution of rural roads or import tariff and foreign exchange polices? Is the capital constraint more binding than the transport constraint? Different ways of lifting these constraints need to be assessed in terms of their likelihood of success and their financial, economic and social costs and benefits. For example, in lifting the credit constraint, the implications of different means of promoting credit supplies to private traders could be compared through looking at Zimbabwe's historical experience, financial institutions' views within Zimbabwe and other country experience.

135. Some research on transport and credit constraints to the development of the rural economy has been done[20]. However, very few studies have been carried out in Zimbabwe in relation to the marketing system (Takavarasha, 1994)[21] and little is known about the

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20 In 1990, the Government commissioned a Transport Sector Study and in the same year the World Bank also published the results of a similar enquiry. In 1995, the MOA/USAID grain marketing reform impact research, a report of the transport sector with particular reference to the implications for grain marketing was commissioned - see Casavant K for Coopers and Lybrand (1995) Agricultural Marketing Information Systems: Transportation Analysis in Zimbabwe, mimeo. This also made reference to previous reports undertaken by the research project which had also covered some transport issues written by, respectively, Joshua Mashauri and Will Masters. NRI was not able to obtain the latter two reports.

21 Full text of a speech delivered at the Project Launch Workshop of the Zimbabwe grain Marketing Reform Research Project, Harare and published in the workshop proceedings by Coopers and Lybrand, Harare.

operations and costs of the transport sector including technical data to allow analysis of it (Casavant, 1995). This is strange when *problems of transportation faced by smallholders and communal farmers is by now conventional wisdom* (Casavant, 1995). The lack of data is critical, given that between 90 and 100% of maize sold by farmers to the GMB or private traders is transported to the first point of sale by the farmers themselves.

Transport

136. Before implementation of ESAP, it was generally acknowledged that, although Zimbabwe's road infrastructure was well developed compared to that in neighbouring countries[22], smallholders faced increasing transport problems. A scarcity of vehicles and spare parts relative to demand, insufficient financial resources in the small-scale transport sector and restrictive licensing arrangements were blamed. There is now some evidence to demonstrate that the liberalisation of foreign exchange acquisition and other ESAP policies have begun to alleviate these constraints. As a result, since 1991, there has been a big increase in the truck fleet, especially in the number of trucks less than 10 tonnes in size, and there has been an improvement in the age composition of the fleet. The proportion of economically expired vehicles (over 8 years of age) fell from 53.2 to 51.2% between 1993 and 1994 and the proportion of trucks less than three and half years old rose from 30 to 33.2%. Likewise, the availability of spare parts has also increased. These factors have led to increased competition and a real decline in transport rates particularly over long distances.[23]

137. Transporters and traders confirmed that previously it had been impossible to import new or second hand trucks and that those available on the domestic market were very few and very expensive, but that the situation had eased considerably since 1991. Nevertheless, the same fieldwork suggests that, despite increased truck numbers, the gap between supply and demand is still large (and not just seasonally) and improvements have been seen mostly in large-scale and long-distance services. For all the farmers and traders interviewed during

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22 Despite this relatively rosy picture however, there has been much criticism of the country's road networks. For example, it has been argued that the tarred network, which mainly serves to connect urban centres and leaves rural areas being not well connected to either the towns nor to each other, impedes small scale and intra-rural trade and promotes only large scale trade between towns and the development of the urban economies (see for example Reynolds N. (1987) A Diagnostic Study of Poverty, Economic Security, Resource Management, Financial Flows and Development Administration in Chikore: A Ward in Natural Region IV, Manicaland, in Cropping in Semiarid Areas of Zimbabwe, Proceedings of a Workshop sponsored by AGRITEX and German Agricultural and Rural Development Team, Harare.

23 Between 1990 and 1993, long haul rates have fallen by 36 to 56% depending on the region, although the range of quotes in tenders for transport services to the GMB remains high - i.e., up to 50%.

February 1996, the availability and cost of transportation services remained their top marketing problem. It has been claimed that there is sufficient transport available in the communal areas and that whilst rates appear high, they are not ridiculously so given the necessary use of non-tarred roads, seasonal demand and evident market and negotiating power on the side of traders and transporters (Casavant, 1995). However, not only is this argument contradictory (i.e. if there was sufficient transport available, would traders/transporters be able to acquire such market and negotiating power?), but it is based on a necessarily rapid overview of a little studied system. Further analysis may show that transporters mix the types of produce they carry in order to alleviate the seasonality of demand in the agricultural market. In addition, an increase in competition in the transport sector in communal areas could bring rates closer to costs. Given that the transport constraints identified by farmers and traders are so universal in their coverage and primary ranking, research into the precise nature and underlying causes of the constraints on increased entry into the small-scale and communal area transportation subsector and means of lifting these constraints, could have a major impact on the efficiency of grain markets and producer and consumer prices. Such research would also inform the development of horticultural markets and other rural economic subsectors.

Credit

138. Some research has also been undertaken into rural credit constraints which have been faced by emerging traders in other newly liberalised economies. Whilst the literature pertaining to Zimbabwe has not yet been collected or reviewed, it is clear that little attempt has been made to undertake research among development finance institutions as to means of overcoming the perceived high risks in lending to traders and trader-farmers, who usually lack collateral. Moreover, substantial work undertaken in other countries on the use of collateral substitutes (e.g. group lending in Malawi; inventory credit in Ghana) could be brought to bear in the Zimbabwean context.

139. There remains a vacuum of ideas as to how to go about ensuring the full development of private sector markets. There is grave danger, as has happened in other countries, that failure to facilitate the development of competitive and dynamic private markets through proactive investment in institution building and lifting constraints to entry will lead to the development of segmented markets and local monopolies. This would adversely affect many small farmers' food security and income status, as well as impose a high cost on the Zimbabwean economy. It has been demonstrated time and again that in promoting increased efficiency through opening up marketing regimes, liberalisation is necessary, but not sufficient. This is particularly the case where private markets have been heavily and effectively controlled, as in the grain sector in Zimbabwe.

140. The impact of the current performance of grain markets on food insecurity and their potential to contribute towards reducing this remains more or less what it was pre-liberalisation and has been cogently summarised as follows. *Inadequate farm production and inadequate purchasing power among the rural poor are largely responsible for the*

persistence of food insecurity amidst food abundance. In the long run, enhanced food security will require increased on-farm productivity and income growth among the poor.....(However) increased purchasing power, among the rural poor in the short and medium run may be facilitated by reducing the price of goods that form large shares of their expenditure bundles....Estimates from past research have indicated that a reduction in consumer grain prices in rural areas through the development of intra-rural trade may increase real cash incomes among poor grain-deficit households by as much as 20 to 30 percent.....These gains, however, are based on a scenario of well functioning informal grain markets that supply grain to deficit areas throughout the year. These markets currently do not exist (Chisvo *et al.*, 1991). Realising the potential benefits of a liberalised policy framework requires the development of the capacity of the private sector to take up opportunities provided by legislative and policy changes. This research would help to inform the government and donor community on the best means of supporting the continued development and performance of these markets.

Horticultural Produce Markets

141. Horticultural markets appear, from previous research, casual observation and a rapid appraisal of market participants' activities, to be well developed and operating in a relatively dynamic and competitive fashion. The main constraint to increased trade and productivity faced by traders and farmers is the availability of transport. This constraint also adversely effects field crop market development and should, therefore, along with capital constraints, be addressed separately from a focus on horticultural marketing. Other problems faced by horticultural produce traders appear to have a relatively minor impact on the performance of these markets, e.g. the lack of shade in wholesale markets. However, there does appear, from an outsider's point of view, to be considerable potential in attempting to forge stronger links between smallholder producers of horticultural produce and industrial horticultural processors. In addition, research into the possibilities of developing a middle level horticultural produce processing market, i.e. between on-farm household processing and industrial-scale processing, and akin to hammer mills, could be very productive.

142. On-farm, sun-drying of green leafy vegetables, tomatoes, mushrooms and onions is common practice, but is aimed at home consumption and gifts for neighbours. Consumer demand for the products appears to be limited and, aside from dried leafy vegetables which are sold in urban markets, no significant market exists. Potentially useful research aimed at increasing incomes could be undertaken.

- Developing preservation methods more suited to consumer tastes. Some work on appropriate technologies for improving the quality of sun-dried fruit and vegetables is already being undertaken by ENDA and it is possible NRI could collaborate in and expand on such work.

- Potential market demand for preserved fruits and vegetables and means of increasing such demand. Industrial processors say they have enjoyed enormous growth in the demand for these products, both domestically and regionally, over the last 5 to 10 years and predict continued growth. However, the likely nature of this future growth could be more rigorously assessed.

- Means through which communal farm contribution to meeting such demand (share in the market) could be enhanced through increasing and improving links with the formal sector industrial processors.

143. Partly as a result of pre-independence international sanctions, Zimbabwe has a relatively large and diverse commercial agro-industrial sector. This represents an enormous potential source of demand for small-farmer produce, although much of the industry's raw material needs are currently met by the commercial farming sector. It appears that this is the result of marketing, rather than production efficiency constraints. Interviews with senior management in the formal industrial sector suggest that it is very interested in being able to purchase more produce from the communal sector, in part because such produce can be obtained at a cheaper price than from the commercial farming sector.[24] However, assured and continuous maintenance of quality and bulking up of sufficient quantities to allow economies of scale to be realised appear to be the main constraints to greater formal sector market interaction with communal farmers. Research into addressing the constraints on formal sector purchases of communal farmers' produce could do much to allow the farmers to gain from national and international demand for their produce. There have been some efforts to engage in contract farming in the past, but these have faced various difficulties. Research into this history could highlight ways of ensuring greater success. In addition, other countries experiences could also be useful in identifying ways through which formal/informal sector market interactions could be enhanced, e.g. Kenya's organisation of exports from smallholder producers. In this, the potential role that co-operatives and the Zimbabwe Farmers Union (ZFU) and other institutions could play in meeting the formal sector's demands could be assessed.

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24 This desire was expressed by all three of the agro-industrial firms interviewed in February 1996, namely National Foods, Cairns Foods and Agrifoods.

MAJOR POST-HARVEST CONSTRAINTS FOR SMALL-SCALE FARMERS

144. Farmers were asked what constraints they felt were a priority and needed addressing. Their responses are summarised below by commodity type.

Maize

- Susceptibility to storage insect pests
- Drying of the vlei crop during the rainy season
- Long storage period (<4 months) after harvesting prior to shelling and treatment
- Cobs susceptible to insect damage - particularly important with respect to LGB
- Rodent attack
- Poor selection of grain protectants as evidenced by use of malathion and phosphine; wrong timing by applying to cobs before shelling; incorrect application rates - tendency to over-apply; incorrect technique - poor mixing; lack of advice
- Scarcity of granary construction material; moisture seepage through the walls; collapsing structures and a need for more durable structures; access holes open and compartments not sealed at the top
- High cost of hiring transport and unreliability

Small grains

- All farmers interviewed in Chivi gave lack of draught power as their major constraint after considerable cattle deaths in the devastating 1991/92 drought. Farmers attributed late and incomplete planting to this problem which contributed to low production
- Processes such as thinning, transplanting during gap filling, cutting heads, threshing and winnowing are considered laborious and time consuming
- In areas where farmers grow surplus grain, transport to the GMB is said to be expensive and unreliable. Bags are expensive and often unavailable. Farmers end up selling locally or to traders offering lower prices than the GMB
- Hybrid varieties such as sorghum-SV2 are more susceptible than local varieties to storage insect pests and birds
- Lack of money to buy agricultural inputs like fertilisers and hybrid seed
- Poor taste of hybrid varieties

Groundnuts

- Rodent damage
- Shortage of thatching grass, particularly in Chivi.
- Picking is labour intensive
- Although farmers did not specifically mention that they have problems in processing groundnuts into peanut butter, they indicated that it was tiring and time consuming
- Aflatoxin from groundnuts grown in the communal areas - for GMB and private buyers

Sunflower

- Transport costs to GMB
- Low returns
- High cost of seed

Horticultural crops

- Availability of transport to market
- Low market prices
- Discoloration of tomatoes
- Rotting of sweet potatoes and onions during storage
- Potato weevil attack on sweet potatoes

RECOMMENDATIONS

145. Following the field study, a meeting was held with representatives of DR&SS, AGRITEX, IAE and UZ to discuss the findings of the field work and to formulate the outlines for research projects. The following research activities were considered important by the CPHP local working group.

- Loss assessment during traditional methods of handling, drying and storage of maize, sorghum, pulses, groundnuts, incorporating a survey of farmer knowledge of insecticide, fumigant and plant insecticide use. The areas of focus to be in NR IV and V.

- Evaluation of the potential for improvements to storage structures and management in selected areas (e.g. Zambezi valley) where wood is the dominant building material (these structures are quite distinct from the mud/brick/wood *hozi*). It is anticipated that, when LGB is confirmed in Zimbabwe, research issues will emerge to find effective ways of controlling the pest in rural stores, including the storage structure itself.

- An economic analysis of yields and storage losses between hybrid, composite and traditional varieties of maize.

- Adaptive trials on farms, and in business centres, of motorised peanut butter machines.

- A feasibility study of the use of oilseed cake by animal feed manufacturers and local dairy, poultry and fisheries enterprises (and possibly as an additional source of oil by refineries using solvent extraction).

- Determination of the promotion of threshers and dehullers of small grains.

- Assessment of local methods of harvesting, curing and clamp storage of sweet potato, including varietal differences, storage periods and losses, followed by on-farm trials of clamp design using locally available materials. Identification of post-harvest characteristics of imported and indigenous sweet potato varieties which are being currently multiplied.

- Improving communications between cassava processors and growers to improve farmer access to markets.

- Determination of losses and constraints during traditional preservation and marketing operations for selected perishable crops.

- Design and development of farm-level (and business centre) solar driers for tomatoes, mushrooms and mangoes to provide a product more suited to consumer taste.

- Identification of means through which communal farm contribution can be increased to the formal processing sector (to include sesame).

- Determination of the barriers to entry into markets for traders.

- Identification of the constraints on the development of the rural transport network.

- Long-term study to determine varietal susceptibility of sorghum to insect attack (and other post-harvest characteristics).

- Feasibility study of the use of medium-scale motorised oil extractors for use in rural areas.

- Program to monitor the economic efficiency of private markets for durable crops.

- Research into a system for monitoring reinstatement of informal markets after liberalisation.

- Survey of seed storage practices to determine viability problems in pulses, followed by on-farm trials of handling and storage techniques.

146. Based on the recommendations of this meeting, concept notes will be prepared for submission to ODA's Crop Post-Harvest Research Programme

BIBLIOGRAPHY

ABUELGASIM, E.H. (1987). *Developing sorghum and millet varieties adapted to low-risk and low-cost small farming conditions.* FAO/SIDA Seminar on Increased Food Production through Low-Cost Food Crops Technology. Harare, Zimbabwe, 2 - 17 March 1987.

AGRITEX/DR&SS (1988). *Cropping in the semiarid areas of Zimbabwe.* Proceedings of a workshop held in Harare, 24-28 August, 1987.

ARNAIZ, E.O., MERRILL-SANDS, D. M. and MUKWENDE, B. (1995). *The Zimbabwe Farmers' Union: its current and potential role in technology development and transfer.* Overseas Development Institute. Agricultural Research and Extension Network Paper.

BRATTON, M. and TRUSCOTT, K. (1985). *Fertilizer packages, maize yields and economic returns: an evaluation in Wedza Communal Land.* Zimbabwe Agricultural Journal: Vol. 82, No. 1, pp. 1-8.

CAMPBELL, B.M. (1987). *The use of wild fruits in Zimbabwe.* Economic Botany: Vol. 41, No. 3, pp. 375-385.

CASAVANT, K. (1995). *Agricultural Marketing Information Systems: Transportation Analysis in Zimbabwe.* Coopers and Lybrand mimeo.

CHIGARIRO, J. (1995). *Assessing grain marketing opportunities for the smallholder farmer under economic reform programme.* Draft Project Proposal, Institute of Agricultural Engineering, Harare, Zimbabwe.

CHIGUME, S. (1989). *Grain Marketing Patterns and Household Food Security in Low Rainfall Areas of Zimbabwe.* MPhil Thesis, Department of Agricultural Economics and Extension, University of Zimbabwe.

CHINWADA, P. (1995). *The importance of bean bruchids in small-farmer bean storage systems in Zimbabwe: Results of questionnaire surveys.* PPRI internal report, DR&SS, Harare.

CHINWADA, P. (1994). *The bean bruchids, Acanthoscelides objectus (Say) and Zabrotes subfasciatus (Boheman): distribution patterns in Zimbabwe, resistance levels in Phaseolus vulgaris L. (Common bean) lines and control.* Thesis submitted for MPhil degree at the University of Zimbabwe, August 1994.

CHINWADA, P. (in press). *The importance of bean bruchids in small-farmer bean storage systems in Zimbabwe: Results of questionnaire surveys.* PPRI internal report, DR&SS, Harare.

CHINWADA, P. and GIGA, D.P. (in press) *Sunning as a technique for disinfesting stored beans.*

CHINWADA, P. and GIGA, D.P. (in press) *Traditional seed protectants for the control of bean bruchids.*

CHISVO, M., JAYNE, T.S., TEFFT, J., WEBER, M., and SHAFFER, J. (1990). *Traders' Perception of Constraints on Informal Grain Marketing In Zimbabwe: Implications for Household Food Security and Needed Research.* In: Market Reforms, Research Policies and SADCC Food Security edited by Rukuni M. and Wyckoff J.B., University of Zimbabwe, Harare.

CHISVO, M. (1992). *An Analysis of the Impact of Grain Marketing Policy on Grain Market Distribution, Household Food Security, Incomes and Nutrition in Low Potential Communal Areas of Zimbabwe: Implications for Food Security and Nutrition Policy.* MPhil Thesis, Department of Agricultural Economics and Extension, University of Zimbabwe.

CHIUSWA, D.V., NAZARE, R.M. and MAZVIMAVI, K. (1994). *Strategy for the dissemination of the ram press technology.* Paper presented at the Ram Press Regional Workshop, Harare, November 1994.

COLLINSON, M.P. (1989). *Small Farmers and Technology in Eastern and Southern Africa.* Journal of International Development: Vol.1, No.1, pp. 66-82.

CONWAY, J.C. and TYLER, P.S. (eds.) (1995). *Practical implications of grain market liberalisation in southern Africa.* Proceedings of a workshop held in Harare, Zimbabwe, 18-20 October 1994. Natural Resources Institute, Chatham Maritime, UK.

COULTER, J. (1994). *Liberalisation of cereals marketing in sub-Saharan Africa: lessons from experience.* Marketing Series Vol. 9. Natural Resources Institute, Chatham Maritime, UK.

COULTER, J. and COMPTON, J.A.C. (1991). *Liberalisation of cereals marketing in sub-Saharan Africa: implementation issues.* Marketing Series Vol. 1. Natural Resources Institute, Chatham Maritime, UK.

CUTLER, P. (1986). *Food security in nine African countries: Botswana, Ethiopia, Ghana, Kenya, Mali, Sudan, Tanzania, Zambia and Zimbabwe.* Overseas Development Administration, London, UK.

DEVEREAU, A.D. (1994). *Tropical sweet potato storage: a literature review*. NRI Research Report. Natural Resources Institute, Chatham Maritime, UK.

DEVEREAU, A. D. (1996). *Fresh storage of sweet potatoes in Uganda: evaluation of on-station trials.* DRAFT NRI report. Natural Resources Institute, Chatham Maritime, UK.

GATA, N.R. and KATIVHU, A. L. (1991). *Research and documentation of indigenous science and technology for sustainable agriculture, food systems and natural resource management in Zimbabwe*. Proceedings of a workshop held at Chinhoyi, Zimbabwe, 11-15 July, 1991.

GATA, N.R. (1995). *Indigenous knowledge systems for sustainable natural resource management and farming systems, with special reference to southern Africa and in particular Zimbabwe*. Paper presented at the Regional Workshop o Indigenous Knowledge Systems (IKS) and Natural Resource Management in southern Africa, Kwazulu, Natal, South Africa, April 24-27, 1995.

GIGA, D.P. (1994) *Background information on post-production practices of small farmers in Zimbabwe*. In Annual Report on ECDGXII Project Contract TS3-CT92-0097, 1 April 1993 to 31 March 1994.

GIGA, D.P. and BISCOE, J. (1989). *Treating maize grain for storage with registered protectants in Zimbabwe: technical, practical and economic considerations.* The Zimbabwe Science News: Vol. 23, Nos. 10/12, pp. 101-103.

GIGA, D.P. and KATERERE, Y. (1986). *Rural grain storage in Zimbabwe*. African environment, ENDA, Harare, Zimbabwe.

GIGA, D.P., TEMBO, E., NEHUMAI, I. and MATARIRANO, L. (1988*). Grain storage in communal areas of Zimbabwe: results from a survey*. The Zimbabwe Science News: Vol. 22, Nos. 3/4, pp. 40-44.

GWARAZIMBA, V.E.E (1984). *The status of pearl millet in Zimbabwe and prospects for the future*. Zimbabwe Agriculture Journal: Vol. 81, No. 4, pp. 157-16

HEDDEN-DUNKHORST, B. (1990). *The Role of Small Grains in Semi-Arid Smallholder Farming Systems in Zimbabwe*. Mimeo, SADCC/ICRISAT, Matopos, Zimbabwe.

HORN, N.E. (1994) *Cultivating Customers: Market Women in Harare, Zimbabwe*. Lynne Rienner, Boulder, London.

HOUSE, L.R. and OBILANA, A.B. (1987). *Development of varieties for small farming conditions - sorghum*. FAO/SIDA Seminar on Increased Food Production through Low-Cost Food Crops Technology. Harare, Zimbabwe, 2 - 17 March 1987.

IVY, P. (1987). *Technical and environmental limitations to increasing food crop production under sub-humid and semi-arid east and southern African environments and possible solutions*. FAO, Rome, Italy.

JAYNE T.S. and CHISVO, M. (1990) *Zimbabwe's Grain Marketing Policy Challenges in the 1990s: Short Run vs. Long Run Option.* In: Food Security Research in Southern Africa: Policy Implications edited by Rukuni M. and Wyckoff J.B., University of Zimbabwe, UZ/MSU Food Security Research in Southern Africa.

JAYNE, T.S. and CHISVO, M. (1991), Unravelling Zimbabwe's Food Insecurity Paradox. *Food Policy*, Vol.16, No.5.

JAYNE T.S., CHISVO, M., HEDDEN-DUNKHORST, B., and CHIGUME, S. (1990). *Unravelling Zimbabwe's Food Insecurity Paradox: Implications for grain Marketing Reform.* In: Integrating Food, Nutrition and Agricultural Policy in Zimbabwe, Proceedings of the First National Consultative Workshop, Juliasdale.

JAYNE T.S., RUKUNI, M., HAJEK, M., SITHOLE, G. and MUDIMU, G. (1991). *Structural Adjustment, Maize Marketing and Food Security.* In: Zimbabwe in Toward An Integration National Food Policy Strategy, Proceedings of the Second National Consultative Workshop, Nyanga, June 1991, University of Zimbabwe Harare.

JAYNE, T.S. and RUBEY, L. (1993). Maize milling, market reform and urban food security: the case of Zimbabwe. *World Development*: Vol. 21, No. 6, pp. 975-988.

KLEIH, U. (1994). *Feasibility study of cassava production and marketing in Zimbabwe.* NRI Research Report No. R2100(S). Natural Resources Institute, Chatham Maritime, UK.

KOK, E. M., (1987). *Increased food production through low-cost crop technology - production and marketing of seed for the small-scale farming sector*. FAO/SIDA Seminar on Increased Food Production through Low-Cost Food Crops Technology. Harare, Zimbabwe, 2 - 17 March 1987.

MAKAYA, P. (1995) *Life after Death: The post-harvest characteristics of leafy brassicas var. Acephala grown in Zimbabwe and possible loss reduction interventions.* PhD Proposal, July 1995.

MAKAYA, P. (1995) *Quantification of horticultural production post-harvest losses in the communal areas of Mashonaland East Province*. Project Proposal, June 1995.

MANZUNGU, E. (1993). *What happens to sweet potatoes?* ILEIA Newsletter, Vol. 93, No. 3, pp. 20-21.

MARANGE, T. (1995). *The potential threat of the Larger Grain Borer (LGB), Prostephanus truncatus to the maize industry in Zimbabwe*. Dissertation submitted for the Postgraduate Diploma in Grain Storage Management. Natural Resources Institute, Chatham Maritime, UK.

MATARUKA, D.F. (1985). *Review of the constraints to maize production in the communal areas in Natural Regions III, IV and V*. Zimbabwe Agriculture Journal: Vol. 82, No. 5, pp. 171-175.

MAZVIMAVIK K. (1996). *Assessment of Household Grain Consumption, Grain Milling and Trading in Communal Areas of Natural Regions IV and V*", Report Prepared for ZGMAAR, Impact Assessment task A2, Phase IV; Probe Market Research (1995) Evaluation of Grain Market Reform Impact in the Semi-Arid Regions of Zimbabwe (Phase 3); Probe Market Research, and (1995) Evaluation of Grain Market Reform Impact in the Semi-Arid Regions of Zimbabwe (Phase 2) and Jimat Consult (Pvt) Ltd (1995) Pilot Study on Hammermillers for USAID and Status Study and Survey of Hammermillers for USAID.

MUKHERJEE, N. and MUKHERJEE, A. (1994). *Rural women and food insecurity: what a food calendar reveals*. Economic and Political weekly, March 12.

MUTIRO, C.F., GIGA, D.P. and CHETSANGA, C.J. (1992). *Post-harvest damage to maize in small farmers' stores.* Zimbabwe Journal of Agricultural Research: Vol. 30, No. 1, pp. 49-58.

MVUMI, B. M. and GIGA, D. P. (1994). *Residual effectiveness of pirimphos-methyl on maize in small farm stores*. Postharvest Biology and Technology: Vol. 4, pp. 353-36

MVUMI, B. M., GIGA, D. P. and CHIUSWA, D. V. (1996). The maize (*Zea mays* L.) post-production practices of smallholder farmers in Zimbabwe: findings from surveys. *Journal of Applied Science for Southern Africa*. (In press).

OLVER, R. C. (1987). *Development of maize varieties for small-scale farming conditions in Zimbabwe*. FAO/SIDA Seminar on Increased Food Production through Low-Cost Food Crops Technology. Harare, Zimbabwe, 2 - 17 March 1987.

OLVER, R. C. (1986). *The Zimbabwe maize breeding program*. In: To feed ourselves: a proceedings of the first eastern, central and southern Africa regional maize workshop. Lusaka, Zambia, 10 - 17 March 1985.

PPRI (1987). Annual Report 1986-87. DR&SS, Harare, Zimbabwe.

PPRI (1988). Annual Report 1987-88. DR&SS, Harare, Zimbabwe.

PPRI (1990). Annual Report 1989-9 DR&SS, Harare, Zimbabwe.

REYNOLDS, N. (1987). *A Diagnostic Study of Poverty, Economic Security, Resource Management, Financial Flows and Development Administration in Chikore: A Ward in Natural Region IV, Manicaland.* In: Cropping in Semiarid Areas of Zimbabwe, Proceedings of a Workshop sponsored by AGRITEX and German Agricultural and Rural Development Team, Harare.

ROHRBACH, D.D. (1989) *The Economics of Smallholder Maize Production in Zimbabwe: Implications for Food Security. Michigan State University International Development Paper No. 11.* Department of Agricultural Economics, MSU, East Lansing, Michigan;

RUKUNI, M. and EICHER, C. K. (1994). Zimbabwe's agricultural revolution.

RUKUNI, T. (1994). *Assessing the potential of using motorised threshers for service threshing in semi arid areas of Chiredzi.* Technology applications IDRC Project 92-8466 interim report. pp. 15-17.

RUKUNI, T. (1994). *The ram press study.* Technology applications IDRC Project 92-8466 interim report. pp. 41-58.

SCARBOROUGH, V. and KYDD, J. (1992*). Economic analysis of agricultural markets: a manual.* Marketing Series Vol. 5. Natural Resources Institute, Chatham Maritime, UK.

SPURLING, A., PEE, T.Y., MKAMANGA, G. and NKWANYANA, C. (1992). *Agricultural Research in southern Africa: a framework for action.* World Bank Discussion Paper, Africa Technical Department Series No. 184. The World Bank, Washington, USA.

STANNING, J. (1989) *Grain Retention and Consumption Behaviour among Rural Zimbabwe Households.* In Mudimu G. and Bernsten R. (eds.) Household and National Food Security in Southern Africa, Proceedings of the Fourth Annual Conference on Food Security Research in Southern Africa, UZ/MSU Food Security Research Project, Department of Agricultural Economics and Extension, Harare.

STANNING, J. (1989). *Smallholder maize production and sales in Zimbabwe: some distributional aspects.* Food Policy: August 1989.

SUBRAMANIAN, S., SADOULET, E. and de JANVRY, A. (1994*). Structural adjustment and agriculture: African and Asian experiences.* FAO Economic and Social Development Paper No. 124. FAO, Rome, Italy.

TAKAVARASHA, T. (1991) *Agricultural Pricing Policy for Zimbabwe* edited by Rukuni M. and Wyckoff J.B., University of Zimbabwe, UZ/MSU Food Security Research in Southern Africa

TAPFUMANEYI, L. (1993). *Cassava Production, Processing and Utilisation.* AGRITEX, Harare, Zimbabwe.

TAPFUMANEYI, L. (1995). *Cassava and cowpea utilisation for the 'small' farmer.* AGRITEX, Harare, Zimbabwe.

TEMBO, E. and MVUMI, B.M. (1995). *Efficacy of an organophostphate and organophosphate-pyrethroid combinations against stored maize insect pests.* Paper presented at the Research Co-ordination Meeting, 2 November 1995, Institute of Agricultural Engineering, Harare, Zimbabwe. COMMERCIAL IN CONFIDENCE.

TSHUMA, J. (1989). *A national survey of grain storage practices in Zimbabwe.* PPRI, Harare. DR&SS/AGRITEX report.

UTETE, D. and TEMBO, E. (1996). *Production and processing of vegetables and fruits in Zimbabwe: trends and status.* Paper presented at Workshop on Improving Supplies and Nutrition through Household and Village Level Processing and Preservation of Vegetables and Fruits in Eastern and Southern Africa, Harare, Zimbabwe, February 1996.

VAN DER GEEST, W. (1991). *Food security: the cereal market policy model - a non-technical introduction.* Working Paper No. 3. Food Studies Group, Oxford, UK.

VON BRAUM, J., BOUIS, H., KUMAR, S. and PANDYA-LORCH, R. (1992). *Improving food security of the poor: concept, policy and programs.* International Food Policy Research Institute, Washington DC, USA.

WEAVING, A.J.S. (1981). *Grain protectants for use under tribal storage conditions in Zimbabwe: evaluation of admixtures with maize stored in traditional grain bins.* Zimbabwe Journal of Agricultural Research: Vol. 19, pp. 205-224.

WHINGWIRI, E. E. and HARAHWA, G. (1985). *Maize varieties for the low-yielding environments in Zimbabwe.* Zimbabwe Agricultural Journal: Vol. 82, No. 1, pp. 29-3

WHINGWIRI, E.E., MASHINGAIDZE, K. and RUKUNI, M. (eds.) (1992). *Small-scale Agriculture in Zimbabwe: book two - field crop production.* Rockwood Publishers, Harare, Zimbabwe.

WHINGWIRI, E.E., RUKUNI, M., MASHINGAIDZE, K. and MATANYAIRE, C.M. (eds.) (1992). *Small-scale Agriculture in Zimbabwe: book one - farming systems, policy and infrastructural development*. Rockwood Publishers, Harare, Zimbabwe.

WOOLFE, J.A. (1992). *Sweet Potato: an Untapped Food Resource*. Cambridge University Press, Cambridge, UK.

ZINYAMA, L.M. (1988). *Commercialisation of small-scale agriculture in Zimbabwe: some emerging patterns of spatial differentiation*. Singapore Journal of Tropical Geography: Vol. 9, No. 2, pp. 151-162.

Annexe 1: Background information about Mutoko Central Communal Land

Mutoko Central is comprised of seven wards with a total area of 55,618 hectares and a resident population of 10,600 households.

Ward	Area (hectares)	Population (households)
Kabasa A	8,732	1,264
Kabasa B	9,501	907
Kawere	10,292	1,211
Maranga	7,645	1,258
Mbudzi A	5,251	1,914
Mbudzi B	9,023	1,624
Nyamukopa	5,174	2,400

(Source: AGRITEX, 1992)

The estimates for area planted in the 1995/6 growing season indicate that 14% of the total land area is under cultivation.

Crop	Estimated planted area (hectares)	As percentage of total area planted (%)
Beans	29	0.4
Cotton	0.8	-
Groundnuts	641	8.1
Maize	4,938	62.2
Mhunga (Pearl Millet)	796	10.0
Rapoko (Finger Millet)	141	1.8
Sorghum	1,169	14.7
Sunflower	228	2.9

(Source: AGRITEX estimates, 1995)

The soils of the area are mainly 5G group, of Koalinitic order, moderately shallow greyish brown, coarse grained sands, formed on granitic rock (light texture) (Surveyor General, 1979).

Other projects/donors working in this area are: ENDA; ARDA (marketing of horticultural crops); Japanese; DANIDA.

The assistance of the following AGRITEX staff is gratefully acknowledged.

Mr Yartz (Senior/District Agricultural Extension Officer, Mutoko)
Mr Vengesai (Agricultural Extension Officer, Mutoko)
Mr Moyo (Extension Worker Superviser, Mutoko)
Mr Gurumansi (Extension Worker, Kabasa B Ward)
Mrs Sengwe (Extension Worker, Mbudzi A Ward)
Mr Jokonya (Extension Worker, Kawere Ward)
Mr Mutete (Extension Worker, Nyamukopa Ward)
Mr Katsande (Extension Worker, Mbudzi B Ward)

Annexe 2: Background information about Zimuto Communal Land

Zimuto is comprised of four wards with a total area of 29,000 hectares and a resident population of 2,770 households (13,550 people).

Ward	Area (hectares)	Population (households)
Muyambe		492
Mushavhi		576
Mutonhodza		771
Zimuto		932
	(total: 29,000)	

(Source: CSO, 1992)

The estimates for area planted in the 1995/6 growing season indicate that 27% of the total land area is under cultivation.

Crop	Estimated planted area (hectares)	As percentage of total area planted (%)
Groundnuts	2,120	26.8
Maize	3,950	49.8
Rapoko (Finger Millet)	1,770	22.3
Sorghum	60	0.7
Sunflower	25	0.3

(Source: AGRITEX estimates, 1996)

The soils of the area are 5G group, mainly moderately shallow greyish brown, coarse grained sands throughout the profile, to similar sandy loams, over reddish brown sandy clay loams, formed on granitic rocks (Surveyor General, 1979). Zimuto Communal Land falls under NR III and IV.

Other projects working in the area include: IUCN (conservation and environmental projects); Aztrec (tree planting projects); EU (grazing programmes); Christian Care/EU (supplementary food production projects);

The assistance of the following AGRITEX staff is gratefully acknowledged:

Mr Danda (Chief Agricultural Extension Officer, Masvingo)
Mr Pamire (Provincial Agricultural Extension Officer, Technical, Masvingo)
Mr Vengesai (District Agricultural Extension Officer)
Mr Pofa (Agricultural Officer, Zimuto)
Mr Bakure (Extension Superviser, Zimuto)
Mr Muhwandarika (Extension Worker, Zimuto)

Annexe 3: Background information about Chivi South Central Communal Land

Chivi South Central is comprised of six wards with a total area of 88,816 hectares and a resident population of 8,624 households.

Ward	Area (hectares)	Population (households)
17	13,375	1,403
18	12,250	1,321
19	19,252	1,480
20	12,813	1,600
21	16,813	800
22	14,313	2,020

(Source: AGRITEX, 1995)

Early estimates for area planted in the 1995/6 growing season indicate that 16% of the total land area is under cultivation.

Crop	Estimated planted area (hectares)	As percentage of total area planted (%)
Cotton	122	0.8
Groundnuts	2,604	18.6
Maize	4,852	34.6
Mhunga	1,774	12.7
Rapoko	1,116	8.0
Sorghum	2,901	20.7
Sunflower	648	4.6

(Source: AGRITEX estimates, 1995. NB Good rains in early 1996 are likely to cause these estimates to be revised upwards by 20% for maize, 30% for groundnuts and 50% for sunflower)

The soils of the area are mostly 5G group, mainly moderately shallow greyish brown, coarse grained sands throughout the profile, to similar sandy loams, over reddish brown sandy clay loams, formed on granitic rocks. There are some areas of group 2, lithosol group, very shallow soils, less than 25cm deep, over weathering rock or gravel,, mixed with

group 4X, which are shallow to moderately shallow, brown or reddish clays, formed on ultramofic rocks and usually with inverse Ca/Mg ratios and often with toxic quantities of heavy metals (Ni and Cr) (Surveyor General, 1979). Chivi South Central Communal Land falls under Natural Region V.

Other projects working in this area are: ITDG (food security project); Lutheran World Federation (soil and water conservation project); World Vision (integrated agricultural project); Oxfam (water projects); GTZ/ITDG (seed multiplication project); Heifer Project (restocking); CARE International (soil and water conservation) and the EU (school development and dam construction).

The assistance of the following AGRITEX staff is gratefully acknowledged:

Mr Butaumocho (Acting District Agricultural Extension Officer, Chivi)
Mr Makonyere (Senior Agricultural Extension Officer, Chivi)
Mr Gwabwira (Extension Superviser, Chivi)
Mr Hamadziripi (Extension Worker, Ward 18)
Mr Mapepa (Extension Worker, Ward 21)
Mr Musengi (Extension Worker, Ward 22)

Annexe 4: Team working groups

On -farm working groups (each group consisted of two members who rotated on a daily basis)

Mr Tim Donaldson (Food Security Department, NRI)
Ms Tafadzwa Marange (PPRI, DR&SS)
Ms Veronica Mutikani (AGRITEX)
Mr Brighton Mvumi (IAE, AGRITEX)
Mr Ngoni Nenguwo (HRC, DR&SS)

Marketing working group

Ms Vanessa Scarborough (Research Fellow, ODI)
Mr Ephraim Zimhunga (PPRI, DR&SS)

Literature review group

Dr Anne Turner (Crop Science Department, UZ)

Annexe 5: On-farm questionnaire/checklist

Field Crops - Questions for farmers *(with examples of what areas to cover and probe)*

1. Which food crops are grown? Why?
   (maize, sorghum, millet, pulses, sunflower, groundnuts)

2. Which varieties are grown?

3. Why are they grown?
   (taste, processing, sale, beer)

4. What is the one problem you would most like to resolve for each crop from the time you plant it to the time it is eaten or sold?

5. When are they harvested? Is this the best time?
   (month)

6. How are they harvested?
   (left in field for x months, stooked for x weeks, carried by, ox cart to homestead)

7. How is each crop prepared for storage?
   (dried, shelled, threshed, winnowed)

8. What are the main post-harvest constraints?
   (poor storage facilities, lack of credit, low market prices after harvest)

9. Which crops are stored and for up to how long (months) is each crop stored?
   (Is this because it is finished, or does storage become difficult after this?)

10. When does storage begin?
    (month)

11. How frequently are removals from the store made?

12. How much is taken out each time?

13. What proportion of the crop is used at home for consumption?
    (x% or number of bags)

14. What, apart from food, is the crop used for?
    (sale, beer, peanut butter, gifts.....)

15. If any is sold, when is it sold and at what frequency?
(Why, how is decision made, source of info, to whom, where, for what reason, if sold off-farm how is it taken there, what costs are involved)

16. How is each crop stored? What type of container? Describe it?

17. How durable is the store - how many years will it last?

18. What is the store built from?
(mud, brick, cow dung, wooden poles, grass - pictures and/or drawings of storage containers)

19. What problems are found during storage?
(drying, insects, storage materials unavailable, cost....)

20. What level of loss is sustained during storage?
(x%)

21. What causes the losses and what proportion?
(insects rodents, mould, mechanical damage.....)

22. What do you do to prevent losses?
(insecticides. types, plant leaves, seeds, kernels, ash, oil, cat.....)

23. How are these methods applied, in what quantities?

24. How effective are these measures?

25. Are you satisfied that you are protecting the crop as best as possible?

26. Are there any measures you would like to take to improve the quality or reduce the losses but which you cannot afford or do not possess the technology.

27. Do you receive any advice of measures to protect the crop in store?
(How good is the advice, have you tried to adopt it, what was the result, if not why)

28. From who? How often?

29. Where do you obtain your seed?
(markets, friends, kept from last harvest)

30. How do you treat/select your seed?
(select straight after harvest/just before planting, kept in a container, insecticides)

31. What are the main problems you have with your seed?
(Prices, supply/access, quality)

Horticultural and Root Crops - Questions for farmers ***(with examples of what areas to cover and probe)***

1. Which food crops are grown?
(onion, tomato, mango, rape, sweet potato, cassava)

2. Which varieties are grown?

3. Why are they grown?
(taste, processing, sale, handling?)

4. What are the main constraints to production?
(weather, pests, input supply, funds/credit)

5. When are they harvested? How do you know they are ready for harvest?

6. How are they harvested and packaged during transport?
(left in field for x months, carried by, ox cart to homestead)

7. How is each crop prepared for storage?
(sun-dried, dried, chipped.....)

8. What are the main post-harvest constraints?
(storage facilities, credit, market prices)

9. Do you grade your own produce?

10. Which crops are stored and for how long (months) is each crop stored?

11. When does storage begin?

12. How is each crop stored? What type of container? Describe it?

13. How long can you store sweet potato?

14. Which varieties store better?

15. What problems are found during storage?
(drying, insects, storage materials unavailable, cost....)

16. What level of loss is sustained prior to sale?
(x%)

17. What do you do to prevent losses?
(plant leaves, kernels, ash, oil,.....)

18. What is the grade out % of the crops you sell?
19. Are there any measures you would like to take to improve the quality or reduce the losses but which you cannot afford or do not possess the technology.

20. Do you dry any produce?

21. Describe how you prepare for drying.

Annexe 6: Marketing questionnaire/checklist

Questions for traders

1. What crops do you store?
2. For how long do you store each one?
3. What type of storage structure/containers do you use?
4. What problems do you encounter during storage?
5. How do you tackle these?
6. Do you use insecticides at all or fumigation?
7. Give details of methods of pest control you use?
8. What would you like to do or have to help you improve storage?
9. Do farmers ever sell you insecticide treated or fumigated produce?
10. How do you finance your trade?
11. What is your weekly/monthly turnover?
12. What markets do you sell to?
13. Which markets do you buy from?
14. Do you use agents, how many?
15. What arrangements do you have with them?
16. Do you operate alone or in partnership?
17. How many agents usually buy from these markets?
18. What are your costs?
19. What prices are you buying and selling?
20. For how many years have you been trading?

21. What did you do before?

Questions for processors

1. What crops do you process?
2. Do you buy and sell on your own account or provide a processing service only?
3. How long have you been in the business?
4. What were you doing before?
5. Why choose the processing business? Why choose this location?
6. How did you meet initial capital investment?
7. How did you learn about the business?
8. Who are you buying from/selling to?
9. What are the difficulties in buying/selling?
10. What are the costs and returns involved? Per unit and annually? Throughput?
11. Seasonality?
12. Competition? Expansion/diversification plans? Is this your sole business or do you have others? Constraints/problems?
13. Do you have any credit facilities/loans?

Annexe 7: Areas visited and people interviewed

Mutoko Central Communal Land

Mbudzi A Ward

Mbudzi B Ward

Kabasa B Ward

Kawere Ward

Chivi South Central Communal Land

Ward 18

Ward 21

Ward 22

Zimuto Communal Land

Munyambe Ward

Mushazuhi Ward

Mutonhodza Ward

Zimuto Ward

Traders etc.

4 communal and 1 small-scale commercial farmers in Mutoko, 2 communal farmers in Zimuto and 2 communal farmers in Chivi.

8 horticultural producers/traders in Mbare Msika, 3 grain retailers in Mbare Msika, 1 independent grain wholesaler in Masvingo, 2 previously approved GMB agents in Mutoko and Chivi and the Masvingo Co-operative Union.

National Foods, Masvingo and Harare, Agrifoods, Masvingo and Harare, 1 small hammer miller in Harare suburbs and Cairns Food Products, Harare.

1 private transporter in Masvingo. ZIMACE brokers, GMB Head of Planning, Harare and Depot Manager, Masvingo.

USAID, Coopers and Lybrand GMRR Project Manager, Ministry of Agriculture Chief Economist, Economics and Markets, Harare City Council Mbare District Market Officials, World Bank.