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CHAMA. RICE EVALUATION

JULY - AUGUST 1986

Submitted by:
Dr. Joan Campbell

"Improving the quality of life in rural Africa through the development of water resources, increased food production and the delivery of health services"

I. INTRODUCTION

HISTORY OF THE SCHEME

In 1981, in response to a request by The Ministry of Agriculture and Water Development (MAWD) of the Government of Zambia (GOZ), Africare received a grant of \$1,166,224 from USAID to undertake a scheme designed to increase rice production and rice farmer income in three areas of Chama District - Kapilingizya, Simulemba and Chifunda - in the country's Eastern Province. With the use of mechanization it was hoped to increase the amount of rice land and the number of rice farmers as well as productivity per farmer and per hectare. The project was to last three and one half years, including the growing seasons of 1981-82, 1982-83 and 1983-84.

The interest of the GOZ was to increase the nation's supply of staple grains, thereby reducing the need for imports and foreign exchange expenditure. GOZ wished also to increase the income and level of living of a remote and impoverished area of the country that is vulnerable to famine.

Specific features proposed by Africare to be carried out by itself and the GOZ included:

- 1) A technical package consisting of tractor preparation (ploughing and harrowing) of rice land; nursery plots; transplanting of nursery shoots in rows and seed multiplication and purification to identify and provide the best rice strains for each area.

2) A management package with two components: a District Rice Management Group (DRMG) and a Farm Management Group (FMG). The members of the FMG were to be elected by scheme members and would include a chairman, secretary and treasurer as well as a number of committee members. Accounting duties were to be shared by the secretary and treasurer. The F.M.G. was apparently modeled after the management of the wards into which each district was divided.

3) A personnel package of an agricultural engineer to serve as Africare Agricultural Technician (AAT); a MAWD District Rice Coordinator (DRC), Mr. Godfrey Ndhlovu, and two MAWD technicians for each area-one extension agent (EXST) and one commodity demonstrator (CD).

4) An infrastructure package to include housing for the above personnel and specified improved roads and bridges in order to increase accessibility of the scheme areas so that goods and services might enter and produce leave. These works were to be carried out by GOZ with funds sometimes provided by Africare. Storage sheds for produce and equipment were to be constructed in each area by scheme members.

The project began in August of 1981 with Mr. Harold V. Schmucker, an agricultural engineer with rice cultivation experience in West Africa, in charge.

At the close of the third growing season, March, 1984, Mr. Schmucker submitted to Africare a report of project progress. He found that Africare had met all its commitments: provided an agricultural engineer, provided four wheeled vehicles for both the

A.A.T. and the R.C. as well as a John Deere Tractor, complete with plough, harrow and trailer-plus spare parts-for each section of the scheme, all these vehicles being properly registered and insured; provided hand sowing and weeding machines; provided to the government funds for house and road construction.

Mr. Schmucker found that GOZ had failed to accept and make use of these funds or to provide an effective DRMG. Project members at Kapilingizya had built a storage shed (for produce and equipment), and although none was built at the other two areas, Mr. Schmucker felt that the temporary covers constructed each year were adequate substitutes.

Mr. Schmucker highly praised the work of the R.C., but found that EXST were ineffective partly because scheme members distrusted them as outsiders and partly because much of their time (eight to fifteen days a month) was taken up with collecting their salaries. They were provided with bicycles that did not stand up to the extremely difficult terrain and they were not adequately trained. In any case, during the rainy season, when most rice cultivation took place, the unimproved roads kept EXST from reaching farmers.

Mr. Schmucker reported that scheme members did not follow advice for better cultivation and that the Japanese manufactured planters and weeders provided by Africare were not suitable for the scheme. He also found that farmers lacked incentive, in the form of consumer goods, to increase production.

Failures to meet goals of increased number of farmers, hectarage, productivity and income, Mr. Schmucker attributed to misunderstandings about the nature and capacity of the project area. He found that current productivity of thirty 80 kg. bags/hectare was about what it had been before the scheme, but that the tractor had enabled many farmers to cultivate more rice land as well, probably, as giving them more time to increase their outside non-rice plots.

Scheme hectarage had more than doubled from 47 ha at the start to 100 hectares, by 1984, or two-thirds of capacity (65 ha at Kapilingizya, 45 ha at Simulemba and 40 ha at Chifunda). Original estimates had been for 450 ha. Since tractor capacity was 88 ha, Mr. Schmucker felt that only with outside ploughing could tractors achieve their potential.

The 1983-84 growing season saw 300 scheme farmers (150 at Kapilingizya, 85 at Simulemba and 65 at Chifunda) a number which Mr. Schmucker felt could increase to a maximum of 350. That season should see, he reported, a nearly five-fold increase of farmer income due, in part to their increased land cultivation and, in part, to price increases - from K18 to K40/bag of rice - since the start of the scheme.¹

Given their current income, Mr. Schmucker felt that farmers could well afford tractor hire fees and that the tractors would pay for their own operation as well as amortizing 40% of their

¹Current price is K55/bag, the same as for the 1984-85 harvest.

original costs by 1984, should those fees be collected. That they were not collected he found to be the fault of the FMGs.

In conclusion, Mr. Schmucker suggested that Kapilingizya (about which, in his first annual report, he had complained that they had not yet cooperated at all with the scheme) was the area most likely to succeed, and that future Africare attention should be concentrated there.

Based on this report Africare submitted to USAID a request for a two year extension of the project with the following goals:

1. Develop the FMG into self-sustaining entities able to maintain their tractors;
2. Complete rice trials;
3. Perform a feasibility study of wet ploughing² and transplanting.

Due to failure of GOZ to accept its share of project funds, the extension could be funded at very little additional cost to USAID.

In November of 1984, the project was extended through two additional growing seasons with Mr. Thomas Moller as the new A.A.T., Mr. Moller has a background in accounting, cooperative management and community development, as well as in rice production.

²Wet ploughing, by hand, as a substitute for tractors, which he felt were inappropriate, had been suggested in his 1983 evaluation by Ching'Ambo.

During the extension period, the scheme areas would be required to bear all tractor costs. Emphasis would be on developing Kapilingizya and helping the other two areas to maintain such progress as had been achieved.

To accomplish this, Africare agreed to help MAWD to maintain the road linking Kapilingizya to Chama, as well as a feeder link - to be constructed on a self-help basis - to Simulemba.

For its part, MAWD agreed to:

- 1) annually grade the above mentioned roads,
- 2) facilitate salary collection by EXST;
- 3) provide in-service training for EXST,
- 4) provide a fuel depot in Chama.³

As stipulated, Mr. Moller has worked at improving the FMGs' ability to manage the scheme and its books. In late July of 1985, he cooperated with Sarah Grote, Africare Cooperative Consultant, and MAWD staff in conducting a Cooperative Seminar for Kapilingizya, Simulemba and Chifunda.

The seminar, for scheme chairmen, secretaries and treasurers, as well as their vices, covered cooperative and financial management. Ms. Grote found that the bookkeeping system prescribed by the Ministry of Cooperative and Marketing already partially in place (limited by the lack of understanding by secretaries and treasurers) was appropriate for the scheme and she prepared a manual for training in its use. The manual, as did her

³Chama Evaluation II had reported "a major part of the AAT's time is spent in hauling fuel."

seminar topics, also provides basic guidelines in cooperative management for the Board of Directors.

Ms. Grote also helped update all scheme books, preparing balance sheets and income statements for all sites for all the years of the project (1981-82, 1982-83, 1983-84, 1984 through July 1985).

At the same time as Ms. Grote's seminar, Mr. Moller cooperated with the district mechanic in running a seminar for tractor drivers which dealt with driving and maintenance skills.

An examination of monthly reports following the July 1985 seminars shows the A.A.T. continuously preoccupied with helping FMGs with bookkeeping and planning to continue his activities during the succeeding months. Another bookkeeping seminar for FMG officers, as well as one for tractor drivers. Both Mr. Moller and the seminar participants expressed confidence in the ability of the scheme to carry on, should Africare pull out. This he did partly by individual assistance and partly through mobile seminars.

Some accomplishments as well as constraints at this concluding period of the extension period follow.

- 1) Kapilingizya and Chifunda each have two EXST - one specializing in rice and one concerned with all crops - both on and outside the scheme. Simulemba has one general EXST whom Mr. Moller reports to be ineffective, since, having married into

Simulemba village, he hesitates to exert authority over members of his wife's family.⁴

Only Chifunda ever had a C.D., who does not appear to have remained to the present.

Current work of the EXST is through the technique of Visitation and Training (V&T) prescribed by the MAWD. This consists of visiting individual farmers on their farms. To increase effectiveness of V&T, the government has modified the system to focus on the Contact Farmer. The EXST will visit and train selected individual farmers who will then pass on his instruction to a small group of their neighbors.

To acquaint the farmers of this new extension technique MAWD sends an acting troupe to farming communities, whose performance the consultant was privileged to witness in Chifunda. No previous announcement of the performance was made. Instead, the community was called together by the players stationing themselves under a large tree in the school field and beating a drum.

There has been no in-service training for EXST. The R.C. is well trained in rice cultivation but appears hesitant to exert leadership on the EXST. He seems preoccupied in working with the AAT and must devote time to his other duties in the district agricultural office. He is, in fact, rice coordinator not just for Africare projects but for all the district which includes at least two other "mechanized" rice schemes initiated by the

⁴Simulemba is a huge village (about 200 population) and contributes the bulk of the Simulemba Scheme's members.

Integrated Rural Development Project (IRDP) of the Swedish International Development Agency (SIDA). More will be said of these schemes later in the report in the section on "Glimpses Into the Future."

All staff housing is in place pole and dagga houses neglected by GOZ having been built by scheme member through self help.

2) The FMG's are fully staffed and, after new elections to replace ineffective or, in one case, corrupt leaders, are reported to be capable of carrying out their various managerial and accounting duties. A few of the new committee members are women. The F.M.G's each have three subcommittees: works, equipment and supervisory.

Mr. Moller reports, however, that all FMGs are in need of holding regular scheduled meetings and that meetings he has called for have gone un or poorly attended.

3) Each scheme has two trained tractor drives and although Mr. Moller complains of their carelessness he also reports that all three tractors are in perfect shape and that scheme storage sheds hold supplies of spare parts. There is a district mechanic who can make tractor repairs which are too complicated for drivers to do routine maintenance.

4) Government now deposits EXST salaries in Barclay's Bank in Lundazi, cutting time for salary collection from up to half of each month to one day.

5) All scheme areas now bank at Barclay's in Lundazi rather than at the Postal Savings in Chama, reducing time for withdrawals

from six weeks to one day or less. This is crucial for purchasing fuel (if available) in time to start tractor service in time to finish before the rains.

6) Rice trials are being carried out on five limas at Kapilingizya by six technicians - four supplied by Africare and two by MAWD. Only a few scheme members have been recruited to carry out rice trials on their plots, but there is hope that more will join now that government has agreed to pay a premium for seed rice.

7) A few farmers at Kapilingizya and Chifunda are reported to have planted some early maturing rice this year. Although no definite figures seem to be available, rice trial workers and EXST feel confident that the good results of these pioneers will persuade more farmers to follow suit in succeeding years.

Only one farmer - the FMG chairman at Chifunda - reported planting in rows. After he'd gotten two rows planted he had to broadcast the rest in order to finish planting before the rains. He feels that productivity was greater and weeding was easier in those two rows than in the remainder of his field, but had he persisted in row planting he would not have been able to plant a good part of his field before the rains, thereby reducing his total yield considerably.

Rice trial technicians claim that their fields - cultivated with nursery plots and transplanting in rows - are considerably higher yielding than members' plots. The district agricultural officer feels that such practices in Chama should lead to yields

of about 20-80 Kg bags per lima. However, a report by the R.C. in October 1985, showed that demonstration plots conducted in the agricultural camps associated with five Chama Rice Schemes (I.R.D.P. as well as Africare) states that they yielded from eleven to thirteen bags per lima - anywhere from two to five fewer bags than the technicians involved had estimated.

Farmers have done as well, or better, using traditional methods by careful cultivation, such as planting and weeding early, thorough careful bird scaring and timely harvesting. With good rains yields up to seventeen bags/lima at Chifunda and sixteen at Kapilingizya have been reported. For that same harvest farmers cultivating more casually, but with tractor preparation realized about 10 bags/lima.

Since the government price of rice in 1985 had been raised to slightly over K55/bag, both groups of farmers were well satisfied with their yields and with the scheme, those realizing ten bags feeling that their decision to devote to other crops time that would be required to maximize their rice production seemed a good trade off in nearly equally high prices obtained for these other crops, or in full storage bins of preferred food crops such as maize or sorghum.

Where some farmers reported poor or no yields-except for the situation in this year's cultivation period in Simulemba, where a misplaced irrigation channel drew the entire river on to the scheme the reasons were either ecological (bad rains or bad soils) or untimely personal tragedy. People who were unable, due

perhaps to illness or a family death, to tend their crop during a critical period such as bird scaring or harvesting, lost most of the crop.

8) Tractors are reported as being able to pay for themselves and earn enough for tractor replacement, allowing for foreign exchange availability. Sources of tractor income include: land preparation for persons in and outside the scheme - only the latter only being required to pay in advance, and the farmer now being persuaded to pay outstanding debts (in cash or in kind) by chiefs and headmen, whose aid has recently been enlisted recently by F.M.G.s haulage of harvest to market or storage; carrying passengers when the tractor is going to town.

9) There has been some road improvement, usually by means of self help organized by headmen and/or ward chairmen, with later grading by GOZ. Currently all schemes areas are accessible in the dry season but only Kapilingizya is reachable year round. This condition seems likely to continue for some time since heavy rains and floods, including some caused by rivers that can unpredictably change course, can obliterate even well-graded dirt roads.

At the time of this study farmers at Kapilingizya and at Chifunda had harvested high yields of rice due to good rains. At Simulemba, three quarters of the scheme had been flooded out even before planting could take place. This occurred when the rains came early caused sudden rising of the river which diverted from its original course to flow through a newly constructed irrigation channel to drown the scheme. Simulemba people hope the

channel can be eliminated before the next rains so that the river will return to its original course. Even this, however, might not restore the scheme to its original potential for rice, since the receding river deposited sand over the clay dambo soils, thus reducing their water holding capacity.

Mr. Moller fears that all schemes are in danger of losing that capacity and in his latest reports calls for erosion control. One source of potential gulleying in Kapilingizya might well be a fish trap constructed by the rice trial technicians for their own use. This despite the fact that they warn farmers not to deepen holes which naturally trap fish carried to the scheme by the flood water, for fear of gulleying.

II. THE SETTING

A. Ecology

Chama district is in the Luongua valley in Zambia's Eastern Province. It is considered to be "very remote" and is difficult to travel to or in, particularly in the five month rainy season which takes place during the months of November through April. Annual rainfall averages about 900 mm but is very erratic with a range from about 600 mm to about 1300 mm. No rain at all falls in the seven months of the dry season, leaving the ground baked to near cement hardness.

Soils are heavy, often sandy, loams with patches of clay-rich, dambo areas suitable for rice. Other area crops include maize, groundnuts, sorghum, finger millet, sunflower,

cassava and cotton, as well as various tropical fruits and vegetables.

The Luongua River and its tributaries - one of which is associated with each scheme-flood early with the heavy rains and spill over the area producing the necessary condition for wet rice cultivation. The flood water carries fish which are trapped in pools left in natural basins when the floodwater retreats back to the rivers. Much of the river system disappears in the dry season, leaving only a few pools in sand filled river beds.

Where no cultivation clearings have cut and kept it down, the area is covered with light forest or brush with frequent thick patches of very tall grasses, including elephant grass. Forest, brush and grass harbor the tse-tse fly as well as the wild animals on which it feeds. The tsetse has closed the area to animal husbandry but, in any case, people have lacked motivation to rear domestic food animals, since until recently there has always been plenty of good food animals to hunt. Currently most wild animals have retreated into protected game areas or to the permanent beyond the Luongua River. Monkeys of various species and other small wild animals particularly mice, are still common throughout the area, as are a great variety of snakes.

The forest supplies a variety of plants which provide wild fruits, fuel-wood and building poles. The fallen leaves of one tree are used as fertilizer said to be good for rice as well as other crops.

Malaria and bilharzia are common in Chama, the first being a frequent cause of morbidity, and, for small children, of death. Bilharzia is common among rice growers, paddy water being hospitable to the host snail.

Seed eating birds present a threat to the many grain crops, whose seeds, unlike those of maize, are unprotected from bird attack. Maize is not immune from animal predation, however. Wild pigs harvest maize and the hybrid variety, whose kernels have a soft outer coat, are vulnerable to mice.

B. People

The Chama district is the home of the Senga tribe who speak the Chinyanja language. The Senga tribe is comprised of seven chiefdoms, of which three are included in the Africare scheme. Kapilingizya is in the area of the Senga senior chief, Chief Kabombo. Simulemba is part of the Chikwa chiefdom and Chifunda is the area of Chief Chifunda.

Each chiefdom contains numerous "villages," each village consisting of a single family or a group of families related through the men. The Head of the senior family of a village is its headman and groups of neighboring villages are united through a group headman who is elected by all the headmen of the group of villages.

Villages range in size from the few members of a single family to that of Simulemba village which consists of twenty-five married men and their families plus twelve unmarried men and an unrecorded number of unmarried women. Since most married men are

polygamous, with about two to six wives, and since most wives have about six children, Simulemba would seem to have a population of over two hundred. But like other villages, Simulemba is under a single headman.

Headmanship and chieftainship are passed from father to son, reflecting the strong male authority pattern of the Senga. But these positions do not automatically go to the eldest son. Rather the title holder searches among his sons, starting with those of his first wife, and with the eldest to the youngest, for the son who would fill the position best.

An exception is Chifunda, where, due to an accident of history, the chieftainship is passed from a chief to his sister's son. For this reason the sisters of the chief remain in their natal village on marriage - so that the chief can get to know the nephews from whose number he will chose his successor. This gives his sisters considerable status as possible mothers of a chief and seems to be reflected in somewhat higher status of women in Chifunda. Leadership duties of headmen and chiefs include solving disputes, allotting land to new settlers, and calling meetings concerned with community affairs.

Cross cutting the traditional political organization of the chiefdoms is the modern political organization of wards, which are divided into branches, and these into sections. Each level of this modern political organization is ruled by an elected chairman, secretary and treasurer, plus four committee members.

Kapilingizya is in Kalinku Ward; Simulemba is in Lunlizi Ward and Chifunda is in Chilinji Ward.

The pattern of a Senga village is a mixture of single-roomed houses made from poles and mud with grass roots. The houses vary in shape and purpose; several round, or occasionally square; one or more (depending on village size) open-sided which are used for social gatherings, and many raised on stilts for grain storage or chicken coops. The size of storage bins reflect the size of the stored crop, large bins for maize and rice, small ones for finger millet. The legs of the bins are sometimes sheathed in metal, the result of a MAWD project designed to prevent rodent depredation. In any case, the storage bins, plastered inside and out, are said to be effective so that post-harvest grain loss is not a big problem here as it is in many parts of Africa.

The village contains, and may be surrounded by, a variety of food trees and sometimes cassava bushes.

Traditionally, the Senga have been cultivator/hunters, and to the extent that it is possible, they are today. Now, however, not all men hunt, but those that do, legally or otherwise,⁵ provide meat for all. The product of the hunt may be handed to the headman, as in Simulemba, who then distributes it to all villagers, or sold to special trading partners or to anyone who has cash to pay or produce to barter. Wild animals are increasingly scarce and the meat of most highly valued, but the

⁵ Hunting is only permitted by license, and licenses are difficult to obtain.

Senga do not eat meat of animals that resemble humans, monkeys or hippopotani, whose skin is reminiscent of human skin. Some sources of meat are available to all.

Burning of fields to make catching of mice easier is common in the dry season, and mice often caught by women, are considered a delicacy. In the wet season, fish trapped in the fields are harvested, as they are from pools in the shrinking rivers in the dry season.

The main economic activity of Chama people, however, is farming. Fields are cleared by cutting or ring-barking trees very early in the dry season. Later, when dried, these trees are burned and their ashes turned into the soil.

Rice traditionally is grown in small patches of dambo soils, the hard packed earth broken by long handled hoe, and the seeds broadcast in time for the first rains. As the rice shoots appeared, some were transferred from densely growing areas to thinner areas - a practice called gapping. Weeding is done on a schedule that is a compromise between necessity and available time. Bird scaring, however, is always given priority, since the many seed eating birds could harvest an entire rice crop.

Farming traditionally is a family enterprise. On marriage, in addition to help with his first bride price, a son is given an already cleared first plot to work with his wife. After their first crop, he is expected to clear new land for himself and his wife and, thereafter, for each new wife.

Rice fields are used every year, but for other crops rotation is practiced. Maize one year, followed by groundnuts for two, followed by several years of fallow, for example.

Family cooperation is common for most crops, but finger-millet, cultivated for the brewing of beer is considered a woman's crop, as sunflower and cotton are men's crops. There are no cooperative cultivation groups beyond the family existed, but when necessary, farmers call upon the labor of anyone who would work for cash, or salt, or sharing of a beer party, a practice followed on the scheme by some of the most successful farmers.

While no farmer cultivates all crops, all choose a few so that decisions as to time allocations must be made. The farmer quite consciously opted against maximum production of one crop at the cost of neglecting another. The farmer chooses to maximize his production, not of a single crop, but of his complex of crops. This choice to distribute resources and energy among a variety of crops has a double motive. Firstly, diversity of cultivation provides security against famine should one crop fail, and secondly, Chama farmers refuse to marry their daughters to men with fewer than four crops. Of course, this rule serves to ensure the practice of crop diversification as a defense against the threat of famine.

The following agricultural calendar - drawn up for Chifunda, but fairly typical for all of Chama district - will suggest the competition for farmer husbandary and, therefore, what choices he must make.

Rainfall for 1985-86 is also indicated on the calendar, as are the periods of school closing - important in terms of availability of child farm labor.

Chama Area Agricultural Calendar 1985-86

Month	Rain (in mm.)	School + = Open	Crop	Activity
July	0	+		Ring bark or cut trees burn fields (continues through October)
Aug.	0	Holiday	Rice	Carry to market Start hand ploughing
Sept	0	+	Rice	Continue hand ploughing
Oct.	0	+	Maize	Burn fields; hand plough,
			Rice	Hand or tractor plough
Nov.	59	+	Rice	Plant with first rain,
			Maize	Spot plant
			Cotton	Plant after maize
Dec.	206.5	Holiday	Maize	Continue planting; weed early plantings,
			Rice	Continue planting weed early planting, gap.
			Sorghum	Plant
Jan.	371	+	Rice	Plant; second weeding of early planting.
			Maize	Weed early planted
			Finger- Millet	Plant (women)

Month	Value	Sign	Activity	Description
			21	
			Ground-nuts	Plant
			Sun-flower	Plant (men)
Feb.	225.5	+	Rice	Third weeding
			Maize	Weed
			Sun-flower	Weed
			Ground-nuts	Weed
			Finger-Millet	Late planting along dombo (which stays moist)
Mar.	122.35	+	Rice	Bird scaring (children and, if needed adults); harvest early maturing and dry in shed.
April	120.7	Holiday	Rice	Bird scaring (children) harvest, dry in shed.
			Maize	Harvest after rice
			Ground-nuts	Harvest after maize, dry on ground.
			Cotton	Harvest after maize
May	0	+	Rice	Thresh (women) early planted rice; bird scaring late planted rice.
			Maize	Continue to harvest
			Sorghum	Bird scaring; harvest
			Ground-nuts	Continue to harvest
			Cotton	Pick remainder (soiled and spoiled)

			Sun- flower	Harvest early planted which has dried in field. Thresh, winnow, bag, sell.
June	0	+	Rice	Bag
			Maize	Start shelling (women)
			Finger Millet	Harvest (women)
			Sun- flower	Harvest late planted (men)
			All crops	Thresh, winnow, bag. Start clearing new fields.

No farmer, of course, grows all the crops listed in the calendar. Each selects a variety depending on available land, his own personal calendar and tastes family needs and potential profitability.

Aside from the few farmers growing cotton, all local crops are food as well as cash crops, and what is sold represents the farmer's estimate of surplus, not only over current subsistence needs but also over the amount he feels must be stored against possible famine. And this will vary for individuals (the bachelor may have a much larger surplus than a farmer with many children) and for years. The year following one of poor harvest may see very little of a huge harvest sold as the farmer replenishes his used up stores. Rice, in fact, is valued for its good keeping quality - its ability to defend against famine. It is not this

year's harvest the rice farmer sells, but that of a year or two.

The traditional Chama rice is considered superior for eating because of its aromatic and non-sticky qualities. Farmers say they are willing to grow recommended varieties for sale in addition to growing sufficient of the traditional type for family consumption.

For food not grown, farmers may use surplus rice, or some other crop, to obtain it through barter. For crops sold by family members, the husband may keep the money and dispense it to his wives according to their needs. To have some assured income, nearly all Chama women grow finger-millet for beer brewing. Since most of their beer is bought by men, beer brewing may be seen as a mechanism for channelling money held by men to women who have need of money.

And what are the needs for money in a society like Chama which is so close to being self sufficient? Men aided by their fathers, need occasional large sums for bride price. Children need school fees, and school clothes. Probably family clothes are the major regular expense. Then luxury foods such as salt, sugar and cooking oil (called "salad") as well as meat and fish. Soap, kerosene and matches are other essential purchases and many people pay to have their maize mechanically milled. People may buy mats and blankets, and occasional luxury items such as watches, bicycles or radios.

Locally brewed beer is a frequent purchase, and beer drinking would seem to be a principal social activity. Many farmers report having open bank accounts through the scheme, though most deny this is to care for their old age, claiming instead, "my children will take care of me."

Schools serve all the scheme areas but levels of education do not appear to be high. There are, however, throughout the district, many men who have worked in the Copper Belt or elsewhere and have returned home with some skills as well as knowledge of a wider world.

Chama people generally appear well nourished and in fair health but environmental health problems are common. People are aware that the flooding that nourishes the rice also brings malaria and bilharzia but they feel this is a small price to pay for the prosperity gained through the rice.

III. METHODOLOGY

The information upon which this evaluation is based was gathered by three basic methods: observation, interviews and analysis of project documents.

To the limited extent possible, participant as well as non-participant observation was practiced in such activities as purchasing in local stores as well as the Chama market, in joining village groups in shelling corn or groundnuts, in eating with village members or sharing in a beer party.

All interviews were of the open-ended, non-directed type since the object was to obtain information on the range of experiences of people on the scheme, as well as of scheme personnel and of the scheme itself, rather than statistical information on a few of its aspects. Some interviews were held with individual farmers and some with groups. In addition, interviews were held: with scheme personnel - the R.C., two rice trial technicians, four EXST, four Scheme Officers, two tractor drivers and the A.T. with local (headmen, chiefs, ward chairman), district and provincial officials; and with professionals with some knowledge of the area and its people.

For farmer interviews, a random sample was chosen which included six farmers at both Kapilingizya (3 women, 3 men) and Simulemba (4 women, 2 men) and five at Chifunda (3 women, 2 men). a representative sample of case studies chosen from the farmer interviews will be found in Annex I.

All available project documents, including correspondence, were studied, with particular attention to monthly and quarterly and summary reports of the A.T.

Evaluation was based on a variety of factors, as noted in Section IV., following.

IV. EVALUATION

A. By Goal Achievement Production Figures:

According to to Mr. Schmucker's 1984 report, as mentioned earlier, progress towards goal achievement is not a valid way to

judge the success of the scheme, inasmuch as goals were based on faulty base line data. He estimated total scheme rice area potential to be only about one-third of the 450 ha assumed to be available - 65 ha at Kapilingizya, 45 ha at Simulemba and 40 ha at Chifunda. During the final growing season, 163 ha of rice were cultivated throughout the scheme, well above Mr. Schmucker's estimated potential. This figure, in fact, was reduced by the loss of most of Simulemba's ha to the river, which flowed through the Simulemba scheme leaving that area with only six of its potential ha under cultivation. Thus, in terms of hectarage, Simulemba could be judged a failure at the close of the extension period. But hectarage at Simulemba had been down for the previous year as well. On the 1984-85 growing season, less than 18 ha had been cultivated at Simulemba, down from 46 ha the year before and only a little more than the 15 ha cultivated during the opening season of 1981-82.

The other two scheme areas showed a steady increase in hectarage. Kapilingizya increased from about 25 ha in the first season to more than 84 ha in the last season or about thirty percent more than Mr. Schmucker's estimated potential. Kapilingizya can be judged a success in terms of hectarage - and this despite fault its FMG for having failed to allocate 24 available ha.

Chifunda's hectarage increased the most steadily. Hectarage increased ten times from a mere seven at the start, to more than seventy during the last season or almost double the potential of

40 ha estimated by Mr. Schmucker. Chifunda's hectarage includes some in each of two branch areas, one of which is at a distance of 22 Km. from the main scheme. These branch areas were opened at the request of groups of farmers living in their vicinity.

Currently a third group of farmers is planning to ask for a third subscheme close to their villages. Chifunda can clearly be judged a success in terms of rice scheme ha.

Increase in numbers of farmers (or in the case of Simulemba, decline in the last two seasons) parallels that of hectarage. Since original goals set for number of somewhat more than four hundred can be judged a success except at Simulemba.

In terms of productivity, production per farmer and per hectare are all but impossible to estimate. In the tables below supplied by Mr. Moller in a summary report of February 1986, for the four marketed harvests of the project, only those bags sold to Eastern Corporative Marketing Union were recorded. Bags consumed are estimated as about 60% of total production and bags sold in the informal market seem to have been estimated purely by guess. As mentioned earlier, bags consumed are unlikely to maintain a steady percentage. A steady amount is more likely to approach accuracy since people's capacity to eat does not go up or down with their productivity. Factors impacting on the amount consumed, include, as mentioned earlier, the need to refill depleted storage bins after a poor harvest year. It also includes the amount of harvest of other subsistence crops. For example, if

maize is in short supply, more rice will be held for consumption, or to barter for maize.

It is also true that ecological variables (rainfall amount and pattern, flooding, siltage, crop disease, etc.) beyond control of the project have a marked effect on rice yields. In any case, calculations based on the charts below show that the final recorded year (1984-85) saw a reduction for Kapilingizya of production per farmer to five bags from the pre-project 8 bags per lima estimated by Mr. Schmucker, and a reduction to 19 bags per hectare from his pre-project estimate of 30 bags per hectare. For Chifunda, the figures are as follows; 17 bags per farmer and 81 per hectare, an unlikely figure which results from the unlikely figure of 2,422 bags consumed. For Simulemba, figures show a reduction to 3.5 bags per farmer from an initial 22 bags and to eleven bags per hectare from an initial 67.

The three project productivity tables of Mr. Moller as well as a summary one appear below. To each of the first three, I have added a final two columns which show approximate production of bags per farmer and bags per hectare.

TABLE 1

KAPILINGIZYA RICE SCHEME PRODUCTION

SEASON:	FARMERS:	HECTARES:	80_Kg._Bags BAGS_SOLD_(1):	80_Kg._Bags CONSUMED_(2):	80_Kg._Bags SOLD_I/M_(3):	OUTSIDE_PLOWING FARMERS:_HECTARES	
1981-1982	86	26.6	-	11	-	-	-
1982-1983	96	26.0	279	580	80	-	-
1983-1984	155	43.5	336	880	-	-	-
1984-1985	155	42.5 (4)	308	400	50	-	-
1985-1986	205	84.5	-	-	-	30	12.5

1.M. = Informal market; that is sales outside the legal channel of E.C.U., until this year the only legal marketing channel. Prices on the informal market are considerably higher than paid by E.C.U.

TABLE II
CHIFUNDA_RICE_SCHEME

SEASON:	FARMERS:	HECTARES:	80_Kg.	80_Kg. Bags	80_Kg. Bags	OUTSIDE_PLOWING	
			BAGS_SOLD_(1):	CONSUMED_(2):	SOLD_I/M_(3):	FARMERS:	HECTARES
1981-1982	17	7	53	110	80	-	-
1982-1983	50	16	152	215	108	-	-
1983-1984	80	25	304	233	194	-	-
1984-1985	187	43	669	2,422	387	57	21
1985-1986	186 (4)	72,75 (4)	-	-	-	32	20,625

The faltering of steady growth shown six to eight week for 1984-85. Mr. Moller attributes to a tractor breakdown which interrupted early ploughing.

Low productivity in 1981-82 reflected Mr. Schmucker's judgement that Kapilingizya farmers really had not yet participated in the scheme.

Mr. Moller reported that Kapilingizya had realized a profit of K8,990 for the years 1981-84 and a further profit of K4,472 in 1985. Giving an average income per farmer of just under K112.

For 1985-86 Mr. Miller notes (4) that 114 farmers ploughed 40 $\frac{3}{4}$ ha by tractor while 72 farmers ploughed 32 ha by hand. This is significant in that it demonstrates that farmers in each group were able to prepare approximately equal amounts of land - about $\frac{1}{3}$ ha.

Since sales of rice had not yet occurred at the time of this study, no comparison between productivity on hand-ploughed and tractor ploughed limas was possible. It would be good to make such a comparison when sales occur. It is claimed that tractor preparation of rice land is superior to, as well are easier than, hand ploughing since the deeper ploughing of the tractor up roots many weeds and turns green manure into the soil.

It would also be well to enquire whether those who hand ploughed planted fewer outside crops than those who used that tractor, since it is assumed that farmers use scheme time saved by tractors to increase outside production.

Chifunda's 1981-85 profits amounted to K18,170. Dividing total scheme income for each scheme by its number of farmers shows that Chifunda farmers (average 81) averaged K2-20 income, about double that of farmers on each of the other schemes. In terms of the scheme objective of increasing farmer income, Chifunda can be judged most successful.

TABLE III

SIMULEMBA RICE SCHEME, PRODUCTION FIGURES

SEASON:	FARMERS:	HECTARES:	80 Kg. BAGS SOLD (1):	80 Kg. CONSUMED & I/M (2):	OUTSIDE PLOWING FARMERS: HECTARES	
1981-1982	45	15	401	601	-	-
1982-1983	50	21	232	348	-	-
1983-1984	80	46	213	319	-	-
1984-1985	61	18.625 (3)	84	126	-	-
1985-1986	29 (4)	6.3125 (4)	-	-	40	32.5

As mentioned early, a disastrous flood in 1985-86 has nearly wiped out the Simulemba Scheme. Only two farmers had planted .3125 ha on the 16 1/4 hectares tractor ploughed before the flood, and 27 farmers hand ploughed six hectares. In 1984-85 hectorage had been limited due to a damaged plough. Still, for the years 1981-85 Simulemba realized total profits of K6,690 or an average income of K117 for each of an average number of 59 farmers, somewhat better than that of Kapilingizya'a farmers.

A table summarizing growth on the three schemes, including evaluations of each year's harvest follows. An analysis of production statistics shown thereon suggested that Chifunda and Kapilingizya have achieved about equal success.

TABLE IV
 PRODUCTION STATISTICS

		CHIFUNDA	SIMULEMBA	KAPILINGIZYA
1982	Hectarage	7	15	25
	No. Farmers	17	45	85
	Harvest	Poor	Good	Poor
1983	Hectarage	16	21	25.5
	No. Farmers	50	50	100
	Harvest	Poor-Fair	Poor	Good
1984	Hectarage	25	46.	40.
	No. Farmers	80 Est.	80 Est.	200 Est.
	Harvest	Good	Good	Good
1985	Hectarage	61.5	18.625	42.5
	No. Farmers	187	61	155
	Harvest	Excellent	Very Poor	Good Excellent
1986				65

B. By Behavior Change:

As reported earlier, some farmers are practicing more careful husbandry of rice in response to EXST instruction. They may accept advice to plant earlier, weed earlier and more often (three times is prescribed) and harvest when indicated. They have resisted such more time consuming methods as nursery planting, transplanting and planting in rows, and in interviews three EXST

agreed that this resistance was suitable considering competing demands of other elements of their farming system. They are gradually agreeing to grow new short maturing rice varieties in addition to their preferred food rice.

After some changes in their membership F.M.G. members are taking their responsibilities more responsibly, accept, as reported by Mr. Moller, in holding meetings. Tractor drivers have learned to maintain their machines.

C. BY COMPARISON WITH A CONTROL: A look at the past in the present.

As a substitute for account base-line data an attempt was made to investigate production figures for a community of farmers whose habitat and culture were similar to those of the people on the Kapilingizya scheme. Mudula Village, a large village near Kapilingizya in the Kabombo Chiefdom is such a village. Interview with a sample of farmers yielded the following information for the 1984-85 harvest.

Farmers cultivated from 1/2 to one lima of flooded rice each, achieving about 5 bags per lima, the same amount calculated for Kapilingizya during the same year.

Farmers cultivated between one and two limas of maize. Farmers felt that the people in Kapilingizya, some of whom are their relatives, were much better off than they were - and they have already requested a scheme near a neighboring river - the Chivato Rice Scheme. They feel that with tractor preparation they could cultivate more land.

On the other hand, they attributed their poor harvests of 1984-85 to drought, saying they have done much better this year, as they had in earlier years of good rains.

D. By Social Indicators: It is hard to judge that Mudula village is not doing as well as Kapilingizya. Most Kapilingizya villages have only pole land dagga houses. Here, each of the six wives of the headman has a brickhouse which the head man says he built with money earned working away from home as a treasury clerk. Consumer goods, including bicycles, appeared to be similar to those in Kapilingizya.

Signs of malnutrition in children were more visible than on the schemes, but appeared to be limited to the children of a young women who had returned from her husband's village after divorce. Although the headman claimed village members, her clanssmen help her with work and food the local community worker reported that her younger children barely survived till harvest time. She also reported that village men hunt at the Luongua River and this considerably supplements the yields of their farming.

The community worker, however, reports that there is less malnutrition among scheme families than among non scheme families and that less famine relief food is required on the scheme.

This consultant tried to document and quantify any differential need of famine relief. A comparison of a roster of Kapilingzya farmers, compared to the registry of Ward people receiving relief food, showed that 17% of Kapilingzya's families were among the recipients, but since the population figure for the

ward was not available at the time, percentage of total ward members receiving relief could not be calculated.

E. By Public Opinion: As mentioned above, a community of outsiders is convinced that Kapilingzya's members produce more and eat better than they do. Scheme members of all three areas are convinced they are better off than before the scheme, or, in some cases, feel they could be better off if allocated better land if flooding were better if the tractors was more dependable, or if some personal catastrophe had not hampered their husbandry. In any case the low drop-out rate testifies that people believe in the scheme.

On all the schemes members agreed that the greatest guarantee of increased productivity would be flood control. (All specified flood control, not irrigation, since water is as often ill timed or too much, as too little).

Asked if they could have tractors, or flood control, but not both, which would they choose, only people at Simulemba, despite its recent disastrous flooding, choose tractors!

Another indication that tractors are not unconditionally supported by scheme members is Mr. Moller's complaint in his first report, that on his first visit to kapilingizya, (November 1985) he found the tractor could not be started, and when he asked farmers to help push it, they refused.

F. By Consultant Analysis: Is the scheme sustainable?

1. Technology:

Experience on this project demonstrates that the principal limiting conditions to wet rice production are water and soil. To insure sustainability these factors must be maintained.

In terms of cultivation practices, timely land preparation, planting, bird scaring and harvesting are essential. Where does a tractor fit into this constraint system? As utilized in the Chama Rice Improvement scheme, the tractor might have served as a facilitator and enhancer of land preparation. In actuality it would appear that the Chama tractors frequently failed in these roles, for a variety of reasons: breakdown, lack of fuel, difficulty of obtaining spare parts; lack of money to purchase necessary inputs. During Africare's sponsorship of the project, its technician, with skills in managing tractors, with a four-wheel drive vehicle to fetch tractor necessities and with access to ready cash including foreign exchange when necessary, was not able to keep the tractors functioning despite spending a major share of his time on the effort.⁶

It is difficult to believe that scheme management, lacking the AAT's resources, and left with increasingly older machines, will have more success with tractors. Therefore, tractor land preparation is judged to be non-sustainable.

But, since tractors are not a limiting, but merely a potentially enhancing factor, the scheme could well be sustainable

⁶ As noted in the Chama Evaluation II report.

without their use if attention is paid to the two limiting factors: soil and water.

2. Management:

Although it would seem that establishment of the FMG management system, rather than incorporating the traditional Senga system, was not worth the time and effort required, it does seem to be functioning at the present time. The FMG is, therefore, judged to be sustainable as a management system if the traditional leaders, chiefs and headmen - are utilized, not only in the collection of tractor hire fees and organizing self-help schemes, as has recently occurred, but in practicing their traditional roles in calling meetings, aiding in decision-making, etc.

In terms of bookkeeping, it is questionable that the current officers are dependably capable of carrying on unassisted, and should bookkeepers continue to be selected by popular vote, with no requirement as to necessary skills, this scheme function is judged to be non-sustainable. However, the scheme should be profitable enough to hire a bookkeeper for the few short periods needed.⁷ Bookkeeping is not judged to be a hindrance to scheme sustainability.

3. Personnel:

With the new extension approach of "Contact Farmer" and more guidance by the R.C.O., current personnel should be able to adequately lead farmers in improved cultivation, particularly if -----

⁷ Sarah Grote reported she was able to bring all three schemes books for four years up to date in just a few days.

their efforts are on the practical. For example, general emphasis should be on timely planting and weeding and better seed selection with more refined instruction, such as nursery cultivation and row planting reserved for farmers who are interested in these practices.

4. Infrastructure:

Much of this project was implemented on the understanding that all required infrastructure would be supplied and maintained as required. This did not, and is not likely always to occur. Further expansion of the project should await necessary infrastructure. Since project members have become accustomed to using self-help as part of infrastructure provision and maintenance, infrastructure, when in place, should no longer be a constraint to project sustainability.

A plan for modifying the project to increase sustainability will be found under VIII recommendations.

V. REMAINING CONSTRAINTS

Most constraints have been mentioned in discussions of History of the Scheme. A summary of these constraints with suggestions for possible solutions is presented below.

TABLE 5 CONSTRAINTS

Constraints	Possible Solutions
A. Ecological	
1. Soil Erosion.	<p>Before land preparation for the new season begins. EXST should inspect fields and suggest necessary steps for erosion control, such as:</p> <ol style="list-style-type: none"> a. Levelling plots. b. Where necessary filling of small gulleys with stone and earth. c. If large gulleys have opened they should be treated as a scheme, rather than individual farmer problems. They might be filled, as above, strengthened with logs planks and covered with earth.
2. Erratic Rain Fall and flooding.	Provision of a back-up irrigation system.
3. Extremely hard.	<ol style="list-style-type: none"> a. Pick axes might be tried for breaking soil before hoeing. b. With irrigation, soil might be pre-softened.
4. Porous soil.	Should be reserved for short maturing less water demanding rice.
B. Technical	
1. Tractor Problems	<ol style="list-style-type: none"> a. Spare parts should be replaced as they are used as should fuel and lubricants. b. Ploughing should start early enough in the season so that, should the tractor breakdown, there would be time for hand preparation. c. With irrigation system some land should be softened and prepared by hand, so comparison as can be made of how well irrigated hand ploughing could be substituted for tractors.

- d. People should be prepared for tractor phase out.
2. Unsuitability of mechanical weeders and planter. Attempts should be made to use current supply of planters and weeders after softening of the soil with irrigation.
- C. Inaccessibility
1. Lack of all weather roads. Road improvement should be given priority.
2. Limited mobility of staff and farmers. Sturdier bicycles, motor bikes or motor cycles might be available as well as motorcycles and taxis.
3. Difficulty of hauling crops from fields. Wheel barrows should be available for purchase or rental. Where roads are flat, bicycle or motor bike trailers might be tried. They could be purchased, rented or contracted.
- D. Financial Problems
1. Late payment by ECU. Credit should be sought in order for the scheme to purchase necessities (fuel, lubricants) on time. Credit might be extended to individual farmers to pay tractor hire fees while awaiting ECU payment.
2. Difficulty of getting credit. By law, credit can not be extended to women. Kapilingizya, the only scheme not a Co-op might be converted to a coup. Assistance offered by the District Cooperative and Marketing Officer to acquaint membership with advantages of a cooperative, and help in forming one, should be accepted.
3. Occasional excessive crop loss. Many financial institutions exist in Zambia. The scheme should take out insurance against crop loss for its members.

E. Poor Cultivation Practices

1. Inefficiency of insufficiently trained EXST. EXST in need of further training should be provided this by Africare's A.T., since government has failed to do so. Or this training should be part of the R.C.'s duties.
2. Lack of Compliance of farmers.
 - a. Timing for land preparation, planting, weeding, bird scaring, harvesting should be determined by an expert and farmer's cooperation should become a requirement of the scheme.
 - b. Help with more refined cultivation practices should be offered to interested farmers rather than time wasted pressuring all. Plots of participating farmers should serve as demonstration plots.
3. Plots not equally productive. Scheme land should be divided into areas according to their suitability for different rice varieties.⁸
4. Inability of farmer to perform necessary task. Social welfare committee could be added to F.M.G. which would assign to volunteers critical tasks which disabled member cannot perform. These helpers could be compensated by farmer from proceeds of crop sale. This was suggested to both the Ward Chairman and Chief at Chifunda, each of whom expressed enthusiasm for the idea and offered his leadership in to institutionalization.

⁸See case History of Nganjo, which follows.

D. Management

FMG does not hold regular meetings nor are their, or member well attended.

- a. Cooperation of the Chief should be requested in calling and endorsing meetings.
- b. Ad hoc meetings can also be convoked with a drum.
- c. A beer party after the meeting could be offered.

IV. GLIMPSES INTO FUTURE - TWO POSSIBLE SCENARIOS

By good luck there are two models near Kapilingizya which give some idea as to what may be the fate of the Chama rice schemes when the sponsor departs.

A. Nganjo - Success

Nganjo was a mechanized rice scheme started about two years before Africare's Scheme by S.I.D.A. It is so nearly like Africare's scheme that one wonders if the latter was not modeled on the former. An outstanding difference appears to be that whereas Africare provided each scheme area with a tractor to be managed by locally hired drivers, Nganjo was provided tractor services from the outside. This was reported by Nganjo's EXST to be a major complaint of scheme members who would rather have been made responsible for their own tractors than having been "spoon fed" with tractor services. No complaints were reported for the excellent storage sheds/offices provided by S.I.D.A. But these had little to do with the outcome of the scheme. On withdrawal, S.I.D.A. left its tractor to the District Council, and from that time the scheme has had neither drivers nor tractors. But previous failures of the tractors had demonstrated to scheme

members that they could function without tractor help. Indeed the E.X.S.T. evaluated the situation thus: we are better off knowing there will be no tractor. The tractors were really an excuse for laziness. People did not prepare their fields early, waiting for the tractor. When it broke down before everybody got its services, it was too late to prepare fields before the rains, and harvest suffered. Now people know there will be no tractor. They start to prepare the field early. They are already working (early August). The whole family together, a little each day⁹. And this way the work is not too hard and they will be finished before the rains.

This EXST insisted production is now as good as it had been for those lucky enough to have tractor services - 10-12 bags/lima with casual care and 15-18 bags with careful care.

Success was also reported for persuading farmers to put some fields into cultivating a short (three months) maturing rice variety. This Sindano rice requires less water, as well as shorter standing water than the traditional four month variety preferred by the people. The scheme area is a moderately sloping bowl, with water retained longer in its center. Allocations for four months rice is therefore in the center of the field, with the border areas planted in three month rice. Both consequently do well, with the shorter maturing rice being somewhat more productive. This system of cultivating two varieties makes work

⁹ August is school holiday and children as well as men and women are free for hand ploughing.

easier, since the third time for weeding is eliminated for the three month crop, and the time for harvest is less concentrated, allowing the dual cultivators to harvest each at optimum time.

Although close to the Kapilingizya scheme Nganjo enjoys certain advantages. Although it is not closer to Chama Boma than is Kapilingizya, it is more accessible since the roads leading to it are quite good. It is therefore more approachable by ECU which does not keep its members waiting so long for their money.

B. Katangalika - a failure

Like Nganjo, Katangalika was a SIDA scheme. Its management and services were similar, and it too is served by good roads. Yet, the second year of its independence is marked by near total failure. All but four scheme members had departed before the planting season to search out and prepare dambos where they could find them. The reason had nothing to do with tractors, services or management, but with ecology. An enormous gulley had opened up as the land dried following the previous year's harvest and people knew that all the flood water would run into this gulley and be carried off the scheme.

The four farmers who remained on the scheme got rice yields of four bags/lima and they too planned to plant elsewhere for the coming season. The scheme is completely abandoned.

VII. LESSONS LEARNED

A. Any innovation offered to an existing society must be considered not as an independent entity but as an element in at least two systems - the ecological system and the social system.

B. Before attempting innovation a baseline study should be made, not only of production figures, but of the two systems mentioned above.

C. An impact statement should estimate how the innovation will be effected by, and effect the ecology and the social system. This would give guidance as to whether the scheme will work and, if so, what difficulties might be anticipated and how these might be minimized. It is unrealistic, for example, to anticipate, as does the extension proposal, that "with good rains" desired results will be obtained when the project's three growing seasons had suffered three bad rains - two of drought and one of excess.

D. An old adage in the development profession is "start where the people are." This should include not only their productivity and income but also the services they receive. If roads are bad, financial services are bad, these should be taken into account. To trust that a developing Third World country government - with all its many problems - will be able to carry out (and on time), its hopes of providing adequate goods and services is planning on "pie in the sky," not for where the people are. Planning should be, as it should in C., above, not for the best, but for the worst case scenario.

E. Simplicity - simple innovations, whether social or technical might increase productivity as much as complicated high cost technical ones, and should be sought. For example, an institutionalized means of helping disabled farmers in their cultivation might increase productivity as much as do tractors.

F. Evaluation should be a continuing process, as indeed it was in the Chama scheme, through monthly, quarterly, annual and end term reports, but these were not the basis of change because of lack of another needed characteristic.

G. Flexibility. If obstacles to working according to the original design inhibit the scheme's progress, attention should be paid to modifying the design as events indicate.

VIII. RECOMMENDATIONS

If Africare is to continue its assistance to the Chama rice scheme (and this consultant thinks it should), the following strategies suggest themselves.

A. The size of the scheme should be narrowed until the many still existing snags can be worked out. Kapilingizya is suggested as the area for continued assistance because it is doing fairly well; it had the most land for expansion, it is most accessible; its FMG has been the most stable; its secretary and treasurer may have mastered the bookkeeping system; and USAID's Willie Cook feels it is the only area worthy of continued USAID support.

As the scheme area proves successful it might be expanded. Should the time come when their problems of inaccessibility are

solved, the modified scheme might be expanded to reincorporate Simulemba and Chifunda.

B. Emphasis should shift from tractor use and maintenance to improved husbandry, including cultivation of early maturing strains for non consumption purposes. Any new A.A.T. should be skilled in rice cultivation and should be prepared to spend his major effort in assisting the scheme in its cultivation practices.

C. Money for technical inputs should be concentrated on flood management and erosion control. Water management might be a combination of.

1) Several small channels leading to different areas of the scheme from the nearby Luwumba River.

2) A dam in the river to hold water in the section serving the scheme together with provision of some system to direct excess flood water away from the scheme.

3) Boreholes sited throughout the scheme in sufficient number to serve as a backup to rain and river flooding, and possible to soften the soil a little in order to ease the task of hand ploughing, should that become necessary.¹⁰

D. By means of C. 1, 2, 3 above, if possible, some scheme land should be kept wet long enough to extend the usual five month flooding so that two crops per year of three month rice could be cultivated. Perhaps a less water demanding variety could be used

¹⁰ Professor Molins reports that if the boreholes sunk for irrigation a scheme fifty years ago, 50 percent are still in operation.

for the second, or for both croppings, (see the earlier discussion of the Nganjo scheme).

E. Erosion control should be addressed by constant surveillance. As soon as gulleying commences, the depression should be filled with stones and earth, reinforced in larger gulleys with planks covered with earth. Unless some better method is available.

F. Since, sections of a growing locust plague are approaching Chama, one from Botswana to the South and one from Tanzania to the North, provision should be made to insure the farmer against famine due to crop loss.

1) Farmers should be encouraged to store a year's supply of grains. Rice stores will and should be a major part of stored food. Perhaps there should be a community store as well.

2) Farmers should be encouraged through their scheme to take out crop loss insurance which is offered by many insurance companies in Zambia.

G. Credit should be made available to scheme members so that necessary inputs can be purchased when needed without waiting for payout from ECU.

Since women in Zambia are not ineligible for credit, the scheme should be converted into a coop. The coop could receive credit which it could pass on to any member requiring it.

In any case, six of the area's headmen, through their group headman, as well as some scheme officers expressed to the consultant the wish of many members to have their own multipurpose

agricultural co-op. This was broached to the District Cooperative officer who offered his services in acquainting members with the nature of coops and how to form one.

H. Membership on the scheme, evidentially highly prized, should require some commitment from members.

1) To cooperate in rice trials and seed multiplication.

2) To adhere to good cultivation practices, at least insofar as carrying out activities on time, such as land preparation, planting, weeding, bird scaring and harvesting. Perhaps some authority might announce the best time. This could be the chief or group headman, the scheme chairman, or the man considered to be a gifted rain-maker. Any of these could consult EXST as to the best time.

3) To agree to help when called upon, a scheme member who is prevented from carrying out a necessary rice-cultivation task. The suggestion by this consultant that a social welfare committee to see to this activity be added to existing scheme management committees was enthusiastically received by a chief, a ward chairman and various scheme officers and members.

4) To pay all bills owed to the scheme on time, using credit if necessary.

I. Since, at long last, the FMG has been accepted and functions fairly well, it should be maintained, with the following provisions.

a. The assistance of traditional authorities (Chief, Headmen) should be requested, particularly as to calling meetings - one of their traditional functions.

b. Election of bookkeepers should not be merely a popularity contest. Candidates should be limited to those with a demonstrable skill in mathematics. They should receive training in record and bookkeeping. The possibility of hiring temporary bookkeepers as the scheme expands should be considered.

J. Possibilities of fish farming as part of the flood system should be investigated. Two methods suggest themselves:

1) In association with the dam, where many will be trapped as the river recedes.

2) In the fields to which fish are carried in the flood water. If holes could be dug and lined with cement or stones so that they would not grow into gulleys, but could retain water, not only would trapped fish be easy to harvest, but, since fish swim up river to spawn just before the flood, fingerlings would grow to harvest size, thereby supplying fish over an extended period of time.

Both Jordan Holtam and Godfrey Ndhlovu have designed irrigation cum fish farming schemes which might be suitable for the scheme. These should be considered.

K. A mechanical rice polisher should be available to scheme members so that they might sell polished rice which received a much higher price than does unpolished rice, and that they might be able to polish rice used for home consumption.

L. Possible funding might be provided by USAID through the large amount of kwacha generated in Zambia by PL 480 food sales.

Annex 1

Rice Scheme Farmers: Case Histories

Mr. Albert Zimba, Vice Chairman, (Kapilingizya)

Mr. Zimba has been on the scheme since it started. He has three limas and each of his four wives has one lima. Each wife also has 1 lima of rice outside the scheme. All of the family's eleven rice limas were ploughed and harrowed by the scheme's tractor, as were the two hectares of maize land he works outside.

In addition, two of Mr. Zimba's wives cultivate a lima each and two cultivate a half lime each of millet. One wife also cultivates a lima of groundnuts, and each wife also grows some maize.

He and his wives produce about ten bags of rice per lima. He sells all but eight bags but his wives reserve all the rice they produce. Mr. Zimba claims that all his wives "love" each other and help each other with their farming. He has about twenty children, and though four are grown - one son and one daughter each have a lima on the scheme while another son and daughter are waiting to get on - there are plenty of young ones to scare birds on all the family's fields. In addition, he employed six casual workers for one month for weeding maize at a cost K30 each. He also used help in weeding rice but paid for this in beer.

The Zimba family's main source of income is maize. He sells 50 bags and each wife sells 5 bags. He keeps all the money from maize sales, but gives money to each wife as needed. Each wife also keeps money from selling four pails of millet beer three times a year, for an annual income of K320.

Some of their "reserved" rice, the Zimbabes sell on the informal market in January and February "when there is hunger around." For this they get K30/tin and 5 tins/bag. Some rice is used as barter for labor.

Mr. Zimba and his family live in the village of his elder brother who is the village headman. This brother is the local ward chairman and also the owner of the Kapilingizya maize mill which is located in their village. Also in or around the village are several mango trees, three orange trees and four stations of bananas. The village pawpaw trees were blown over by a heavy wind.

Mr. Zimba's wives kept twenty chickens to provide eggs and meat, but dogs and cats ate many of their eggs and many of the chickens were caught by a feral cat, and some by an eagle.

The family gets most of its meat by buying from hunters. Whatever the meat, it sells for K4/kg - whether fresh or dried. Mr. Zimba feels this is too expensive and would like to hunt himself, but the wait for a license is several years.

Mr. Zimba also buys fish - three small or one large one costing K2. In the dry season his wives catch and cook mice. He feels the family eats well, and that all are healthy.

In addition to food, Mr. Zimba spends money on school fees and clothes. He owns a watch, a bicycle and a radio and considers himself a rich man. This he ascribes to the tractor which helps him cultivate more fields. He reports, however, that "sometimes we sit together and discuss - we want water for good flooding, then we would always get a good harvest if the river water could be directed to the scheme. All would be willing to pay, because until now it is up and down, and with good flooding, we would have no fears."

Mr. Zimba thinks it would help Kapilingizya to have its own co-op which would encourage new enterprises, such as soy beans and cotton, neither of which would be competitive with maize or rice.

Mr. Zimba realizes that he is not achieving maximum rice production but is satisfied with his yields because less care to rice allows him more time for maize. He feels he is maximizing his total farm, if not his rice, productivity. Mr. Zimba feels he manages a successful farming system which is dependent on his good partners, his wives. Indeed, he says his wives were chosen, in part, because of their farming skills.

It must be said that Mr. Zimba's prosperity may be in part due to his getting preferential treatment in use of the tractor - be allocated limas in more favored sections of the scheme.

Ndina Ngambi (Kapilingizya)

Mrs. Ngambi is the second wife of her husband. She lives in her father's village rather than in that of her husband because she does not get along with his first wife. She does all of her

farming under her own management, hiring help as needed. On her scheme lima this past year she estimated that she harvested 15 bags of rice.¹¹ All of the harvest, except some with which she, as do all scheme members, awaits delivery of bags from ECU.

Mrs. Ngambi owes tractor hire fees of K55-K45 for ploughing and K10 for credit until she receives payment from ECU for any bags she sells. Harrowing was done by hand, which together with broadcasting the rice seed, took her two days. She would have hired the tractor for harrowing too, but it had broken down. Her crop was among the best on the scheme. She ascribes this to good flooding this year and also to her care in weeding early, the time for which was her own decision the first of January.

Mrs. Ngambi has no children of her own, but pays a child of her older sister to help with bird scaring and harvesting, as well as with carrying the harvest to the village, and later to the scheme shed for marketing. This transport requires six trips per bag, or about two kilometers.

Mrs. Ngambi grows millet for beer, and sorghum and groundnuts used for food. She expects to sell only 6 bags of rice to ECU. She will also sell some tins of hand polished rice to private customers at K30/tin, and 3 pots of beer for K60. She is able to spend all her money on herself, a considerable amount of which

¹¹In Chifunda, when figs are ripe, boys use the opportunity to kill birds attracted by the fruit, with sling shots.

In general it is dangerous to accept farmers' yield estimates which are often too high, but the FMG treasurer agreed that Mrs. Ngambi is a very good farmer and achieved high yields.

must go for clothes, since Mrs. Ngambi is noticeably well dressed. In addition, she buys blankets, salt, sugar and oil and pays to have her grain milled. She feels she is much better off since she has joined the scheme, seeing poor flooding as her only problem. With good water she feels she could cultivate 2 limas and because of her careful cultivation she will probably get a second lima.

Mrs. Faggie Kumwenda - Kapilingizya

Mrs. Kumwenda and her husband each have a lima at separate parts of the scheme. Hers is near the mouth of the river and receives its first flood. But she received the tractor late so the flood came before germination of her rice and stayed in her field till harvest time. She harvested only five bags. Her husband's plot is further from the mouth of the river and although it too received early flooding and late ploughing it did not hold the water so long. He harvested six bags, all of which he has sold. All of hers is being held for home consumption, as will be the harvest of the three limas of sorghum they cultivate together. Mrs. Kumwenda also has one lima of maize but this year the rain was too much for maize and the yield was poor.

Fortunately, the Kumwendas prefer sorghum 'nshima'. The Kumwendas had enough groundnut harvest from one lima to sell five bags (unshelled) at K32=85/bag. Mrs. Kumwenda was the only woman interviewed who did not get some income from selling millet beer. Her religion (Presbyterian), she claimed, forbids alcoholic beverages.

The Kumwendas did not earn enough from their farming to support the family, but Mr. Kumwenda also works as a carpenter and this year he was able to get planks and carry on his trade.

Mrs. Kotipasi Ngulube - Simulemba

Mrs. Ngulube is the second wife of her husband and was interviewed along with two of her co-wives and a neighbor, a divorced woman who had returned to Simulemba from her husband's village. Like most of Simulemba these four women had lost all of this year's rice crop when the scheme area became a river bed due to diversion of the river into a newly constructed irrigation channel. But this disastrous result in their rice limas (each woman has one rice scheme lima) was not new for them. In 1985 Mrs. Ngulube had also harvested zero bags of rice, as did one of her co-wives. Another co-wife had harvested two bags from her lima and the neighbor had harvested four bags.

Their poor 1985 rice harvest the women attributed to their having been allocated land containing too much sand. The softer soil of these sand/clay fields enabled them to plough their fields by hand when the tractor broke down, but each did later use the repaired tractor for harrowing her lima. The sand that made the soil softer however, also made it more porous so that much water was lost, resulting in a shorter flood period and reduced harvest. In Mrs. Ngulube's case the problem was not too short flooding, but no flood - the water never reached her slightly elevated land.

Now, the women report, the invading river has deposited even more sand on their plots. They are not disenchanted after two years of rice scheme failure and are eager to try again, but they want different land, and think that now, with a new FMG, they have a chance at better fields. The women think that better land could become available if the scheme is expanded. To do this, they offer services of themselves and their husband in stumping and burning.

All the women have outside plots for other crops. Mrs. Ngulube prepared one lima of maize but obtained no yield because her crop was eaten by bush pigs. Her more fortunate neighbors, however, reported yields of eight to twelve bags of maize per lima from one or two limas. Three of the women also had some land (one half to one and one half limas) in groundnuts and one of Mrs. Ngulube's co-wives sold two bags. She herself obtained four bags of groundnuts on one half lima and plans to sell what she and her four children do not consume in order to buy maize. In addition to feeding herself and her children, Mrs. Ngulube, as do her three co-wives, contributes some food each day to her husband who eats with other men of the village in a separate men's house.

All the women cultivate some finger millet and obtain occasional income from producing millet beer.

The women unanimously think that the scheme gives them a chance at better rice harvests than they produced before - partly because the tractor makes weeding easier and deeper and partly

because they have learned to plant and weed earlier. Despite two years of no or poor harvests they all intend to pay their tractor hire debts as soon as they are paid for selling maize to ECU or in Mrs. Ngulube's case, with money given her by her husband from proceeds from selling his maize.

Elliam_Zimba, Ward_Chairman_(Chifunda)

Mr. Zimba is a retired school teacher who returned to Chama in response to the government's "Back To The Land" campaign which grew out of its "Grow More Food" movement of 1980. He arrived shortly before the inception of the Africare Rice Scheme and was not able to join the scheme until last year.

Mr. Zimba is obviously well educated and civic minded. He was elected to his position as Ward Chairman because of his leadership in building a school and housing for its teacher. He is also quite knowledgeable about rice production and has recently visited a modern rice farm in Malawi, returning with seeds of three varieties of short maturing rice which he intends to try in the coming growing season on a lima outside the scheme. This past growing season he planted two limas of rice, one on the scheme and one outside. But in February Mr. Zimba was hospitalized for several months after receiving news of his brother's and sister's deaths, one following immediately on the other. Mr. Zimba's wife stayed near the hospital in order to be able to visit her husband. Of their two limas, only one bag of rice was harvested from the scheme lima and five from the one outside. Mr. Zimba, in returning home, had settled near his father who was able to scare

birds on his son's outside plot to a certain extent since this plot was near their homes, but the scheme plot was too far for him to reach.

For the previous year, outside the scheme, Mr. Zimba had obtained 11 bags on his rice lima, all worked by hand. He feels that, had he been present this year for bird scaring on his tractor worked scheme lima, he could have done much better, probably 15 bags. For his previous years hand ploughed lima, Mr. Zimba had the assistance of twelve workers who did the job in one day and were paid in beer. He thinks that the tractor would have given him a better yield because it goes deeper than workers do with their hand hoes, and digs any weeds into the soil as manure, resulting in "fatter" rice.

Mr. Zimba thinks there might be a way to net birds, rather than scare them. Weaver birds (one of the main rice predators) are sometimes trapped and they make very good eating.¹²

Due to his duties as ward chairman, Mr. Zimba's farming, other than rice, is limited. He does not intend to run for election to a third term as ward chairman, finding that his salary of K50/mo. does not compensate him for time lost to farming.

¹² In Chifunda, when wild figs are ripe, boys using sling shots, use the opportunity to kill birds attracted by the fruit.