

PART 1 INTRODUCTION

1.1 Authority

This is the Final Report of the Feasibility Study on the Lower Munyati River Basin Agricultural Development Project (hereinafter referred to as "the Study") which was prepared in accordance with the Scope of Work (hereinafter referred to as "S/W") agreed upon between the Government of the Republic of Zimbabwe (hereinafter referred to as "GOZ") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 15th April 1998. The S/W and the Minutes of Meeting on S/W are attached to this report as Attachment 1 and 2, respectively.

This report presents the result of the Phase-I Study Work in PART 3 "Agricultural Development Plan in the Kudu Dam Irrigation Project", and the result of the Phase-II Study Work in PART 4 "Agricultural and Rural Development Plan in the Nyarupakwe Pilot Project". The report consists of three volumes, Main Report, Appendixes and Drawings. The Appendixes and Drawings support the Main Report and contain the detailed data and information collected and the result of analyses of concerned sectors.

1.2 Background of the Project

In Zimbabwe, the agricultural sector is the most important sector for the country, since it provides employment for approximately 70% of the population. The sector contributes 60% of the raw materials required by the manufacturing sector and 40% of total export income. The importance of the agricultural sector is highlighted and emphasized not only the Second Five-Year National Development Plan (1991-1995) but also in the Zimbabwe Program for Economic and Social Transformation 1996-2000 (ZIMPREST) which were formulated under the framework of the Structural Adjustment Programme of World Bank and IMF. Agricultural sector, especially small-scale agricultural sector development is emphasized in "Zimbabwe Agricultural Policy Framework: 1995-2020" which indicates basic agricultural policies for the next 25 years.

On the basis of rainfall, soil, and vegetation, farmland in Zimbabwe is classified into five natural regions (NRs) from NR I to NR V. On the basis of land holding, it is divided into four subsectors, such as communal land, resettlement land, small-scale commercial farm and large-scale commercial farm. Only 19% of total farmland is classified as NR I and II and almost 63% of this high potential land is occupied by large-scale commercial farms. Almost 80% of irrigated land in the country is in commercial farms. This highly skewed land distribution pattern causes many problems. About 80% of all the national land are located in the semi-arid zone,

which receives less than 650mm of annual rainfall. Extensive rainfed farming and pasture livestock rearing are conducted in these areas, but farming in these areas is easily damaged by drought because of unstable rainfall pattern. Recently, droughts occurred almost every five years and damaged communal and resettlement lands, in which adequate irrigation systems had not been developed. Under these circumstances, irrigation development in communal and resettlement lands is given high priority to improve the economic welfare of smallholder farmers.

In pursuance of government policy to develop smallholder irrigation and agricultural development, the Kudu Dam Project in the Munyati River has been planned since the 1960s. The GOZ conducted a feasibility study to evaluate technical and economical suitability of the Kudu Dam. After the feasibility study, detail design of dam itself was carried out with Zimbabwean budgetary resources in 1993. However, the required study on agricultural development plan in the benefited area of the Kudu Dam Irrigation Project had not been undertaken. The GOZ made a request to the Government of Japan (GOJ) to carry out a Master Plan Study on March, 1991. In response to the request of the GOZ, the Master Plan Study on the Lower Munyati Basin Agricultural Development was conducted from 1994 to 1995 taking account of three development scenarios, namely one case with Kudu Dam and two cases without Kudu Dam. The Master Plan Study concluded to promote the agricultural development in the Lower Munyati River Basin by the scenario with construction of the Kudu Dam. Considering the result of the Master Plan, the GOZ requested technical cooperation with regard to the Feasibility Study on the Kudu Dam Irrigation Project to the GOJ. In response to this request, the GOJ dispatched a preparatory study team and had a series of discussions with the GOZ on the Scope of Work (S/W) for the Feasibility Study on the Lower Munyati River Basin Agricultural Development Project. As a result of these discussions, both sides agreed on the S/W on 15th April 1998.

1.3 Objectives of the Study

The objectives of the Study are:

- (i) to conduct the Feasibility Study on the Lower Munyati River Basin Agricultural Development Project in order to formulate the irrigation and drainage plan and the agricultural development plan for the Communal Area and Resettlement Area in the Lower Munyati River Basin,
- (ii) to select priority project area(s) and to formulate the irrigation canal construction plan and the agricultural development plan for the priority project area(s), and
- (iii) to carry out, in the course of the Study, technology transfer to counterpart personnel of Zimbabwe.

1.4 Study Area

The Study Area covers:

- (i) Kudu Dam and two main irrigation canals, and
- (ii) approximately 14,700 ha of proposed irrigation land in the Communal Area and Resettlement Area in the lower Munyati River Basin.

1.5 Activities of the Study Team

The activities of the JICA Study Team consisted of two stages: Phase I Study Work for the Kudu Dam Irrigated Agriculture Development Project and Phase II Study Work for the Nyarupakwe Pilot Project as summarized below.

(1) Phase I Study

(a) Preparatory Work

For smooth and efficient execution of the Study, the following works were carried out in Japan at the beginning of October 1998 prior to the departure of the Study Team to Zimbabwe:

- (i) Examination of available data,
- (ii) Preparation of a Plan of Operation, and
- (iii) Preparation of the Inception Report.

A meeting was held on October 14, 1998 between the JICA Advisory Committee and the Study Team to discuss the contents of the Inception Report, mainly for the plan of operation and work schedule for the field survey.

(b) First Field Work

The Leader of JICA Study Team arrived in Harare on October 18, and had the inception meeting with the Inter-Ministerial Committee on October 20, 1998. The Inception Report was basically accepted by the Government of Zimbabwe and the Minutes of Meeting was signed as agreed between the Chairman of Inter-Ministerial Committee and the Leader of the JICA Study Team on October 23, 1998, which is attached to this report as Attachment 3.

After this meeting, the JICA Study Team commenced field work in close cooperation with Zimbabwean Counterparts. Performance of the JICA Study Team in the First Field Work period is outlined as follows:

- (i) Collection and review of the existing data and information in all fields,
- (ii) Social environmental survey (on subcontract to Scott Wilson Zimbabwe Pvt. Ltd.),
- (iii) Soil survey (on subcontract to Scott Wilson Zimbabwe Pvt. Ltd.),
- (iv) Construction material investigation of Kudu Dam (on subcontract to Northern Testing Laboratories),

- (v) Laboratory analysis of water quality (on subcontract to Government Analyst Laboratory),
- (vi) Water resources and water use survey,
- (vii) Agricultural survey,
- (viii) Marketing survey;
- (ix) Irrigation and drainage survey,
- (x) Rural infrastructure survey,
- (xi) Rural society survey,
- (xii) Agricultural Support Services Survey,
- (xiii) Environmental survey,
- (xiv) Public consultation meeting,
- (xv) Preliminary study on water source development, and
- (xvi) Formulation of a basic development concept and provisional selection criteria of priority area(s).

The results of these surveys and studies were compiled in the Progress Report (I), which was submitted to the Government of Zimbabwe on March 4, 1999. In order to discuss the contents of the Progress Report (I), a meeting was held between the Inter-Ministerial Committee and the Study Team on March 11, 1999. The Minutes of Meeting on the Progress Report (I) was signed as agreed between the Chairman of Inter-Ministerial Committee and the Leader of the JICA Study Team on March 12, 1999, and is attached as Attachment 4.

(c) Supplemental Field Survey

According to the original work schedule in the Inception Report, the aerial photography was scheduled for November 1998. However, aerial photo shooting could not be done due to continuous cloudy and rainy days at that time in and around the Study Area and was postponed until April 1999. Based on the aerial photograph, the digital orthophoto map (scale 1: 15,000, main contour interval 5m and intermediate contour 2.5m) was prepared at the end of May 1999.

In order to confirm main irrigation canal routes and irrigation areas which were proposed in the Progress Report (I), supplementary field work in Zimbabwe was conducted with the above orthophoto map in hand from beginning to mid-June 1999.

(d) First Home Office Work

The home office work of the Phase I Study was carried out in Japan from mid-June to the end of July 1999. The work included the following:

- (i) Review and analysis of the data and information collected in the field surveys,
- (ii) Study on water resources development for optimization of Kudu Dam

scale,

- (iii) Formulation of agricultural development plan in Kudu Dam Irrigation Project including land use/allocation plan, proposed cropping pattern and farming practices, plan for strengthening agricultural support services, irrigation and drainage plan, rural infrastructure plan and environmental conservation plan,
- (iv) Plan for project implementation and organization,
- (v) Preliminary estimates of the project costs,
- (vi) Project evaluation, and
- (vii) Selection of the pilot project area.

The results of these works were compiled into the Interim Report which was submitted to GOZ through JICA in August 1999.

(2) Phase II Study

(a) Second Field Work: Explanation and Discussion of the Interim Report

A meeting was held between the Inter-Ministerial Committee and the JICA Study Team on September 9, 1999 in Zimbabwe to explain and discuss the contents of the Interim Report. The Minutes of Meeting on the Interim Report was signed by the Chairman of Inter-Ministerial Committee and the Leader of the JICA Study Team on September 16, 1999, and is attached as Attachment 5.

(b) Second Home Office Work

Using the aerial photograph and orthophoto maps which were prepared during the Phase-I Field Work, the following topographic maps were prepared by the JICA Study Team in Japan:

- (i) Mapping area : Proposed main irrigation canal routes – about 90 km²
(180km x 500m)
Selected pilot project area – about 2.5 km²
- (ii) Mapping scale : 1 : 5,000
- (iii) Counter interval: Index contour – 2 m, Intermediate contour – 1 m (in flat land)

(c) Third Field Work

With the assistance of topographic maps prepared in Japan, the JICA Study Team conducted the field surveys mainly for the Nyarupakwe Pilot Project Area in close cooperation with Zimbabwean Counterparts for five months from the middle of January to the middle of June 2000. Performance of the JICA Study Team in the Third Field Work is outlined as follows:

- (i) Longitudinal and cross section survey of main irrigation canals from Kudu dam (on subcontract to Digital Topographic Mapping Services, DTM)

- (ii) Sampling of water for water quality analysis (analysis was done in Japan)
- (iii) Participatory Social environmental survey (on subcontract to Intermediate Technology Development Group)
- (iv) Geological core-boring and soil mechanical investigation of Nyarupakwe dam (on subcontract to Northern Testing Laboratories/Geotechnical Services)
- (v) Attending Public Hearing Meetings at Nyarupakwe area
- (vi) Field survey in and around the Nyarupakwe Pilot Project Area
 - Water resources survey
 - Land use survey
 - Cropping pattern and farming practices survey
 - Agricultural technology and extension survey
 - Farm economy survey
 - Livestock survey
 - Irrigation and drainage survey
 - Farmers' organization survey
 - Marketing survey
 - Rural infrastructure survey
 - Environmental conservation survey
- (vii) Formulation of basic development plan for Nyarupakwe Pilot Project
 - Water resources development plan
 - Agricultural development plan
 - Irrigation and drainage development plan
 - Livestock development plan
 - Rural infrastructure development plan
 - Agricultural support services
 - Environmental mitigation and management plan

At the end of the field work, the JICA Study Team prepared the Progress Report(II) and had a meeting on this report with the GOZ on 8 June 2000. The Minutes of Meeting on the Progress Report(II) was signed as agreed between the Chairman of Inter-Ministerial Committee and the Leader of the JICA Study Team on 12 June 2000, and is attached as Attachment 6.

(d) Third Home Office Work

The third home office work of the Phase-II Study was carried out in Japan from June to August 2000. The work included the following:

- (i) Formulation of development plan of Nyarupakwe Pilot Project
 - Water resources development plan
 - Agricultural development plan
 - Livestock development plan
 - Irrigation and drainage development plan

- Rural infrastructure development plan
 - Institutional strengthening plan
 - Plan for strengthening of agricultural support services
 - Environmental mitigation and management plan
 - Proposed organizational set-up for project implementation and O&M
- (ii) Evaluation of Nyarupakwe Pilot Project
- Estimation of project cost and benefit
 - Implementation plan
 - Project Evaluation
- (iii) Finalization of agricultural development plan in Kudu Dam Irrigation Project
- Water resources development plan
 - Review of Kudu Dam design
 - Agricultural development plan
 - Irrigation and drainage plan
 - Design of main irrigation canal
 - Institutional strengthening plan
 - Plan for strengthening of agricultural support services
 - Environmental mitigation and management plan
 - Proposed organizational set-up for project implementation and O&M
- (iv) Evaluation of Kudu Dam Irrigation Project
- Estimation of project cost and benefit
 - Implementation plan
 - Project Evaluation
- (v) Preparation of recommendations of Kudu Dam Irrigation Project and Nyarupakwe Pilot Project
- (vi) Preparation of Draft Final Report
- (vii) Preparation of Guideline for Formulation of Irrigation Project
- (e) Forth Field Work

A meeting was held between the Inter-Ministerial Committee and the JICA Study Team on October 10, 2000 to explain and discuss the contents of the Draft Final Report. The Draft Final Report was basically accepted by the Inter-Ministerial Committee and the Minutes of Meeting was signed as agreed between the Chairman of Inter-Ministerial Committee and the Leader of the JICA Study Team on October 13, 2000, which is attached to this report as Attachment 7. On 12 October 2000, a seminar was held at Kadoma Hotel to transfer technical skills and practical knowledge to the counterpart personnel and officials concerned of the Government of Zimbabwe. In the seminar, the result of the feasibility study was explained and the guideline for participatory survey for formulation of irrigation development plan was used as the material of the seminar.

(f) Forth Home Office Work

On the basis of the comments on the Draft Final Report from the Government of Zimbabwe, the Final Report was prepared with necessary modification in the middle of November 2000.

Transfer of knowledge to the counterparts was undertaken through on-the-job training in the course of the data collection and analysis, field surveys, and also through discussions on the survey methodology, the results of the field surveys and preliminary basic concept of the pilot project. The JICA Study Team and the counterpart personnel who took part in the Phase II Third Field Work are shown in Table 1.5.1. In addition to the above, two (2) counterpart personnel, Mr.A.Dube (Senior Irrigation Specialist of AGRITEX Midlands Provincial Office) and Ms.E.R.Ndoro (Senior Agricultural Extension Officer of AGRITEX Kadoma District Office), participated in the preparation of the Interim Report in Japan in July and August 1999 as part of the training program for counterpart personnel provided by JICA.

PART 2

GENERAL ECONOMIC CONDITIONS AND AGRICULTURAL BACKGROUND

2.1 General Macroeconomic Conditions and Recent Developments

2.1.1 GDP and Per Capita Income

Zimbabwe's GDP in 1998, the most recent year for which data is available is estimated at Z\$ 133.9 billion at current market prices. This translates to a per capita income of Z\$ 1,543. The 1998 per capita income if expressed in terms of US dollars represents a sharp decline over 1997 because of the depreciation of the Zimbabwean dollar from December 1997 to December 1998 of about 100%. Zimbabwe has also been experiencing very high rates of inflation since the beginning of 1998, and this has also resulted in the reduction in purchasing power for the average consumer as increases in incomes have not kept pace with the price increases of goods and services.

Most Zimbabweans earn considerably less than the average per capita income because income distribution is highly skewed. This is due to the dualistic structure of the Zimbabwean economy that comprises a fairly modern commercial farming, manufacturing and mining sector on the one hand, and a rural peasant sector with low productivity and heavy population pressure.

The Zimbabwean economy like many other African economies is highly diversified with manufacturing as the largest productive sector accounting for about 25% of GDP followed by agriculture at around 15% and mining and quarrying accounting for about 7% each. The service sector accounts for the balance, with distribution, hotels and restaurants, public administration and transport and communications contributing substantially to GDP. The most important manufacturing industries are basic metal and metal products, clothing, textiles, food processing and chemicals. The manufacturing sector is the second largest source of formal employment after agriculture and accounts for 15% of the workforce.

2.1.2 Recent Developments

The rate of growth of the economy in the 1980s averaged around 2.5% per annum, reasonably contributed by all sectors, although it was characterised by high variability, reflecting the economy's vulnerability to uncertain weather conditions. In spite of substantial progress made in the social sectors, overall economic growth barely kept pace with the rate of population increase. In addition, growth in employment did not keep pace with the increase in the labor force. Increased government spending associated with a near stagnant economy led to recurring large fiscal deficits in the late 1980s.

Zimbabwe launched its Economic Structural Adjustment Program(ESAP) in 1991. The objective of ESAP was to stabilize the macro-economy and improve the

investment climate with a view to ensuring sustained income and employment growth. Specific goals of ESAP were (a) fiscal deficit reduction and monetary reform: (b) trade and foreign exchange regime liberalization: (c) deregulation of private sector activities, lifting of price controls and restrictions on investment licensing: (d) sector specific policy reforms: and (e) measures to ease the impact of reforms on more vulnerable groups.

The performance of the economy was favorable in the very first year of ESAP but was followed by a severe drought in 1992 that lowered output by 6% and GDP by 10%. The economy recovered somewhat in the next three years when growth averaged 4.0% per year. However, beginning 1997, growth performance has been disappointing due to a sharp deterioration in overall economic conditions. This is largely due to the persistent and large fiscal deficits that have reinforced inflationary pressures in the economy and have kept interest rates high, thereby preventing improved economic performance. The current account deficit in 1997 was a high 9.2% of GDP and was hardly changed in 1998 at 9.1%. Annual inflation since 1998 has been reaching over 50% according to official estimates. Since 1998 there was also renewed pressures on the exchange rate due to poor balance of payments performance caused by high import demand and poor export performance. A negative balance of payments coupled with high domestic inflation put pressure on the exchange rate leading to a sharp deterioration of the Zimbabwean dollar which moved from 18.6 to the US\$ in 1997 to 36.1 in 1998. Since 1998 the Zimbabwean dollar has been managed at around US\$1=38.0, although the unofficial rate indicates an overvaluation of around 60%.

Key Economic Indicators

	1993	1994	1995	1996	1997	1998
GDP at Current Prices (US\$Mill)	6,563	6,891	7,134	8,545	8,906	9,084
GDP of which:	100	100	100	100	100	100
Agriculture	13.7	17.1	13.5	19.7	16.2	-
Industry	30.5	29.2	25.6	22.1	21.9	-
Services	47.2	43.8	49.3	46.9	48.7	-
Exports (US\$Mill)	1,061.1	1,600.4	1,920.3	2,496.6	2,424.6	1,156.0
Imports (US\$Mill)	996.4	1,461.7	1,844.0	2,247.0	2,654.0	2,335.3
GDP Growth (%)	1.3	6.8	-0.7	7.3	2.4	1.2
GDP/capita (US \$)	520	500	540	610	670	-

2.2 National Development Goals and Policy

The economic performance under ESAP was well below expectations due to adverse weather conditions in 1992 and 1995 and only partial implementation of the structural reforms. The government in 1996 outlined its development objective in ZIMPREST (Zimbabwe Program for Economic and Social Transformation 1996-2000). The fundamental government development objective of ZIMPREST is "to achieve a sustained high rate of growth and speedy development in order to raise

incomes and standards of living of the peoples, and expand productive employment of rural peasants and urban workers, especially the farmer". The main goals were:

- (a) Urgent restoration of macroeconomic stability (low inflation and interest rates, stable exchange rate);
- (b) Facilitating public and private savings and investment needed to attain growth;
- (c) Pursuing economic empowerment and poverty alleviation by generating employment opportunities;
- (d) Investing in human resource development; and
- (e) Providing a safety net for the disadvantaged.

Within these broad objectives, the policy is designed to aim for:

- (i) Minimum target reduction in the government budget deficit from nearly 10% of GDP to under 5% and a decline in inflation to single digit level,
- (ii) Sustained improvement in savings and investment performance to an average level of at least 23% of GDP,
- (iii) Growth in exports of at least 9% per annum, and
- (iv) Maximization of employment.

Since the launching of ZIMPREST, there was a marked deterioration in the overall economic situation. Economic growth in 1998 was barely 1%. High domestic credit expansion, reflecting both public and private sector borrowing, witnessed an increase in money supply well in excess of desired economic activity. High rates of inflation were also reinforced by the impact of currency depreciation. Poor balance of payments performance caused by high import demand and poor export performance saw renewed and persistent pressures on the exchange rate. The current account deficit worsened and reached almost 10% of GDP in 1998, well in excess of the goals set in IMPREST. Inflation reached annual levels of over 60% compared to the ZIMPREST goal of single digit inflation and the exchange rate (US\$ = Z\$) moved from 18.6 to 36.1 within a space of the 12 months in 1998. External debt as ratio of GDP rose from 59% in 1997 to 78% in 1998 and 82% in 1999 and the debt service ratio increased from 17% in 1997 to 20% in 1998 and 22% in 1999.

The investment climate also suffered during the past two years due to the issue of land ownership of the large commercial farms. Prices of essential consumer goods rose sharply and frequent shortages were experienced, especially of petroleum products. Trade union activity intensified due to wage demands in the face of high rates of inflation. These and other issues remain unresolved and the newly elected government needs to address major economic and social issues if the economic and investment climate is to improve and economic growth restored.

2.3 Agriculture Sector

The agriculture sector contributes only about 15% of GDP, but despite its relatively small share, it provides about 70% of total employment and about 40% of

merchandise exports in a normal year. In addition, about 60% of manufacturing value added is related to agro-industry or the provision of inputs to agriculture. Many services, including a sizeable proportion of domestic trade are associated with agriculture. Growth in the agriculture sector, though highly variable, has on average, been modestly growing at around 2.4% per annum over the last decade, well below the 3.0% rate of increase in population.

Agricultural land accounts for 85% (32.7 million ha) of the total land area of the country that includes 2.4 million ha of crop land and 30.4 million ha of rangeland. Farming is carried out in two contrasting and distinct subsectors : (a) the modern large scale commercial subsector (LSCS); and (b) the small holder subsector comprising mainly subsistence farming in the communal and resettlement areas as well as small holder commercial production.

Size Characteristics of Farms

Farming Sector	Number of Farms Units	Average Farm Size (ha)	Total (mill. ha)
Communal Areas	1,000,100	16	16.35
Resettlement Areas	63,000	60	3.79
Small Scale Comm.	8,500	124	1.38
Large Scale Comm.	4,600	2,700	11.22

The historical basis for the difference is the colonial period when large areas of the more productive agricultural land were acquired by legislation and reserved for the white minority population. The large scale commercial sector currently consists of 4,600 farms with average size of farm of 2,700 ha. This subsector accounts for about a third of the total farm area in the country and adopts technologically advanced farming practices and is an intensive user of purchased farm inputs. These commercial farms are mainly in the higher potential areas. These 4,600 farms support a population of 1.6 million, including permanent farm workers and their families. About 500,000 ha are cropped annually in this subsector, and this subsector produces half the national maize and cotton crops and almost all the tobacco and accounts for about one quarter of the national cattle herd. This subsector is also a major contributor to the export trade in fresh cut flowers, fruits and vegetables.

There are three subgroups in the smallholder subgroup: the small-scale commercial sector (SSCS), the resettlement areas (RS), and the communal areas (CA). The CA's are the largest group and represent the former Tribal Trust Lands reserved for the African population during the colonial period. CA's account for about three fourths of the smallholder sector and occupy 16.4 million ha. These are located in regions with poor soils and low and more erratic rainfall. They also have about one million households or 60% of the country's population. The SSCS mainly comprise the former African Purchase Areas with about 8,500 commercial farms and an average farm size of 124 ha. The resettlement areas are land acquired from the large commercial farms for redistribution to individual small holders. There are an estimated 63,000 farms with an average size of 5 ha. The land tenure system in the

CA's are governed by customary laws, though legally all land belongs to the State. These laws involve customary rights to use of land by individuals or families and are also inheritable within limits. Farmers in CA's also have access to communal grazing area to support their livestock.

2.4 Agricultural Policy Framework

Prior to ESAP and the 1992 drought, the overall objectives of the Government for the agricultural sector were reflected in policy statements and the five year development plans. The major objectives were to: (i) to increase food production to meet domestic requirements; (ii) expand exports to create more foreign exchange; (iii) ensure an adequate supply of raw materials for the industrial sector; and (iv) create additional employment. A feature of government agricultural policies until ESAP was the extensive regulation of commodity prices and marketing. Producer and consumer prices for all the major agricultural commodities were administratively determined, inputs were subsidised and public sector marketing agencies enjoyed a monopoly in respect of the main crops.

Under ESAP, there was a progressive de-regulation of the marketing system. The major changes were as follows:

- (i) Conversion from a system of controlled producer and consumer prices to market determined prices for all formerly controlled products;
- (ii) Deregulation of statutory marketing controls and competition between marketing boards and private traders;
- (iii) Opening of import and export trade to private traders. However, trade in maize and wheat continues to be regulated and monitored for food security reasons;
- (iv) Restructuring of marketing boards with a view to commercialization with the Cotton Marketing Board (COTCO), the Dairy Marketing Board (Dairibord) and the Cold Storage Corporation (CSC) now being registered companies and the Grain Marketing Board commercializing its activities.

With these liberalization measures under ESAP, the overall objectives of Government's agricultural policy as outlined in the Zimbabwe Agricultural Policy Framework 1995-2020 are:

- (a) To transform small holder agriculture into a fully commercial farming system;
- (b) To achieve an increase in total agricultural production that is significantly larger than the increase in population;
- (c) To fully develop physical and social infrastructure in all rural areas; and
- (d) Develop fully sustainable farming systems, which reverse environmental degradation and soil erosion.

The short and medium term goals are to double grain yields on small holder farms, move smallholders to produce high value commodities, improve women's participation, reform public sector agricultural institutions, increase small holder

irrigation by 40,000 ha and improve efficiency of water use.

2.5 Irrigated Agriculture and Smallholder Irrigation

Irrigation plays an important role in commercial agriculture in Zimbabwe. Virtually all sugar and wheat are grown under irrigation while tobacco, cotton, soybeans, and horticultural crops grown on large commercial farms rely heavily on irrigation. Irrigated agriculture accounts for a large proportion of total production of large-scale commercial farms. Irrigation also accounts for about 50% of all agricultural production entering the market.

Government recognized the role that irrigation could play and placed high priority on water development, especially dam construction. Even during the colonial era, incentives were provided to large-scale commercial farmers for development of irrigation and this was a critical factor contributing to the success of large-scale agriculture in the colonial era. Government also recognized the role irrigation could play in food security, income generation and employment creation and has carried out a program for development of small-scale irrigation schemes. These were initially constructed to assist in settling small holders displaced by new large-scale commercial farms.

Approximately 155,000 ha are under irrigation. Of this, about 125,000 ha are in 1,500 large scale commercial farms and are served by over 5,000 private dams. Large commercial farms also have access to government established irrigation systems. The Agricultural and Rural Development Authority (ARDA) that manages estates has irrigation covering 13,000 ha in 26 estates. The farming operations of small-scale irrigators account for a further 3,600 ha.

There are no reliable estimates of irrigated land in the communal and resettled areas but government has provided for small-scale irrigation systems in these areas and there are about 180 such schemes with irrigation facilities covering about 9,000 ha.

The Zimbabwe Agricultural Policy Framework 1995-2020 has placed heavy emphasis on the importance of irrigation for smallholder development. It re-emphasises a commitment to the development of irrigation in a "cost effective, efficient and sustainable manner". The aim is to improve productivity and incomes in the subsector, redressing historical imbalances of investment in land and water development, rural infrastructure and support services. Specific objectives include:

- (a) Growth in the irrigated area, particularly for small holders, with minimum negative environmental and health impact;
- (b) Equitable allocation and efficient use of scarce resources;
- (c) Establishing a water pricing structure consistent with cost and social efficiency;
- (d) Establishing an efficient institutional structure; and
- (e) Implementing effective and efficient drought mitigating measures.

The key strategies to be employed in achieving these objectives include :

- (i) Water allocation will take into account the competing and growing requirements of the agricultural, urban and industrial users;
- (ii) Priority will be placed on farmer managed and operated irrigation systems. Government will assist in their development and farmers will retain responsibility for operation and maintenance;
- (iii) Where exploitable potential has been tapped, greater emphasis will be placed on more efficient and greater equity in water use;
- (iv) Institutional capacity for development will be strengthened;
- (v) Effective water user's associations will be encouraged and facilitated through planning, development and evaluation;
- (vi) All major projects will be preceded by an environmental impact assessment;
- (vii) Water allocation will take into account and address imbalances in water supply between large and small irrigators; and
- (viii) Water pricing will reflect the scarcity of water as a commodity.

PART 3

KUDU DAM IRRIGATED AGRICULTURE DEVELOPMENT PROJECT

3.1 Present Conditions of the Study Area

3.1.1 Location and Administration

The Study Area is located northwest of Kadoma town and administratively consists of four districts, namely Kadoma district in Mashonaland West province, Gokwe South, Gokwe North and Kwekwe districts in Midlands province. There are twelve wards under these four districts as shown below.

Administration in the Study Area			
Province	District	Ward	Type of Land
Mashonaland West	Kadoma	K17 Muzvezve I	Resettlement area
		K20 Sanyati Communal 20	Communal area
		K21 Sanyati Communal 21	Communal area
		K22 Sanyati Communal 22	Communal area
		K23 Sanyati Communal 23	Communal area
		K24 Sanyati Communal 24	Communal area
Midlands	Gokwe North	GN11 Makore 1	Communal area
		GN12 Makore 2	Communal area
	Gokwe South	GS23 Chisina I	Communal area
		GS24 Chisina II	Communal area
	Kwekwe	KW6 Mabura	Communal area
		KW7 Sidakeni	Communal area

Each province has a provincial office of each department under the Governor who is appointed by the President and conducts administration with a certain extent of autonomy. District-level administration is entrusted to District Administrators and the District Office of each department. Ward is a local administrative unit under the district and composed of a number of villagers. The administration at the ward level is by a Ward Development Committee (WADCO) organized by the chairpersons of Village Development Committees (VIDCOs) and a ward councillor as a chairperson. The village level administration is conducted by the VIDVCO, which is also an autonomous institution and the terminal organization of local administration.

3.1.2 Natural Conditions

3.1.2.1 Topography

The Munyati river originates from the central area of Zimbabwe (EL.1,450 m) about 80 km south of Harare, and flows to the west up to the proposed Kudu damsite. After the damsite the stream bends gradually to the north and passes through the central part of the Study Area. After joining with the Mupfure river at about 100 km north-north-west from the damsite, the Munyati river is named the Sanyati river and finally flows into the Lake Kariba. The elevation of Study Area extends from 800 to 1,000 m. The right bank of the Munyati river has a gentle slope towards the

Munyati river, and its tributaries which flow from the east to west are almost small except for the Sakungwe river. On the other hand, the left bank is characterized by the Mafungabusi Plateau and Chinwavaenzu Hills which lie between the elevation of 1,000 and 1,200 m along the west boundary. In the left bank, there are many tributaries and they form river bank terraces.

3.1.2.2 Meteo-Hydrology

Figure 3.1.1 shows the location of meteorological and hydrological stations in and around the Study Area.

(1) Climate and Rainfall

The mean monthly climate and rainfall records at Kadoma and Gokwe Stations are shown in Table 3.1.1 and summarized below.

Climate and Rainfall		
Max. Temperature	Kadoma	24.0 °C in July – 32.0 °C in October
	Gokwe	22.6 °C in July – 30.2 °C in October
Min. Temperature	Kadoma	8.5 °C in July – 17.8 °C in December
	Gokwe	8.9 °C in July – 18.0 °C in November
Relative Humidity	Kadoma	(not available)
	Gokwe	37.0% in September – 74.0% in January
Pan Evaporation	Kadoma	4.5 mm/day in June – 9.0 mm/day in October
	Gokwe	4.6 mm/day in June – 10.4 mm/day in September
Wind Speed	Kadoma	162.4 km/hr in February – 276.2 km/hr in October
	Gokwe	158.5 km/hr in January – 229.9 km/hr in October
Sunshine Hour	Kadoma	6.6 hours in December – 10.0 hours in August
	Gokwe	6.8 hours in December – 10.2 hours in August
Rainfall	Kadoma	0.3 mm in July – 184.7 mm in January
	Gokwe	0.2 mm in July – 182.1 mm in January

The mean annual rainfalls are recorded at 735.4 mm at Kadoma Station and 734.9 mm at Gokwe Station. The annual rainfall distribution is uneven showing that about 95% of annual rainfall is concentrated in the summer season from October to March and there is almost no rain in the winter season.

(2) River Runoff

Among eleven hydrological gauging stations in and around the Munyati river basin, data of Station C8 at Munyati river, C9 at Kwekwe river, C36 at Sebakwe river and C48 at Umsweswe river are used for water resources development study with the Kudu Dam. The mean monthly discharges of these four stations for the last 30 years are shown in Tables 3.1.2 to 3.1.5, and summarized below.

Mean Monthly Discharges

(Unit : m³/s)

Month	Station C8 (C.A=5,890km ²)	Station C9 (C.A=1,250km ²)	Station C36 (C.A=4,170km ²)	Station C48 (C.A=2,480km ²)
January	31.033	5.630	21.832	11.556
February	47.985	8.606	23.015	17.721
March	25.169	4.010	20.162	7.465
April	6.095	1.055	5.389	1.682
May	0.913	0.123	1.086	0.247
June	0.404	0.167	0.592	0.160
July	0.228	0.087	0.549	0.152
August	0.105	0.026	0.472	0.126
September	0.047	0.043	0.509	0.085
October	0.178	0.047	0.519	0.051
November	2.115	0.152	1.415	0.863
December	21.649	3.181	11.385	6.078
Annual	11.327	1.927	7.244	3.849

Figure 3.1.2 shows 10-days average river runoff, and Figure 3.1.3 presents the fluctuation of annual river runoff for the last 30 years. The annual river runoff shows wide fluctuation with the inclination to decrease in recent years.

(3) Water Rights

There are many water rights in the Munyati river sub-hydrological zones. However, water rights at the upstream of the river runoff gauging stations are already abstracted in the measured river runoffs, and therefore only water rights downstream of gauging stations are considered for the water balance study. The annual total amounts of water rights in the downstream of river runoff gauging stations are shown in the following table.

Water Rights			
Section	Ref. No. in Inflow Model	No. of Water Rights	Annual Total Amount (1,000m ³)
Gauging Sta. C9 to KweKwe-Sebakwe CP	Q3	15	1,258.50
Gauging Sta. C36 to KweKwe-Sebakwe CP	Q7	9	5,901.00
KweKwe-Sebakwe CP to Sebakwe-Munyati CP	Q11	6	3,468.70
Gauging Sta. C8 to Munyati-Sebakwe CP	Q15	15	3,280.05
Munyati-Sebakwe CP to Munyati-Umsweswe CP	Q19	3	34.60
Gauging Sta. C48 to Unsweswe-Munyati CP	Q23	10	2,596.09
Kudu Dam Downstream to Munyati-Mupfure CP	Q26	12	20,858.42

Note : CP - Confluence Point

(4) Water Quality

During the Phase I First Field Work (from December 1998 to March 1999), the

water quality analysis to evaluate the water quality for drinking and irrigation was done by the Government Analysis Laboratory on subcontract for 20 samples taken from Munyati River and its tributaries, and 10 samples from existing wells. The result of analysis showed that mercury (Hg) and lead (Pb) concentrations were very high for both samples of rivers and the existing wells as shown in Table 3.1.6. In order to confirm the reliability of these results, additional analysis on mercury and lead was conducted during this Phase II Third Field Work. Ten samples from rivers and ten samples from the existing wells were taken in January and February 2000 by JICA Study Team, and sent to Japan for analysis. The result of analysis in Japan showed low concentration of mercury and lead as presented in Table 3.1.7. All samples are under WHO standard, except for two samples from wells which show a slightly higher value of lead. This result shows that water of rivers and wells in the area have no problem for drinking.

3.1.2.3 Geology

According to the geological map of Mafungabusi, the bedrock of the Kudu damsite and reservoir area consists of andesitic rocks of the Maliyami Formation in the Bulawayan Group and overlying basaltic rocks of the Volcanic Formation in the Deweras Group, fine-grained sedimentary rocks of the Upper Arenaceous Formation in the Deweras Group, and coarse-grained sedimentary rocks of the Mcheka Formation in the Lomagundi Group.

Terrace deposits are distributed on banks of the Munyati river and its main tributaries, forming terrace planes with a relative height of 10 m to 20 m from the riverbed. They are composed of silty to sandy materials being finer toward the top and coarser toward the bottom. Talus deposits and residual soil are distributed on gentle slopes and gentle planes on higher portions. They consist of rock fragments and clayey to silty materials with variable mix proportion. Recent river deposits are scattered on the upstream course of the Munyati river, and widely distributed on the downstream course of the Munyati river. They comprise sand and boulders, and pebble and cobble are rare in the deposits. Top soil is relatively thin in the area, and it is widely distributed, except in riverbeds. The top soil, containing much organic matter, seems to be 30 cm to 50 cm thick, and it may reach a depth of 1 m locally.

3.1.2.4 Soils

There is a strong relationship between soils and geology in the survey area. The parent materials have influenced much of the soils physical and chemical characteristics. The lower Munyati Basin is a "low leaching" environment because of the low effective rainfall it receives. Most soils in the survey area are derived from Karoo sediments. Other parent materials include mafic rocks (i.e. schists, dolerites, basaltic greenstones and andesitic metasediments) and alluvial materials deposited by Munyati river and its tributaries.

Nineteen (19) soil categories were distinguished and mapped for the Study Area. Phases of some of these categories were also distinguished. It was not always possible to accurately delineate homogeneous areas of the different soil types at the soil mapping scale used and the auger density that was achieved in this survey. It was more practical to delineate and map associations of the soil types. Thus, the soil mapping units consisting of associations of soil categories were defined and used on the soil maps. Soil map is shown in Figure 3.1.4.

The Study Area was assessed for their suitability for irrigation using the current Zimbabwean system devised by Thompson and Purves. According to this system, the irrigability of a soil is determined by considering soil group, soil texture, effective soil depth, max. surface depth of medium to coarse grained sand and loamy sand, permeability, the topography of the land on which the soil is situated, and drainage expressed by the existence of mottles. Land suitability map for irrigation is shown in Figure 3.1.5. Aerial extents of land by irrigability are summarized in the next table. Irrigable area, which defined as A/B, B, B/C and C amounts to 23,004 ha.

Irrigable Land by Mapping Unit and Irrigable Class

(Unit : ha)

Mapping Unit	Irrigability Class						Total
	A/B	B	B/C	C	C/D	D	
Q1		2,898					2,898
Q2			290				290
Q3		1,624					1,624
Q4		1,030					1,030
Q5		931					931
Q6		37					37
Q7		2,117					2,117
Q7a		298					298
Q8						533	533
Q9	1,309						1,309
Q10			111				111
Q11	1,191						1,191
Q12		163					163
Q13			376				376
Q14			131				131
Q15			1,093				1,093
Q16			315				315
M1		353					353
M2			136				136
M3					390		390
M4	1,163						1,163
M5		272					272
M6		704					704
M7						126	126
A1			536				536
A2				536			536
A3			1,696				1,696
C1		153					153
D1	3,446						3,446
Q11/M3			95				95
Total	7,109	10,580	4,779	536	390	659	24,053

3.1.3 Rural Society

3.1.3.1 Administration in Rural Area

Within the project related three districts of Kadoma, Gokwe North and Gokwe South, ten wards have direct relation to the potential irrigation development area, consisting of six wards in Kadoma, two wards in Gokwe North, and another two wards in Gokwe South district. Among ten study wards, one ward of Muzvezve (K17) in Kadoma district falls into resettlement area, and other nine wards are all within the communal lands. The administration boundaries of each ward are illustrated in Figure 3.1.6.

Public services at district and ward levels are maintained by three lines of local government, i.e. the District Administrator (DA), Rural District Council (RDC) and government departments. The relation between these organizations is somewhat complicated as shown in Figure 3.1.7.

The local authority of RDC was adopted in 1993 based on the decentralization policy of the Government. RDC in each district is development and planning authority for its rural command area covering communal and resettlement lands and SSCL. This local authority is composed of elected councilors, each representing a ward. The election of councilors every four years ensures participation by local communities in the process of governance at the local level. Local authority works mainly through committees established mainly for finance, health, environment and roads. Other committees that form a part of the local government structures are Village Development Committees (VIDCOSs) and Ward Development Committees (WADCOSs). These planning institutions focus their attention on local level development initiatives. Communities use them to organize projects such as construction of schools and clinics, domestic water supply, irrigation and other infrastructure projects. However, these institutions have generally not functioned as expected due to the lack of financial and technical expertise that is required to enable lower tier structures to plan in a realistic manner.

The government departments at district level also provide public services up to the ward and village levels. These departments include AGRITEX, Veterinary Services, Education, Health, Social Welfare, Construction, Tsetse Control, etc. DA, as the chairperson of District Development Committee, coordinates the rural development activities carried out by RDC and the government departments at district level.

Beside the above administration structure, traditional leaders are important component of the local government process and activities in the communal land. They wield tremendous influence and are highly respected by their communities. The traditional leaders consist of Chiefs, Headmen, and Kraal heads. In the Study Area, there are four Chiefs, two Headmen and about 400 Kraal Heads.

The Traditional Leaders Act enacted in January 2000 by replacing the Chiefs & Headmen Act has enhanced the influence of traditional leaders in recognition of role

of villages in development process. The amended act establishes local-planning committees chaired by a Kraal Head, called the Village Assembly organised at each village. They will form a communication link between the RDC and the local people.

3.1.3.2 Population and Households in the Related Ten Wards

The 1998 population in the related 10 wards is estimated at about 103,000 as shown in Table 3.1.8. Of the total population, about 53% live in Kadoma district, 17% in Gokwe North, and the remaining 30% in Gokwe South. The population density is about 41.2 persons/km² in the Study Area. The density is the highest in Ward 20 (167.7 persons/km²) in Kadoma district, and the lowest in resettlement Ward 17 (8.7 persons/km²) also in Kadoma district. Within the communal lands, in general, the wards in the Sanyati Communal Land (Wards 20 to 24) are densely populated, while four wards in the Gokwe Communal Land are scarcely populated. However, population growth is high recently in the Gokwe Communal Land receiving migration from other communal lands where population pressure is comparatively higher. The number of households in the related ten wards is about 17,800, and the average size of household is calculated at about six.

3.1.3.3 Resettlement Program

The Land Resettlement Program was initiated in 1980 with the goals of: redressing inequities in land distribution, improving the base for productive agriculture among small holders. The resettlement program was implemented under four models as follows:

- (1) Model A: Village settlements were established with individual allocations of arable land.
- (2) Model B: Commercial farms were converted into producer cooperatives and membership ranges between 50-200 members. Both farmland and infrastructure are utilized collectively.
- (3) Model C: This was based on individual settler plots averaging 10ha surrounding a core estate owned by the state farm authority, ARDA.
- (4) Model D: This model was mainly intended for agro-ecological regions IV & V.

In the Study Area, there are Model A and B schemes in Ward 17 in Kadoma district. The number of farmers settled under Model A was about 1,100 in the 1980s in the allocated land of about 4ha each. Three production cooperatives under Model B were settled also during 1980's for a total area of about 7,440 ha. Among them, two were failed in management and new settlement of two cooperatives are now managing the same plots allocated to the former cooperatives, respectively.

In addition to the above, another two new models have been adapted recently to the resettlement program, i.e. Self Contained Model and Farm Settlement Model. The Self Contained Model was developed with the object of ensuring land conservation on individual basis by allocating lands for grazing, cropping, woods harvest and

homestead. The land size allocated to each farm household was 50 ha or more. In the Study Area, about 12,150 ha of land have been delineated for 162 farm families under this resettlement model. During 1997-98 period, 108 farm families have been settled. The Farm Settlement Model is of large-scale farmer resettlement made usually in the former LSCF areas. Under this model, a total of six farm households was settled in a total area of about 5,910 ha in 1994 in Ward 17.

3.1.3.4 Education

There are 317 primary schools and 104 secondary schools in the three districts. The estimated enrolment ratio is considerably high at nearly 100% in the primary schools, and about 39% in the secondary schools. Enrolment ratio appears to be high particularly in the primary schools reflecting the government policy that gives higher priority to the consolidation of primary education. The pupils' male-female ratio is 51:49 in the primary schools, and 54:46 in the secondary schools showing slightly higher enrolment for male particularly in the secondary education.

3.1.3.5 Health

Major diseases reported by the Kadoma hospital are ARI (acute respiratory infection), malaria, injuries and poisonings, tuberculosis and intestinal infectious diseases. The patients of these five diseases occupy about 53% of total patients of the hospital in 1988. Although rural clinics are available in most wards at present, it can be said that the health facilities and personnel are poorly arranged in the three districts, particularly for doctors. Major water born diseases reported also by the Kadoma district are malaria and diarrhea. Cases of dysentery and bilharzia (schistosome) are also reported, but those are not remarkable.

3.1.3.6 Results of Household and Household Member Surveys

(1) Survey Methodology

The present condition of rural society in the potential irrigation development area was clarified based mainly on the household survey and household member survey. The household surveys was conducted for clarifying the socio-economic characteristics of households and the household member survey was for gauging the intentions of household members for improvement/ development of their economy and living standards.

These two surveys were carried out, during the First Field Work period, in the course of Social Environmental Survey which was subcontracted to a local consulting firm. These two surveys covered 23 VIDCOs/villages within the potential irrigation development area which falls into 12 wards and three districts. Among 23 VIDCOs/villages, three villages in Ward 17 are located in the Resettlement area, and other 20 VIDCOs/ villages are all in the Communal area.

The sample size was 357 households in the household survey and 580 persons in the

household member survey. Random sampling method was applied to both surveys. However, only household members over 16 years were sampled in the household member survey. The main survey items include: (i) household and population, (ii) education status, (iii) occupation, (iv) involvement in community organization, (v) cash income source, (vi) fuel for cooking/heating, (vii) food, (viii) health and sanitation, (ix) family planning, (x) agricultural supporting services, (xi) role of male and female, (xii) activities that people want to make easy, (xiii) people's present concerns, (xiv) people's participation to collective action and (xv) preference for irrigated land.

(2) Summary Results of the Surveys

The total population of the sample households is 2,543 with male and female ratio of about 50:50, and the average size of household is 7.1. As for the age group composition, about 40% of the population belong to the age group of less than 15 years old, while 5% belong to the age group of over 61 years old. The economically active population, which belongs to the age group 16-60 years old, is to be about 54% of the total population. Major ethnic groups are Zezuru and Karanga in the potential irrigation development area, and consist of 39% and 36% of the total sample households, respectively. Marriage between different Shona subtribes is common, and villagers consisting of three to four tribes support each other on special occasions, e.g. funerals and marriage. Because of such facts, it can be said that it is not necessary to pay to the tribal issue in a development planning.

On question under the household member survey of whether they want to have land within irrigation command areas or not, 79% of men, 74% of women, and 77% of both genders of the sample farmers showed a willingness to have irrigated land. The household members whose answers were "yes" in this question were further asked about their preference in crops that they want to cultivate in the irrigated land. As a result, 49% of people indicated maize and 32% cotton for summer crops, and 36% of them prefer vegetables, 18% wheat, 17% beans, and 13% maize for winter crops.

To the household members who liked to have irrigation land, further question was asked of whether they would still like land even if they have to pay for water charges. The results of this question reveal that about 94% maintained that they would still like land even if they were to pay for water charges. Only 4% would not like land if water charge is levied. In the same manner, a further question as asked of whether they would still like irrigation land even when they may have to organize a water user group for routine operation and maintenance of irrigation system. To this question, 91% of all the respondents who would like irrigation land said that they would like to participate in a water user group if group work for operation and maintenance does not disturb the farming activities. About 6% did not like to have irrigation land if they have to do group work for the operation and maintenance.

The summary results on other survey items are presented in Table 3.1.9. The detail

results of the surveys are reported in Appendix VIII Rural Society and Institutions.

3.1.4 Agriculture

The main sources of data on present agriculture in the Study Area are the household survey conducted by the local consultant "Scott Wilson Zimbabwe" and the supplementary farm survey carried out by the JICA Study Team. The numbers of samples randomly selected are 357 and 57 farm households, respectively. In the supplemental survey at least one sample per village was selected in the Study Area.

3.1.4.1 Land Use and Landholding

The present land use of the Study Area was identified through the interpretation of the SPOT image, the aerial photos taken in the 1996 dry season and some ground spot checks. The area can be categorized into four land uses, i.e. bush areas, cultivation areas, residential areas and rivers. The extent of land use by category is as follow:

1. Bush	38,300 ha
2. Cultivated areas	39,800 ha
3. Residential areas	3,900 ha
4. Rivers	800 ha
Total	82,800 ha

Based upon the supplementary farm survey, the average landholding is 5.09 ha per household. There is some fallow, rent-out land, rent-in land and share cropped land. Total area cultivated is estimated at 4.91 ha as shown in the table below.

Items	Area (ha)
Area owned	5.09
Area not cultivated	0.27
Arable area	4.82
Area rented out	0.03
Area share-cropped-out	0.03
Area rented in	0.15
Area share-cropped-in	0.00
Total area cultivated	4.91

Source: Supplemental survey

The survey revealed that most damage to farm area in the last ten years is caused by drought. Nearly 90% of the households reported that they occasionally or regularly suffered from drought and the area damaged is, on average, 3.94 ha. Other damage to farms were top-soil erosion and floods/water logging. Problem of damage by wild animals is not significant in the area.

3.1.4.2 Crop Yields and Crop Production

The crop production trends in the related districts from 1989/90 to 1997/98 are given

in the next table. Kadoma district has higher yields probably due to the inclusion of farmers who grow maize as a cash crop with more fertilizer. The average yield of maize in Kadoma district from 1995/96 to 1997/98 was 2.3 ton/ha, while, that in Gokwe district was 1.1 ton/ha. The data of Gokwe would be more representative of the Study Area because of similar climate and soil conditions. Maize yields have fluctuated significantly as shown in the following table. There are no consistent trends in crop yields.

Crop Yields in Related Districts

Season	Kadoma (ton/ha)	Gokwe (ton/ha)	Kwekwe (ton/ha)	Season	Kadoma (ton/ha)	Gokwe (ton/ha)	Kwekwe (ton/ha)
Maize				Peanuts			
90/91	-	0.45	0.79	90/91	-	0.38	0.28
91/92	0.40	0.09	0.00	91/92	0.30	0.02	0.20
92/93	1.80	1.73	1.01	92/93	0.70	0.73	1.16
93/94	1.90	1.18	1.41	93/94	0.90	0.31	0.52
94/95	0.30	0.05	0.20	94/95	0.27	0.07	0.30
95/96	2.25	1.07	1.40	95/96	1.25	0.67	0.80
96/97	2.38	1.24	0.90	96/97	1.25	0.59	0.64
97/98	2.25	1.09	0.39	97/98	0.80	1.00	0.73
Cotton				Sorghum			
90/91	-	0.48	0.85	90/91	-	0.34	0.45
91/92	0.50	0.11	0.20	91/92	0.60	0.16	2.00
92/93	1.03	0.84	1.16	92/93	0.90	1.29	0.83
93/94	1.06	0.67	1.00	93/94	1.20	0.63	0.82
94/95	0.35	0.08	0.18	94/95	0.25	0.10	0.10
95/96	1.20	0.81	0.96	95/96	1.00	0.53	0.60
96/97	1.00	0.83	0.60	96/97	1.00	1.00	0.49
97/98	1.30	-	-	97/98	1.30	1.45	0.52

Source : AGRITEX

3.1.4.3 Cropping Pattern and Farming Practices

The present cropping pattern in the Study Area is single cropping. There are only three small irrigation systems in the area with the total irrigated area of about 80 ha. The typical cropping pattern of a household consists of maize of 1.99 ha, cotton of 2.52 ha, groundnuts of 0.31 ha and others of 0.11 ha.

The cropping calendar practiced in the Study Area are shown in Figure 3.1.8. The farm inputs and crop yields in the 1997/98 cropping season were surveyed in detail in the supplemental household survey. The results are shown in the next table.

Farmers apply organic fertilizers more than chemical fertilizers to maize and groundnuts, while cotton growing relies more on chemical fertilizers than organic fertilizers. No fertilizers are applied to sorghum and millet.

Draft power shortage is a significant problem in the Study Area. The farm survey indicated 33.3% of the respondents experienced there were occasional draft power shortage, while 22.8% experienced frequent shortage. The shortage causes reduction in the planted area and lower yield due to the late planting. Plowing is done by animal power. Tractor ownership was reported in only one case out of 57

respondents. The available animal power is 4 cattle and 0.21 donkeys per household for an average land holding size of 5.09 ha.

The post-harvesting activities such as maize shelling are mainly done with threshing sticks. Only 14% of respondents replied that they do not employ laborers for farming. Land preparation and cotton picking are the typical practices where hired laborer is used.

3.1.5 Livestock

3.1.5.1 Livestock Population and Holding Size

Some form of livestock are kept by most farmers in the Study Area. Most important livestock held by the farmers are cattle and goats, and, of lesser importance are donkeys, sheep, pigs and poultry. A few farmers kept turkeys, guinea fowl and pigeons. The population of cattle in the project related 10 wards are estimated at some 41,100 heads and that of goat is at 29,000 heads as shown in Table 3.1.10. The total population of livestock is some 28,600 LUs as summarised in the following table.

Livestock Population in the Study Area

Area	Livestock Population (heads or LUs)				
	Cattle	Goat	Others	LUs	Stocking Rate
Communal Area Wards (9 Wards)	32,726	25,161	2,118	22,835	3.5ha/LU
Resettlement Area Ward (1Ward)	8,379	3,880	839	5,767	14.9ha/LU
Project Related Wards Total	41,105	29,041	2,957	28,602	5.8ha/LU

Note: Stocking rate = grazing stocking rate (grazing area / LU); Others include donkey and sheep

The average holding sizes of livestock per household in the Study Area are calculated at cattle 2.6 heads, goat 1.8 heads, others 0.2 heads and 1.8 LUs as shown in the following table:

Average Livestock Holding Size per Household in the Study Area

Area	Holding Size (heads or LUs/household)			
	Cattle	Goat	Others	LUs
Communal Area Wards (9 Wards)	2.3	1.8	0.1	1.6
Resettlement Area Ward (1 Ward)	5.8	2.7	0.6	4.0
Project Related Wards Total	2.6	1.8	0.2	1.8

The holding size in the project related communal areas only is the similar to the Study Area with estimated size of 1.6 LUs per household.

3.1.5.2 Livestock Breeds, Herd Composition and Livestock Uses

The great proportion of cattle, goats and sheep in the Study Area are of indigenous breeds, with some limited crossbreeds mainly in cattle. Exotic blood is mainly Brahman and Afrikander in cattle and Boer goat in goats. Farmyard chickens are mainly common stock, but purchased broilers and layers are hybrids. Pigs are of

exotic breeds as are the sheep (Persian Blackhead). Other animals and birds are of indigenous breeds.

From the Livestock Survey conducted by the JICA Study Team, the average herd composition is 1 bull:12 cows in case of cattle and 1 buck:5 does in case of goats for the Study Area. In case of cattle herds, there are a comparatively large number of adult castrates (oxen and steers) which are used for draft purposes.

In the Area, cattle are kept primarily for draft power and secondary for investment. Goats are primarily for food and secondary for investment. While, cattle are held also for reasons of security in times of drought and hardships, and to an extent for cultural and traditional purposes. The uses are multiple and relate to various crop and household needs as well as the commercialisation of livestock keeping.

3.1.5.3 Livestock Production and Production System

The results of the Livestock Survey indicate that some 60% of cattle holders in the Area milk their cows (the remainder mainly leave the milk for the calf), and milk yield varied from 1 to 20 litres per day per household. However, only one-third of these households sold milk. Meat sales by farmers from slaughtered livestock is very low in the Area. The main reasons for not selling were that there was no surplus or that there had been no slaughters for selling meat. It appears that the farmers sell the whole animal (live) rather than slaughtering for selling meat.

Generally, farmers keep their male and female animals together, sometimes separating young stock from older stock in the Area. Farmers use their own criteria, usually non-scientific, for sire selection and, as there is no segregation, breeding is generally unregulated. Although there is a relatively high bulling rate in the composite herd (1 bull:12 cows), there is none-the-less a high number of herds without bulls (53%).

Artificial insemination is not practised under the extensive types of livestock production systems found in the Area because of the difficulty in maintaining a cold-chain for keeping semen. A few farmers do buy "improved" crossbreed bulls from commercial farmers, or obtain specially bred chickens and pigs if they are going into poultry-egg production or bacon-pork.

Animals are kept under extensive, low input, almost ranching conditions at relatively high stocking rates in the Study Area. They rely in summer on range (veld) grazing and in winter on crop residues, range grazing in waterway areas and browse in spring. Very limited amounts of homegrown grains or purchased supplements are fed, except when farmers have pen fattening cattle or doing broilers and layers.

The main sources of purchased feed inputs are from the animal feed companies based in Gokwe, Kadoma, Kwekwe or Sanyati. Most livestock cash expenses incurred by farmers are towards the limited amounts of supplements and medicines.

During the busy summer crop growing period, and sometimes even in the dry season, animals are allowed out of their kraals for only a small part of the day. This restricts

the amount of time the animals have for feeding. Their individual performance as a result suffers and overall productivity is lowered.

3.1.5.4 Livestock Production Resources

The grassveld types found in the Study Area are predominantly *Heteropogon*-other species grassveld and patches of sodic grassveld. The former has a potential grazing capacity of about 1 LU:5 ha (where 1 LU is a beast of bodymass 500 kg) on a year-round basis. The latter is characterised by being found on sodic soils and is very sensitive to heavy grazing. It has a potential grazing capacity of about 1 LU:12 ha on a year-round basis. Whereas the potential grazing capacity of most of the range lands in the Area is about 1 LU:5 ha, much of the lands are in a deteriorated condition and a current grazing capacity of about 1 LU:8-12 ha would seem to be more applicable. Accordingly, the overall grazing stocking rate of 1 LU: 3.5 ha in the project related communal areas indicates that the livestock population in the areas is more than twice the current grazing capacity.

Traditionally, there existed some form of range management that helped to maintain the range land in good condition. However, with the breakdown of traditional societal structures and the integration of people from different areas into "new societies", these traditional practices have tended to breakdown.

3.1.5.5 Animal Health

The major health problems affecting livestock in the Area include a number of tick-borne diseases, and internal and external parasites. The major pests and diseases are shown in the following table:

Major Diseases and Pests of Livestock in the Study Area

Livestock	Diseases & Pests
Cattle	Anaplasmosis(gallsickness), Babesiosis(redwater), Cowdriosis (heartwater), Brucellosis (contagious abortion), quarter-evil or black leg, Theileriosis
Goat	Rift valley fever, Enterotoxaemia (pulpy kidney), roundworm, tapeworm
Poultry	Newcastle Disease, fowl pox, heat stress, predators

Note: Foot-and-mouth disease is not found in the Study Area

3.1.5.6 Support Services

Support services provided for the livestock subsector in the Study Area include the following:

Livestock Sub-sector Support Services

Input Supplies (feeds, veterinary supplies, breeding animals, equipment, etc.)	
Providers	-All except breeding animals available through Farm and City and Agricura depots at Gokwe, Kadoma, Kwekwe and Sanyati, -Cattle breeding stock only available from commercial farmers and Heifer International Project; point of lay and day old chicks from Crest Breeders International and Irvine's Day Old Chicks in Harare or outlets in Kadoma (on order) -Vaccines are available from the Department of Veterinary Services either at the Animal Health Centres or from Harare
Credit (credit services for inputs, capital for breeding stock & sires, marketing, etc.)	
Providers	-Agribank (draft cattle), ZFU, CSC (breeding cattle)
Research (on nutrition, breeding, health, husbandry, fodder production, etc.)	
Providers	-Departments of Research and Specialist Services (DR&SS), AGRITEX, VET, University of Zimbabwe, Pig Industry Board (PIB) (Harare)
Extension (extension services on all aspects of livestock production)	
Providers	-AGRITEX, Livestock Development Trust (Harare)
Health (advice & assist on health issues; control of specified diseases, etc.)	
Providers	-VET (Animal Production and Health Centre & Animal Health Inspectors)

From the above description of the availability of service providers it is apparent that they are usually far from the farmers. This means that to get these services either the farmer must visit the service providers or vice versa - whichever way, there will be extra costs to the producer.

3.1.5.7 Constraints to Livestock Production

Problems relating to all types of livestock production are found to be extremely diverse, with low grazing capacity of range lands and over grazing, water unavailability in dry spells and health in particular being a critical issue. The range of issues identified by the Study Team and raised directly by farmers themselves as major problems are shown in the following table:

Constraints to Livestock Production in the Study Area

Issue	Constraints/Problems
Health	General malaise, mortality, disease, disease and pest control, parasites, lack of dips or dipping, lack of dosing, lack of health facilities (dips, crushes, races, equipment, drugs and medicines, veterinary assistants)
Breeding & Reproduction	Poor sires and dams; poor genetic stock generally, uncontrolled breeding, poor hatching, low reproductive rates
Management & Husbandry	Improper herding, onerous herding tasks, stock straying, laying away from villages
Inputs	Lack of cash/loans/credit for inputs
Marketing	Lack of a market; lack of a market place, insufficient sales, poor prices
Nutrition	Insufficient or no grazing areas or feed in general, high cost of supplementary and concentrate feeds
Water Availability & Drought	Drinking water in the dry season (especially), erratic rains
Natural Resources and Pastures	Poor management of grazing land, poor quality grazing resources (especially in winter), wild fires in grazing areas
Infrastructure	Poor housing and corrals, no fencing or paddocking

With respect to farmer perceptions of how health, breeding, marketing and feeding of their animals could be improved, farmers collectively showed a relatively deep and broad understanding of how to do this, although on an individual farmer basis this was not so apparent. This is important as it shows the potential strength or benefit that could be obtained by adopting a group approach to addressing the problems, for implementation and training.

3.1.6 Agro-Economy and Marketing

3.1.6.1 Economy of the Project Area

The Project Area is located northwest of the town of Kadoma and consists of four districts, namely Kadoma in Mashonaland West Province, Gokwe South, Gokwe North and Kwekwe districts in Midlands Province. The Project Area takes in twelve of 122 wards in these four districts.

Kadoma is the major urban center and is the largest town in Mashonaland West. Gokwe, Sanyati and Nembudziya are also important as they are surrounded by agricultural hinterlands. In addition to agricultural activity related to input supply and output purchases, the Project also has industry and manufacturing based on agriculture. A cotton ginnery, a spinning factory and a textile factory operate in the area. An additional spinning and weaving factory is nearing completion. A flourmill has started operations this year with a capacity of 2,700 tons a month. Several small hammer mill maize grinding operations are scattered throughout the Project Area and cater to the needs of subsistence farmers. The Project Area also has a brewery and a dairy products factory, mainly producing cheese and yogurt. In Koronika, there are small activities in handicrafts producing hats, baskets and pottery. Mining is the other main activity and there are several mines in the area for nickel,

gold and chrome. There is a nickel refinery and a coalfield. There is also an explosives factory, a chemicals factory, a paper factory, and an iron and steel operation. In addition, timber extraction and sawmill operations and brick and tile operations are also carried out in the vicinity of the Project Area.

In order to service these economic activities, the Project Area is well served with a network of roads providing Kadoma with a link with the surrounding areas and the rest of the country. Kadoma is also the converging point for link roads from Sanyati and Chakari. The main railway from Harare to Bulawayo also passes through the Project Area and more than 30 industrial units have direct access to railway service loading and unloading from Kadoma. Other service activities include banks, building societies and moneylenders. There are also cotton and grain collection points, grain bag depots and cattle sales points. As cotton is the most important crop in the area, cotton manufacturing is the largest employment sector accounting for about a third of the formal workforce of the town of Kadoma.

3.1.6.2 Marketing

Until recently, the Project Area like the rest of Zimbabwe operated a highly controlled marketing system with pricing, external trade and agro-processing activities regulated and monopolized by government through four marketing boards. These covered all agriculture except tobacco, horticultural crops and some minor products. Beginning in 1991, these controls were gradually removed, prices were market determined and the marketing boards were restructured and were to compete with the private sector operators. These recent changes are now taking effect and producers in the Project Area, like elsewhere, are adjusting to the new environment. In the market now are private traders, millers and agricultural processors and prices are market determined and are free of subsidies, regulations and controls.

In the context of this evolving system, the Project Area offers the producer a number of choices in both purchase of inputs and sale of output. The transport system is also satisfactory with a good network of main roads in the Project Area. A major problem appears to be in getting produce from the farm to the main road that, on average, is a distance of about 25 km.

3.1.6.3 Marketing of Output

All farmers in the Project Area engage in some form of marketing of food grains, cash crops and livestock. The Project Area on average markets about 220,000 bales of cotton (44,000 tons) each season. Cotton is delivered mainly to COTCO or COTPRO. More recently, Cargill and Motherly Care have also entered the Project Area though the quantity purchased is small. Both COTCO and COTPRO offer farmers credit under a group loan scheme. Inputs are provided to the farmer on condition the crop is sold to the agency. At harvest, the cost of inputs is deducted from the receipts. Over one half of farmers in the Project Area receive credit from

COTCO under this scheme. Farmers are generally satisfied with COTCO although bales are weighed in the farmer's absence and payment is received about three weeks after harvest. COTCO provides a bonus for additional gains made on export markets. COTCO has a depot and ginnery at Sanyati and a depot at Kadoma. They also have collection points (temporary) during the harvest such as in the Veri, Buguwani, Sidakeni, Ganyungu and Nyarupakwe business centers as well as in Namacheni and Zhombe. COTPRO too, have set up collection points in the Project Area. Cargill also buys cotton from farmers and has set up a collection facility at the Sanyati Growth Point.

The other field crops marketed by the farmer in the Project Area are maize, sunflower and groundnuts. About 16,000 tons of maize are sold by farmers in the Project Area each year. GMB is still the major purchaser of maize and other field crops but there are other private companies such as Cargill, Natfoods, Chibuku and Bhagoo who are active in the Project Area. Some private companies buy from farmers and resell to Blue Ribbon and Victoria Milling while some have also developed processing facilities such as meal and stock feeds. GMB still holds a large market share as it is well recognized and provides packaging bags in advance, although prices paid are lower than its competitors. Also the grading system by GMB is not transparent and it takes too long for the farmer to receive payment. The farmer usually gets a discount on the announced price due to quality standard. In contrast, Cargill gives ready cash, and offers better prices and weighs produce in the presence of the farmer.

GMB has a 50,000-ton capacity silo at Chegutu that is 50 km out of the Project Area. It also has storage and bagging depots in Kadoma, Sanyati, Gokwe and Nembudziya. However, it has few collection points so farmers take their maize and other grain to Sanyati or Kadoma. A major shortcoming is that on average, the farmer has to take his produce a distance of 25 km for delivery to the buyer. In many cases, the roads from farm to collection point are in poor condition. Farm produce is taken by small trucks or by scotch cart.

Most sorghum and millet sales take place between households in small quantities and prices received are much higher than GMB prices. In some cases, Chibuku Breweries buys direct from the farmer. Sunflower that is grown in limited quantities in the Project Area are sold to the local oilseed processors. Fresh produce such as vegetables and mealies (green corn) are sold in local markets, nearby business centers and towns and transit points along major bus routes. Vegetables and mealies also find their way to urban centers.

Livestock marketing is mainly for cattle. Livestock sales are mainly on announced market days at dip tank and at established sales pens. Private buyers and local butchery representatives attend these sales. CSC is not very active in the Project Area. Occasionally a representative from TM supermarkets may attend the sales. The local butcheries are Beatties from Kadoma and Brandts in Kwekwe. Farmers

have an advantage with local buyers in that he could hold back if he is not satisfied with the offer price. Goats and donkeys are marketed informally between farmers and through private traders. As the majority of households rear goats, demand is generally limited except during festive days. Marketing of donkeys is more prevalent than goats. Poultry is primarily consumed in the farm household, but small quantities of birds and eggs are sold in the local market. Demand is limited and confined to shops and business centers.

3.1.6.4 Input Marketing

The private sector involvement in input supply and distribution is far more widespread than in output marketing. There are a wide range of operators in the market for supply and distribution. There are the cooperatives that are less important now. Private traders obtain fertilizer and seed from the wholesaler and manufacturer and sell in the local market and there are the direct sales by manufacturers of fertilizer, seeds and agro-chemicals who have depots and stock points from which delivery is made.

In addition to the above, there are several marketing companies such as COTCO, COTPRO, CSC, and Trinidad Industries that supply farmers with inputs under various credit schemes. In the Project Area, COTCO is the largest supplier of inputs for cotton farmers accounting for over half the Project Area farmers. Inputs are also obtained from dealers and traders, especially in Sanyati. Major suppliers in Sanyati and the business centers are Harry's, Telstone Trading, Red Star Wholesalers, and Farm and City Centre. Farmers who are organized in groups also obtain inputs direct from Cargill, Windmill, Pannar and Seedco or from their representatives in the Project Area.

Marketing Service Providers in the Project Area

Output Sales	Input Providers
Cotton COTCO COTPRO Motherly Care	Cotton COTCO COTPRO Seedco Village Store
Grains & Other Field Crops GMB National Foods Cargill Chibiku Bhagoo	Grains & Other Field Crops Seedco Pannar Windmill Village Store Red Star Wholesalers Windmill Harry's Farm and City Centre Telstone Trading
Cattle Beatties Brandts CSC	Cattle National Foods Agrofoods

Most farmers in the Project Area use chemical fertilizers for cotton, maize and groundnuts but the proportion of organic fertilizer for maize is more than chemical fertilizer. Farmers also use only organic fertilizer in sunflower cultivation. All farmers use agro-chemicals in cotton and maize. Field operations are mainly done by use of draft power and most farmers hire the plough.

The distribution network for inputs is established and works well for large farmers. However, in the Project Area, safeguards to ensure quality control are not always adequate resulting in substandard material getting to farmers. In addition, due to distance to remote areas, costs are excessive and there is also the problem of lack of timeliness of delivery. Prices have also seen very sharp increases in recent years for fertilizer as seen below.

Fertilizer Prices 1996-1999

Type/Compound	(Unit: Z\$/ton, Ex-Harare)				
	1996	1997	Jan.1998	June1998	Jan.1999
Ammon. Nitrate	1,970	2,490	2,490	3,495	4,710
Comp.D (8:14:7)	1,604	2,125	2,310	3,240	4,380
Comp.C (6:7:15)	2,315	3,075	3,325	4,690	6,630
Comp.K (7:13:20)	1,820	2,290	3,015	4,190	6,120
Comp.L (5:8:10)	1,990	2,480	2,690	3,800	5,165
Comp.M (12:12:12)	2,220	2,170	2,785	3,870	5,900
Single SP	1,200	1,510	1,725	2,490	3,910
Triple SP	-	-	4,090	5,970	7,850
Gypsum	360	545	585	820	1,150

Source: Commercial Farmers Union

Most farm households depend on the village store or an occasional visit to Sanyati, Gokwe, or Kadoma for purchase of consumer durables. The village store in the business centers stock basic household needs and the household members obtain their supplies from these stores. Bigger and more costly items are obtained during the visit to the towns. No itinerant traders were observed in the Project Area.

3.1.6.5 Agricultural Trade

The Project Area is largely self sufficient and with the exception of cotton, the major cash crop, some maize and cattle (beef), most agricultural production is consumed in the Project Area. Zimbabwe is a major exporter of agricultural products and the main items of export are tobacco, cotton lint and sugar. Of less importance are maize coffee, tea, hides, barley and horticultural products such as fresh cut flowers, vegetables and fruits. Some cotton produced by farmers in the Project Area may find its way through COTCO or COTPRO to the export market. In addition, some of the maize delivered to GMB may also find its way to export markets and so with the cattle sold to private traders. The Project Area produces no tobacco, tea, coffee or barley and most horticultural products are grown on irrigated lands. Maize exports, too are regarded as residual and exports are made only if there is a surplus to domestic requirements.

Zimbabwe is basically self sufficient in food and so is the Project Area. Except in years when rains fail as in 1992, maize is imported. Some wheat and rice is imported in normal years and the imports are likely to grow in view of the rapid increase in domestic consumption.

3.1.6.6 Agro-Processing

Agro-processing activities in the Project Area are entirely a private sector activity. Being a predominantly cotton based activity forward linkages in cotton are most important. There is a textile factory that does bleaching and dyeing, a spinning factory and a cotton ginning operation. There are also plans for another large textile factory in Kwekwe. Next in importance is the large number of hammer and small scale milling operations scattered throughout the Project Area. These are mainly diesel powered and located in every remote village and cater to the farmer household for maize milling.

Other agro-processing activities in the Project Area are about ten seed cake processors, oil expellers for crushing sunflower and stock feed processors, mainly for poultry feed. Among the larger but single operations are dairy processing factory, mainly for cheese production and a brewery. Cotton based activity is the most important in the Project Area and accounts for 35% of formal employment of the population of the municipality of Kadoma. There is a tomato processing factory about 50 km from the Project Area

3.1.6.7 Grading

The classification and grading system for agricultural produce is well established and is frequently reviewed and updated. The grading system was initially established to cater to the needs of exporters. For grain, the grading system is in place for maize, sorghum, soybeans, wheat, and groundnuts. For maize, the system applies to both white and yellow maize. The grades are based on moisture content, test density, extraneous matter and chipped and defective grain. The same applies to sorghum, soybeans and wheat. The beef grading system was revised in 1998.

3.1.6.8 Marketing Information and Prices

Farmers are becoming increasingly interested in market information. This is a recent development as prior to 1993, prices for most commodities were administratively determined and farmers were guaranteed delivery of produce at these prices. Major farm organizations like CFU provide a good service to farmers in the Project Area. They provide up-to-date information on output and input prices through the media. Farmers are now beginning to increasingly rely on this information in making marketing and purchasing decisions. Producer prices by the major marketing agencies in recent years are given below.

Producer Prices 1995-1998

Item	Grade (unit)	1995 Parastatal	1995 Private	1996 Parastatal	1996 Private	1997 Private	1998 Private	1999 Private
Beef	- (c/kg)	1,558.00	1,578.00	1,750.00	1,750.00	2,250.00	3,000.00	3,900.00
Cotton	B (c/kg)	500.00	600.00	550.00	650.00	650.00	-	-
Ground-Nuts	A1 (\$/t)	2,925.00	3,400.00	-	7,500.00	8,000.00	-	-
Maize White	A (\$/t)	1,050.00	1,380.00	1,200.00	1300.00	1,500.00	3,000.00	-
Maize Yellow	A (\$/t)	1,050.00	1,380.00	1,200.00	1300.00	1500.00	-	-
Milk	- (c/lt)	179.34	185.12	-	220.00	295.00	555.00	700.00
Sorghum Red	A (\$/t)	650.00	1,050.00	915.00	1,400.00	1,450.00	-	-
Sorghum White	A (\$/t)	650.00	-	-	-	-	600.00	-
Soybean	B (\$/t)	1,600.00	2,350.00	1,600.00	2,750.00	3,500.00	6,000.00	-
Sunflower	A (\$/t)	1,500.00	1,900.00	1,750.00	1,950.00	1,950.00	1,900.00	-
Wheat	A (\$/t)	2,100.00	2,750.00	2,550.00	2,650.00	2,500.00	4,900.00	5,000.00

Source: CCZ,GMB,CSC,DBZ

3.1.7 Irrigation and Drainage

3.1.7.1 Present Conditions of Irrigation and Water Management

An extensive survey of the existing projects and command area within the Munyati River basin and outside was carried out. Two projects namely Ngondoma and Takavinga constructed within the Project Area were observed intensively. These projects cover an area of 44 ha and 8 ha, respectively. Two more projects namely Nyamaropa and Chibwe (Musikanvahnu) lying outside the Project Area and serving an area of around 500 ha and 703 ha, respectively, were also intensively observed along with their command area. These projects mainly serve communal and settlement areas. Virtually, no concept in respect of conveyance, delivery, distribution of water or water management was observed.

- (1) Gates have been provided at the off-take points of distributaries and AGRITEX staff is required to operate them as per schedule. But on account of shortage of staff it has not been possible for the AGRITEX staff to operate these. One of the supervisors mentioned that on one of his projects only two Water Bailiffs are available, as such it is not possible to attend the gate operations. The gates are being operated by the farmers at their will. Similarly, the gates provided at the openings of the distributaries (so called outlets), from where the watercourses take-off, are also operated by the farmers at their will.
- (2) It is encouraging to note that water is taken by the farmers from the watercourses for irrigating their fields turn by turn. But the time period of the turns is not fixed. With the result, the farmers keep on applying water irrespective of their requirements. Too much over irrigation was observed particularly in the head reaches.

- (3) On one of the projects (constructed with EU assistance), measuring devices were found installed by using steel parshall flumes embedded in concrete. The farmers were not aware of these installations. A little training to the farmers would be necessary to appreciate these facilities.
- (4) Water is taken from the distributaries into the watercourses by constructing outlets in the distributaries. Here no formal outlets/measuring devices are installed. Only rectangular openings are made where in the discharge drawn in the watercourses depended upon the level in the watercourses. Some farmers were using more siphon pipes to keep the water level in the watercourses low so as to facilitate withdrawal of more water from the distributaries.
- (5) Most of the fields were not found properly developed. Application of water by the farmers at the field level was found to be discouraging. In most of the cases irrigation was being done by furrows method of irrigation. The lengths of the furrows were found to be too long compared to the stream size. On questioning, it was found that the farmers were not aware of the relationship between stream size, slope, length of irrigation run, and type of soil. Opportunity time of water absorption was found to be drastically varying, resulting in over irrigation at one location and under irrigation at the others. On discussing these situations with the farmers, it was good to note that they were found to be very receptive and interested in adopting the given practices.
- (6) Night Storage Reservoirs have been constructed on all the projects. These are all small projects. But the Project like Lower Munyati, is required to be treated at a different level in planning, design, construction, operation and maintenance. There is a need to categorize the projects in small, medium and major projects. The potential dangers of constructing night storage reservoirs in respect of loss of water through seepage in the night reservoir area lying in the command, and health concerning diseases like malaria and bilharzia etc. need attention while dealing with the major projects.

These shortcomings are well appreciated by the higher level staff of AGRITEX and scholars of University of Zimbabwe. These have also been reflected in performance assessment studies.

3.1.7.2 Irrigation Performance Assessment Studies

Many studies relating to irrigation performance assessment have been carried out in Zimbabwe. One of the recent studies relates to a collaborative program of irrigation research to assess smallholder irrigation performance in Zimbabwe. The study was initiated in 1989 involving the University of Zimbabwe, AGRITEX, and the International Food Policy Research Institute. The results of the study were presented at a workshop held in August 1993 and are contained in the Proceedings of the workshop published by the University of Zimbabwe in 1994.

One of the concerns of the study was 'how it is practiced in different schemes and how it can be improved'. On the subject of Water Supply and Distribution Effectiveness the Study has recorded:

"The problem of adequacy of water supply seems chronic on AGRITEX and Community managed schemes. To further complicate the problem, the distribution of water within system appears inequitable. Tail-enders are often disadvantaged and current management systems appear unable to tackle this problem adequately. The question is, are there enforceable technical solutions to the water inequity problem? It may also be that irrigation schemes, as with communal areas generally lack in firm institutional and organizational framework for a community based democratic system of allocating resources and adjudicating disputes..."

Mr. Emmanuel Manzungu has recorded in his case study – Contradictions in Standardization:

"In many smallholder irrigation schemes in Zimbabwe poor water use is cited as one common problem. Water is reported lost during conveyance, distribution and application in field. The causes of this problem are varied. Most of the losses are said to be at or below channel gate (Pearce and Armstrong, 1991). Inequitable distribution of water between blocks, between head and tail users along canals and differential water distribution at field level have been documented (Pazvakavambwa, 1984; Pearce and Armstrong, 1990; Donkor, 1991). Over irrigation has also been cited as another problem, particularly in gravity schemes (Makadho, 1993). These studies, in various ways have emphasized the need for solutions to be found to the water-management problem in smallholder irrigation."

Regarding CROP CHOICES it is mentioned that the Government started to interfere with irrigators' crops from about 1936. This continued or rather became excessive by 1974. But the situation is somewhat changed today. Bourdillon and Madzudzo (1994) reviewed the situation of six schemes, all built after independence. They found only one scheme, Shamrock, in which irrigators were to decide which crops to grow. This was also the most successful scheme of the sample. The authors (Emmanuel Manzungu and Pieter van der Zaag) clearly suggest that freedom of crop choice correlates positively with performance.

3.1.8 Rural Infrastructure

3.1.8.1 General

The rural area and living conditions in the Study Area targeting mainly at communal and resettlement area can be summarized as follows:

- (1) Each village exists independently in terms of physical distance, especially, a limited number of villages exist in the area within 20km downstream of the

proposed Kudu dam site. The distance between the village is 5km on average. Houses in the village are small, and they are made of such materials as wood, soils and straw, etc. Almost all the households in the villages have their own elevated wooden-made simple facilities inside their home yards to dry agricultural products.

- (2) Each village in the rural area is connected with unpaved narrow roads having a width of 3 to 5 m on average. However, villagers have to walk a relatively long distance of 5 to 10 km to reach public bus service on the trunk roads. In addition, because of the limited bus service, people suffer inconvenience in daily life. A few have motorcycles and/or small tractors, which are used for shopping for daily necessities and as well as for transportation of small amount of agricultural products.
- (3) Very limited numbers of villages have relatively good access to social infrastructures such as schools, hospitals, clinics, and drinking water facilities (wells), etc. Electricity is not available in most areas, and few households have electricity.
- (4) Cotton, maize, and peanuts, which are the main agricultural products in the rural area, are marketed for cash income. These crops are transported mainly by draft animals. In a few cases, small tractors are also used for transportation of crops. The transportation distance to the markets is 20-30 km, thus causing difficulty in transportation of agricultural crops.

3.1.8.2 Roads

(1) Kadoma District

Road networks in the district are not well developed. According to the District Profile issued in 1998, RDC maintains 600 km of roads, of which 500 km are gravel-metalled and 100 km are tarred. These road networks cover mainly commercial farming areas. DDF (District Development Fund) maintains 415 km of roads except those within the resettlement areas. However, no authority has taken care of the roads in the resettlement areas that were once within the commercial areas. MOT (Ministry of Transportation) maintains 100 km of roads to Sanyati, and 100 km of roads to Mamina. Other than these, there are two state roads in Kadoma District. RDC has 36 personnel to operate their roads department. The main, primary, and district secondary roads are generally in good condition, however, tertiary and feeder roads are in fair to poor condition.

(2) Gokwe North District

MOT and DDF are responsible for provision of roads and their maintenance. Generally speaking, maintenance of the roads in the district is not sufficient due to inadequate funding. A large part of the district still needs additional roads.

Presently, the local authorities are not involved both in road development and its maintenance due to lack of funds, equipment and technical capacity, etc. Thus, the following are widely observed in the district:

- Many people still have to travel a long distance to reach the nearest main roads.
- Lack of proper road networks makes it difficult to transport agricultural products produced by farmers.
- Access to the social services, such as clinics and schools is generally poor, and it causes an impediment to recruitment of trained personnel and delivery of drugs, stationary etc.

The present road networks of the district are classified into the following four categories according to the District Profile: (i) State roads (Surfaced and Unsurfaced), (ii) DDF primary roads (Unsurfaced), (iii) DDF secondary roads (Unsurfaced), and (iv) Council tertiary roads (Unsurfaced).

(a) Surfaced Roads

The Gokwe-Siabuwa State road is the only major surfaced road in the district. It is well developed and used throughout the year. It is vital for the transportation of coal from Sengwa Coal Mine, cotton and maize from the northwest belt and is also used by tourists and other motorists travelling to Binga, Nyaminyami and Bumi Hills.

(b) Unsurfaced Roads

There are several stretches of surfaced roads, which fall under the responsibility of both MOT and DDF. The bulk of the roads are unsurfaced. In view of the unsurfaced nature of these roads, they are sometimes in bad state, in particular, during the rainy seasons. Funds for maintenance of roads come from the Central Government. However, the past experience has revealed that the maintenance of State or DDF roads is not effective due mainly to inadequate funding. Also, the local authorities do not have funds to develop even the tertiary roads, and they suffer shortage of funds to maintain any of the primary or secondary roads in the district.

(3) Gokwe South District

Road networks in the district mainly consist of the State roads (surfaced/unsurfaced), DDF primary roads and DDF secondary roads.

(a) Surfaced State Roads

The Kwekwe-Gokwe-Sengwa (Gokwe-Siabuwa) road forms the major stretch of surfaced road in the district. The road, completed in 1991, is mainly used

for transportation of coal from Sengwa in Gokwe North District and cotton from Sessami. Another stretch of surfaced roads is in the southeastern part of Gokwe, linking Kadoma with the district.

(b) Unsurfaced State Roads

There are several stretches of unsurfaced state roads in the district. They are :

- (i) Gokwe-Kuwirirana-Nembudziya stretch, which links Gokwe DSC (District Service Center) with Nembudziya. The road is in a bad condition, especially, between Bejani business center and Gokwe-Nembuziya turn-off.
- (ii) Gokwe-Nkayi stretch, which links the district with Matabeleland North Province and is used by several buses to Bulawayo.
- (iii) Lutope-Kana stretch, which links the Gokwe-Nkayi road to Manoti RSC (Rural Service Center).
- (iv) Sessami –Kuwirana road, which is mainly used by cotton transporters to carry cotton from Sessami RSC to Sanyati and Kadoma and is also used by buses.

(c) DDF Primary and Secondary Roads

The DDF primary and secondary roads form the majority of the district’s road networks. The majority of the secondary roads are not all weather roads. Details of these roads in the district are given in the following table:

Summary of Existing DDF Primary Roads in Gokwe South District

Road No.	Name of Road	Length (km)	Location in the District
C 101	Gwehava-Sai-Manoti Turn-off	184.0	Central and Western
C 102	Sai-Charama-Plateau	36.0	Western
C 104	Lutope-Sai Loop	23.0	Southern and Western
C 105	Manoti-Mbungu	52.0	-do-
C 109	Gwanyika Plateau	53.0	Eastern
Total		348.0	

Source: Gokwe South District Profile, 1998.

Funds for the maintenance of road come from the Central Government. From the past experience, it may be said that the funds were evenly allocated to DDF roads, although they were not sufficient to cover all the roads.

(4) Kwekwe District

There exist a total of about 46 km of gravel-metalled roads in Mabura of Ward No.6 and about 17 km of the same in Sidakeni of Ward No.7 in the district. The width of these roads ranges from 3.0 to 6.0 m. Road networks in these two wards are poor compared to other districts. At present, no surfaced roads exist in these wards.