V. Improvement policy of the Living Condition of Local Residents

In this chapter, policies for improving the living standards of local people around the Reserve will be discussed as a precondition for easing pressure on the Reserve before the implementation of various plans and programs described in Chapter 6 and following chapters.

5- 1 Improvement of the Income Level of Smallholders

The income level of most farms in the vicinity of the Reserve is low, and they are forced to live below the minimum standard. That is why they depend on natural resources. In this situation, it is a significant measure to improve the income level and living standard of farmers as part of the sustainable multiple-use resource management plan .

1. Current Situation of Smallholders

The population in the vicinity of the Reserve has increased at a higher rate than the Malawi national average. This increase in population has accelerated the conversion of forest, into farmlands and the subdivision of existing farmlands. Many farms in this area are smallholders on subdivided farmlands.

Every farm cultivates the most favorable cash crops, which, however, need heavy fertilization, and their earnings from the sales of cheap crops will be spent for these fertilizers. If they cannot apply any fertilizer, output will naturally decrease. In some cases, with a low yield from the small farmlands subdivided following the population increase, even if they repeat cultivation farmers cannot earn an adequate income to support their families. Therefore, they cannot purchase fertilizer for the next season, and the harvest has decreased year by year without fertilization. Such a vicious circle is a fact for smallholders.

The Reserve is almost surrounded by hills, and farms in this area take the form of upland agriculture. Accordingly, it is important to maintain agricultural productivity, conserve soil, and maintain its fertility. Serious problems for farmers in this area are cultivation which deprives unfertilized soil of nutrients and soil erosion by strong rain and wind.

Despite being fragile, most farmers do not seem to strive towards changing their current situation. They look tired from too many problems and obstacles. They are at a loss on what or how to move toward higher productive agriculture. In most areas, people complain that the agricultural extension staff has rarely visited them. They are not given any opportunity for acquiring new agricultural knowledge and technology, and are still forced to operate pre-modern, less productive agriculture.

2. Future Prospect

The first step to a higher level of income is to create an environment in which farmers will be encouraged to learn new agricultural knowledge and technology, and to put them into practice. In fact, however, the agricultural extension system does not work effectively. Farmers are currently discouraged by the fact that they have no choice but to continue pre-

modern, less productive agriculture. A deficiency of new knowledge and technology for upland agriculture also stagnates the present state of agriculture. To break this stagnation, it is desirable the extension staff will be more active and relevant agencies will take appropriate measures to support the staff.

If new knowledge and technology for upland agriculture is introduced, it will be possible to further improve productivity and create a new form of agriculture. A key to success is how to vitalise the agricultural extension administration and build closer relationship between the staff and farmers in order to encourage the latter to actively manage their agriculture. In this process, efforts to achieve a higher income level are required.

3. Measures

A better rural life, especially a better dietary habit is important. It is significant to consider agricultural activities for this purpose. If a surplus is produced, income should be increased through sales. If anything more weight should be given to the latter. In order to increase current income, promising activities include small animal farming, fish breeding in a small reservoir, irrigated cultivation of vegetables, beekeeping, fruit cultivation, and so on. These are agricultural measures to improve the income level of smallholders.

When taking any of these measures, it is necessary to take into consideration the characteristics of localities. If a combination of various measures are simultaneously carried out, they will give higher results. Therefore, the extension staff needs to take appropriate measures after fully investigating the characteristics of the locality concerned, including communal and blood relationships as far as possible. It should be well understood what farmers need and what they are enthusiastic about, and then a suitable measure should be taken for the locality. In other words, even though vegetables sell well in the market, it will be unsuccessful to encourage the cultivation of vegetables in hilly areas with no water resources.

Market conditions and access must also be taken into account in promoting a form of agriculture. The results of the survey showed that in some cases, it took no less than 3 hours to carry crops to the market though a variety of crops were cultivated. Efforts to encourage agriculture will never bear fruit unless the social infrastructure is improved.

On the other hand, a new activity will require a certain amount of money, and farmers who have no funds cannot but depend on loans. The extension staff needs to give advice to these farmers on how to apply for loans, how to negotiate with credit companies, a prospect of repayment, and how to repay. Thus, the enthusiasm and effort of farmers are fundamental for success on one hand, and a detailed plan and advice are necessary on the other. It is important to build a close relationship between farmers and the extension staff.

Various measures for a higher income level have been proposed. Many of these assume that women will perform new tasks. Women in this area are already overworked. Imposing additional burdens on women will create severe problems. Therefore, family cooperation, especially from men (husbands), is essential in carrying out the proposed measures.

Moreover, women must be given the right to determine how to dispose of the products mainly produced by themselves as well as the use of incomes from sales. As long as labor is imposed on women and the products of this labour are given to men, these measures will never be successfully carried out. This approach is not allowable from the

standpoint of gender.

Currently, farmers individually operate their agricultural activities. However, if they are grouped, problems will be solved more swiftly and strongly. In principle, farmers should be encouraged to set up clubs for collective agriculture.

If they act in groups, they will be able to master the necessary knowledge and technology for solving agricultural problems, and efficiently perform the agricultural activities. They will eventually recognize the necessity of cooperation. When purchasing fertilizers, pesticides and insecticides, they will receive discounts to reduce costs. When selling crops, they will be able to secure a stable market by the joint supply of crops. They will also be able to develop a new market or a new system through joint market research.

Agricultural measures to increase farm income are as follows:

1) Conservation of soil fertility

This measure is recommended for slopes whose topsoil is eroded by rains during the rainy season or wind during the dry season, and areas where soil nutrients were consumed in the absence of fertilization and crop yield is declining.

Leguminous plants will help prevent soil erosion or maintain soil fertility through nitrogen fixation by its root nodules for the purpose of improving land productivity. This will help return fertility to the soil and facilitate the growth of crops. In addition, adopted plants will provide fodder for domestic animals. For these applications, the tree species to be introduced is preferably deep-rooting leguminous plants such as *Acacia albida, Casia siamea.*

An outline of methodology for maintaining soil fertility is as follows:

(1) Recommended site: slopes exposed to the risk of soil erosion by rains and wind, and farmland whose fertility is declining.

(2) Form: Individual farmers. The contour cultivation of crops will be promoted to reduce soil erosion as far as possible.

(3) Tree species to be introduced: As a rule, leguminous tree species. However, plant species should vary from purpose to purpose, namely prevention of soil erosion, fertilization or fodder supply.

(4) Spacing: Spacing should vary with topographical farmland conditions (gradient), the purpose of introduction, and the plant species to be introduced.

When implementing this method, the forestry and agricultural extension staffs will be required to give technical guidance to the farmers.

2) Small Animal Farming

Small animal farming is proposed on the principle that the local people will raise animals as a source of protein necessary for themselves. This activity is mainly intended to earn income. Small animals available for breeding include domestic

fowls, guinea fowls, hares, and guinea pigs. Besides these, goats and sheep are also available.

A suitable site for raising small animals is an area where fodder and water can be secured even during the dry season. The scale of breeding will be determined by the number of family members who can take care of these animals and the availability of fodder and water. In areas adjacent to the Reserve, it must be fully investigated whether tsetse flies occur or not before the start of breeding. There is a case of past damage where a farmer lost all 20 head of cattle. Goats and sheep are not very suitable for breeding in such an area. Since they need drinking water during the dry season, their breeding is limited to an area where a required amount of water can be secured all-year-around.

The breeding of small animals is inevitably exposed to epidemics which may annihilate all of them. Taking appropriate measures are essential. Diseases which domestic animals may suffer from must be constantly controlled under the guidance of the extension staff of the Animal Farming Unit and relevant agencies of the Ministry of Agriculture and Livestock Development. According to the survey by the study team, there were many people who gave up breeding animals because they could not receive any advice from the extension staff in case of disease. To respond to their demand, it is desirable that the authorities will establish a system for thorough extension, disease prevention, and breeding guidance.

(1) Recommended site: An area where fodder and water are available even during the dry season.

(2) Form: As a rule, individual farmers will take charge of breeding. However, farms should be grouped for breeding small animals so that they can collect information on technical improvement and markets, and rationally manage the breeding. Also, efforts should be made to reduce costs by purchasing bulk fodder and securing a favorable market for their sale.

(3) Animal: Similar to the form of breeding, the species of animals to be bred will be determined by taking into account the intentions of individual families and groups. The number of animals will be determined by taking the capacity of a family into account. Species which may not raise any problem in distribution should be selected in light of market trends. Farmers need to receive advice on varieties from relevant agencies of the Ministry of Agriculture and Livestock Development and the Animal Farming Unit.

(4) Operation: As a rule, women and children will assume this task for their respective families.

(5) Purchase of initial animals: Since the purchase of initial animals requires a large fund, farmers must apply for loans. For this purpose, they should be grouped to procure funds on a joint liability. This is an easier way of receiving loans. Bulk purchase will receive discounts and reduce costs.

(6) Disease and insect damage: Animals are exposed to various diseases and harmful insects. In some cases, by their occurrence all the raised animals

were annihilated. Early detection and early response are essential. Domestic animals must always be observed without fail. By all means farmers must prevent any outbreak under the guidance of the Animal Farming Unit and other relevant agencies.

(7) Organisation: As previously mentioned, collaboration has various merits, including cost reduction due to bulk purchase of fodder, pesticides and insecticides, technical acquisition, and proper responses in case of emergencies. The group members will strengthen their sense of solidarity.

(8) Sale: The period of breeding is an important factor. A longer period is not necessarily good. If the period is longer than necessary, it will result in more cost and less profit.

In the case of joint breeding, securing a market for bulk purchase is the best way. Otherwise, farmers must always pay attention to market trends while receiving advice from the people concerned.

In Malawi, although the breeding of guinea fowls has already been started, breeding techniques is on way to be established. In a new attempt, it is necessary to exchange all opinions with groups which have started the breeding.

3) Vegetable Cultivation

In Malawi, the dry season is long, during which securing water is difficult, and therefore agricultural activities are sluggish. Despite a demand, vegetables are not sufficiently supplied. It can be stated that the cultivation of vegetables during the dry season is a promising agricultural activity which can expect a large market.

There are wetlands like dambo (seasonally wet grassland) around the Reserve and also small basins where water gather for long periods of time even during the dry season. Irrigated agriculture is to actively use water even during the dry season from a simple earth dam constructed under these topographical conditions. This method of agriculture is still underdeveloped and needs promotion. The soil of wetlands like dambo is fertile and optimum for cultivating vegetables.

Vegetables are currently cultivated in many areas using dambo areas, although on a small scale. A hole is dug at the bottom of a dambo and the water gathering there is used for cultivation. Such cultivation remains on a small scale only as personal farming.

However, even wetlands like dambo have already been privatized. When irrigated agriculture is managed in a large dambo, it will require joint development with the consent of the farmers in the area, including the village headman.

Even if it is only on a small-scale, an irrigation facility cannot be constructed by a single farm. Farms which wish to use this method must collaborate for its construction.

(1) Recommended site: Dambo and small basins.

(2) Form: As a rule, individual farms will take charge of cultivation. However, for more farmers to cultivate, they should be organized into groups for cultivation according to the capacity of irrigation facilities.

(3) Construction of irrigation facility: A facility which requires the construction of a large dam is unprofitable, and the construction of a large-scale facility is unsuitable for the collaboration of farmers. The size of a facility should be determined within the range of collaboration. A preferable size is one in which farmers who will use the water can afford as a whole. If mechanisation is highly needed, it should be minimised by conferring with the relevant agricultural agencies. Farmers should receive advice and guidance in designing and constructing a facility and request assistance and loans for the construction. Construction work will be mainly assumed by the men.

(4) Cultivated vegetable: The species and cultivated area of vegetables will be determined by taking market trends into account. Cultivation will be mainly assumed by women. Earnings from sales will be managed by the women. In this point, men need to understand the women's role.

(5) Disease and insect damage: Farmers will collectively receive guidance from the agricultural extension staff on knowledge as to damage by disease and insects, methods of prevention, and techniques for sprinkling chemicals after their occurrence. Chemicals will be purchased in bulk.

(6) Crop sale: A cooperative system needs to be formed for the joint transportation of crops to the market. Individual farmers should stop separately carrying their crops to the market and then individually selling them because such an approach is inefficient. Instead, they should devote themselves towards cultivation by seeking for a dealer who can afford bulk purchases.

(7) Organisation: Knowledge and techniques for cultivation will be collectively mastered and problems on disease and insect damage will be jointly solved. Fertilisers and chemicals will be purchased in bulk to reduce costs. Market research and development will also be collaborated with an emphasis on constant supply. A new market will be jointly explored.

(8) Joint project for fish breeding: If any irrigation facility is simultaneously used as a pond for fish breeding, it should be jointly constructed and the rights of both parties should be guaranteed.

4) Fish Breeding

There is a large fish demand everywhere in spite of preferences. While some people like river fish, others like fish caught from Lake Malawi. In this area, the local people generally do not eat raw fish but instead prefer dried fish. It is difficult to ship fresh fish without transportation and distribution system. Prior

to the start of fish breeding, it is necessary to make a complete plan in cooperation with offices of Fisheries Department.

Fishes will be, as a rule, bred in irrigation facilities. It is important to select fast-growing fish species on the assumption that water in the fish-breeding pond will dry up if the dry season last too long.

The fish-breeding pond must be strictly controlled to prevent fishes from leaving the pond during a flood, and as a result changing the natural ecosystem outside the pond. Fish species which inhabit the area should be chosen so as not to destroy the natural fish ecosystem. The people concerned need to receive guidance from offices of fisheries Department in the selection of species, the acquisition of breeding knowledge and techniques, and fish processing technology.

(1) Scale: The scale of fish breeding will be determined according to the capacity of irrigation facilities (vegetable cultivation).

(2) Form: It is rational to organize farmers who will share an irrigation facility into a group for fish breeding.

(3) Fish species: Fish species should be selected so as not to destroy the natural fish ecosystem in the neighborhood. As a rule, fishes which inhabit rivers in the area will be chosen. To secure a market, preference of fishes will be taken into consideration. Species which can be bred in a short period will be chosen on the advice of offices of Fisheries Department.

(4) Breeding: The acquisition of breeding knowledge and techniques, the prevention of disease and insect damage, and necessary treatment will be managed under the guidance of offices of Fisheries Department. If any disease or harmful insect occurs, all the fishes in the pond may be killed. All preventive measures must be properly taken. A strict measure will also be needed to prevent fishes from leaving the pond.

(5) Processing and sale: Since fishes are live products, a transportation system should be considered in advance in order to keep them fresh during transit to the market. If such a system is impossible, fishes will be processed for sale. In this case, the people concerned need to receive guidance from office of Fisheries Department on knowledge and technology for fish processing. If mass shipment is expected, market research should be conducted in advance to seek buyers through office of Fisheries Department.

(6) Income distribution: It should be determined in advance how to distribute incomes among the members of the group. One or more members of the group will take charge of the accounting.

5) Beekeeping

The results of the survey revealed that beekeeping was given less weight by farmers because they did not understand the profitability of beekeeping as an

industrial activity or beekeeping techniques.

Honey is highly demanded, and beekeeping in natural forests has great potential. Currently, the DNPW promotes the beekeeping project, which has remarkably spread. However, supply is still insufficient to meet demand.

Farmers must receive guidance from the agricultural extension office or the Animal Farming Unit in acquiring beekeeping knowledge and techniques, and making and using tools. It would be better for them to jointly operate this activity in groups. As farmers need funds for purchasing protective suits, beehives, and honey extractors, a joint application for loans would be better.

(1) Site: As a rule, areas near the customary forests in villages and areas close to the Reserve and forest reserves.

(2) Form: Collaboration. Whereas bee control and honey collection will be individually operated, honey processing will be collaborated (a honey processing machine is too expensive for individual farmers to purchase). A joint beekeeping plan should be developed in advance.

(3) Operation: As a rule, women will take charge of the beekeeping. They will make beehives and collect initial bees with the cooperation of the men. As far as possible, honey will be jointly collected and processed on the advice of the extension staff. Initial bees should be increased on the advice of the extension staff.

(4) Sale: It is preferable to jointly sell honey as a local specialty in a common brand name and secure a stable market.

6) Fruit Cultivation

In Malawi, mangoes are extensively planted. At this stage, however, mango trees are just planted rather than cultivated for sale. In addition to mangoes, oranges, papayas, bananas, guavas, avocados, and cashews are also promising fruits. Although they are now cultivated, selective breeding, new knowledge, techniques and technologies for cultivation and processing, and the introduction of a distribution system have not yet penetrated among farmers. Seizing preference of the local people is an important factor in marketing. It is also important to select fruit species by taking the state of farmland into account.

At this moment, such a plan is not in effect in Malawi. It is a great problem for farmers that the cultivation of some crop other than maize as their staple will reduce the area under maize cultivation as well as its harvest. Priority should be given to solving this problem. After that, the extension staff involved in agriculture should recommend other crops to farmers in areas with many slopes around the Reserve.

(1) Site: Abandoned farmland, areas around houses, or boundaries of farmland will be used. Fruit trees can also be planted as part of agroforestry.

(2) Form: Although individual farmers cultivate fruits, clubs should be formed

for joint operations from cultivation to distribution. Farmers should acquire new cultivation techniques in groups and cooperate with one another to prevent disease and insect damage. Fertilizers and chemicals will be purchased in bulk to reduce costs. Stable supply and quality assurance will be collectively controlled, and a stable market for mass distribution will be jointly explored.

(3) Variety: A selectively bred variety of mango with market value will be introduced. As for other fruits, improved varieties suitable for the locality and soil should be introduced under the guidance of the agricultural extension staff.

(4) Cultivation: Cultivation and management which require heavy labour will be mainly assumed by the men. It is more efficient for farmers to collectively acquire knowledge in groups as to disease and insect damage, and knowledge and techniques for prevention and control under the guidance of the staff.

(5) Sale: Although individual farmers can sell crops, they should explore a joint distribution market.

(6) Processing: Collaboration under the guidance of the fruit cultivation extension staff. The greater part of this operation will be assumed by the women. Machines necessary for processing will be purchased on joint credit.

4. People's Awareness toward the Proposed Measures

The awareness of farmers toward the proposed measures to increase their incomes were surveyed by sampling at random two villages in each of the east and the west of the Reserve.

The villages surveyed are:

1. Chanika	Mphonde STA	Nkhotakota District
2. Aaron	Kanyenda TA	Nkhotakota District
3. Ching'amba	Chilooko STA	Ntchisi District
4. Chikhang'ombe	Kapelula TA	Kasungu District

* Three villages other than Chikhang'ombe bound on the Reserve.
* Three villages other than Ching'amba are on topographically gentle land
* There are some dambos (seasonally wet grassland) and small basins in each of these villages.
* Whereas Chanika and Aaron in Nkhotakota are at an altitude of around 500 m, Ching'amba and Chikhang'ombe in Ntchisi and Kasungu are at an altitude of around 1,000 m.
* Thirty to fifty farmers from each of these villages participated in this survey.

In the survey, farmers were requested to talk freely on current situations in their villages, agricultural problems, and desired agricultural measures.

In the course of talks, various problems facing the farmers were pointed out. Of them, "a shortage of water" or "measures for water" in upland agriculture was the most serious problem. In addition, the following problems exist.

* A lack of funds for new activities
* Damage to farm crops by wild animals
* No means of acquiring agricultural knowledge and technology
* Difficulty of the extension staffs' coming to villages
* Underdeveloped social infrastructure
* Transportation to the market
* Market development.

The activities that the study team proposed as possible advance measures were evaluated by the farmers as follows. All the farmers surveyed were requested to rank these measures in order of priority.

Table 5-1 The Order of Priorities in Possible Measures

Measure	Chanika	Aaron	Ching'ambe	Chikhang'ombe	Average Priority, rank
1 Conservation of soil fertility	5	6	5	4	5
2 Small animal farming	2	1	1	5	1
3 Vegetable Cultivation	1	2	4	3	3
4 Fish breeding	3	3	2	1	1
5 Beekeeping	4	5	6	6	6
6 Fruit cultivation	6	4	3	2	4

The above-mentioned priority order was determined within the range of knowledge the farmers had at the time. If they acquire new knowledge for these measures, their evaluation will probably change. In other words, farmers remarkably lack knowledge as to new forms of agriculture.

Small animal farming, fish breeding and irrigated vegetable cultivation, by contrast, were high in the priority order because these would produce foods which farmers wanted and also because they judged these products to be highly marketable. This reflects their desire for self-consumption as well as cash income.

In Chanika and Aaron, these high-ranking activities were accepted because large markets (Nkhotakota Town for Chanika, and a sugar factory in Dwangwa for Aaron) exist near these villages. The existence of a neighborhood market is a requirement for any crops.

On the other hand, beekeeping promoted by the DNPW has steadily spread as a result of administrative efforts. This demonstrates that if the authorities earnestly explain measures to the farmers in an understandable way, a significant number of farmers will become interested and carry it out.

With regard to soil conservation, contour cropping is prevailing in every village, and villagers think in their own way on soil conservation.

There are some dambos in every village, which have already been privatized. Vegetables are cultivated on a small scale in areas available for their cultivation. The way of vegetable cultivation is very simple: farmers just wait until water which had gathered at the bottom of the dambo during the rainy season disappears and then they plant the seeds. For watering, they dig a hole at the bottom of the dambo.

Farmers in Ching'ambe in Ntchisi District and Chikhang'ombe in Kasungu District were seen traveling to near towns to sell vegetables produced in the dambo. However, it is a three-hour walk to go to these towns. Some crops have to be carried to as far as Kasungu. Distance, access and transportation means to the market are current bottlenecks for farmers.

5. Problems in Implementing the Action Plan and Proposed Solutions

As previously stated, the social infrastructure of the local communities is insufficient, and its improvement is a prerequisite for carrying out the proposed measures. Unpaved and incomplete roads substantially obstruct the distribution of crops as well as agricultural activities.

There are problems to be improved on both sides, administrative agencies and farmers, in implementing agricultural measures.

1) Measures for Problems for the Administration

For relevant agencies:

* Strengthening extension system
* Strengthening administrative support for the extension staff
* Increase of extension staff members
* Increase of loyalty by the extension staff to work (more consideration for farmers)
* Action and enlightenment on gender problems.

These problems are fundamentally attributable to an insufficient budget on the part of the government. Satisfactory working conditions cannot be provided to the extension staff due to an insufficient budget.

2) Proposed Solutions and Methods to These Problems

Although there is no budget for increasing the extension staff, it is possible to thoroughly educate the staff members in mastering new agricultural knowledge and technology continuously. The staff should strive to establish a reliable

extension system for farmers and somehow visit the villages. The staff should also make efforts to encourage farmers to properly manage their agriculture by providing all possible information on agricultural activities, including new knowledge, technology and marketing.

The government has already grappled with gender problems at the national level. However, women are still forced to live in long traditional customs and practices. It is regarded as taboo for any administrative agency extension staff to refer to this problem in the villages. In fact, staff members hesitate to speak of it.

The government must cope with this problem with a stronger will. It should lead the people to set up women's groups in various agricultural activities, in which women will be encouraged to become aware of gender problems. In the course of guidance in agricultural measures, the staff should lead villagers, including men, to understand equality of the sexes and the necessity for cooperation between a wife and husband so that a women's labor will be reduced.

3) Problems for Farmers

There are common problems in implementing new agricultural measures.

* Farmers are interested in these measures but cannot start due to a lack of funds.
* Too strict application standards prevent farmers from receiving loans (including too strict repayment conditions).
* There is no method for mastering knowledge and technology on these measures.
* The extension staff has difficulties visiting the villages to explain any new agriculture.
* Farmers are not sure that problems will be solved because they cannot rely on the extension staff to visit.
* There is no means of transporting crops to the market.
* Farmers are not sure they are able to sell crops (they do not know about market activities).

In the free talk, women did not actively express their opinions because women's status was still low in village. As one gender problem, this is found in every village and indicates that women have not yet been emancipated.

The specific problems by measure are:

(1) Conservation of soil fertility

In reality, farmers do not know what problems exist because they do not even know how to maintain the soil. Many farmers became interested after they receive an explanation and understand the concept of agroforestry. It is seemed that they intuitively judge this measure to help conserve soil and maintain its fertility.

This measure must begin with its understanding.

For this purpose, it is primarily important for farmers to understand the significance of maintaining soil fertility of farmland with a help of the agricultural extension staff. Specific methods for utilising their knowledge and technology should be taught to farmers and carried out with regard for the local environment.

(2) Small Animal Farming

* A high purchasing cost for initial animals is a bottleneck.
* Despite the frequent occurrence of disease and insect damage, there is no chemical supplier.
* Veterinarians do not practice in the neighborhood.
* There is no water drinking spot for animals in the neighborhood.

In addition to these problems, it was noted as information that ruminants were the best candidate for breeding because of their resistance to disease and dryness, adaptability to any type of grass, short production cycle, and propagative power.

Possible measures to solve these problems are as follows:

* To procure a large fund for purchase, farmers should be organised into groups or clubs for small animal farming so that each group or club of farmers rather than individual farmers will borrow money and take the responsibility for repayment. Those who wish to breed animals do not have to start together in the same year. At the outset, it would be better for them to start farming on a small scale by borrowing a small sum of money in order to reduce the burden of repayment.
* In areas where tsetse flies occur, farmers must get rid of these flies before they start breeding animals.

  Accordingly, the extension staff needs to survey the actual state of the flies and determine whether the area is suitable for small animal farming or not. If prevention is possible, an appropriate measure should be taken. Small animal farming should be started after safety is confirmed.
* The extension staff should give guidance on preventive measures against disease and harmful insects, including tsetse flies and establish such a system that local veterinaries will visit villages to relieve farmers. The staff should also tell farmers where chemicals are available.
* In areas where water for animals cannot be secured in the dry season, small animal farming consuming a large amount of water cannot be recommended. However, if water is available from wells, farmers should secure water in groups.
* Transporting products to the market is involved in not only small animal farming but also agriculture in general. Farmers should purchase vehicles in groups or take an appropriate measure for transportation jointly with the dealer.

(3) Vegetable Cultivation

* This is not profitable for a huge investment.
* Frequent damage by wild animals is an obstacle.
* Farmers do not know how to cope with disease and insect damage.
* Chemicals and pesticides are not easily available.
* As crops are mass-produced at a time, their prices will lower and make the business unprofitable.

Possible measures to solve these problems are as follows:

* To begin with, market research should be conducted concerning the proposed vegetables to estimate possible output. Then, crops will be cultivated on an appropriate scale. The scale of irrigation to secure water should also correspond to that of cultivation. The agricultural extension staff should study the feasibility of irrigated agriculture in the area and give consistent guidance in the whole process of agriculture from the amount of cultivation and fund procurement to marketing.
* For pest control, the staff should give guidance to farmers on preventive measures, and how to procure and use chemicals.

(4) Fish Breeding

* There is no suitable pond for fish breeding.
* This is a new business for villages, where knowledge and techniques on fish breeding are not available.

However, farmers know well that there is a large demand for fish. Many of them wish to start this business if dambo is considered suitable site. As shown in the survey of four villages, fish breeding ranked first in the evaluation of the proposed measures. This indicates that they have high interest in this business.
The greatest problem is to extend fish breeding and procure the necessary funds.

Possible measures to solve these problems are as follows:

* It is advisable to construct common facilities for securing water which will be started by fish farming and irrigated agriculture in that construction can be split and individual burdens can be reduced.
* Experts in fisheries will tell farmers how to breed fishes and use processing technology, including fish species to be bred and pest control.

(5) Beekeeping

* Some farmers, except members of beekeeping clubs, have no knowledge on beekeeping.
* They are afraid of bee stings.

* They do not know how to obtain modern equipment.

A possible measure to solve these problems is as follows:

Since farmers are afraid of bees, the staff will tell farmers about the purchase of protective clothes and a proper way of treating bees. The DNPW, which currently promotes bee-keeping, should provide farmers with information on bee-keeping as part of extension activities.

(6) Fruit Cultivation

* Fruits are demanded, but cheap.
* Bulky and heavy fruits are difficult to carry to the market.
* They are susceptible to disease and insect damage, and chemicals against such damage are expensive.
* A shortage of water in the dry season will inhibit the production of high-quality fruits.
* The wind may damage flowers, which then may fail to bear fruit as expected.

Possible measures to solve these problems are as follows:

* The agricultural extension staff will analyse markets for the proposed fruits and give guidance to farmers in selecting fruit species.
* The staff will introduce good fruit varieties which are easy to cultivate and resistant to disease and harmful insects and for which markets are available and give guidance to farmers in cultivating them.
* Since the occurrence of disease and harmful insects is likely to spread widely across the area, the staff will give guidance in taking preventive measures.
* To sell products in the market, a joint transportation system should be considered together with fellow-traders in the area.

4) Measures for General Problems of Farmers

In all the villages surveyed, all farmers replied that a lack of funds would inhibit the startup of the proposed businesses. This indicates a problem in their awareness toward agriculture. They seem to be less enthusiastic on solving problems independently. They are less willing to solve any problem, one way or another, with no funds. In this respect, the staffs of relevant agencies need to lead these farmers to change their awareness toward agriculture as part of extension the activities. It is now very important to build a close and reliable relationship between the extension staff and farmers, and to promote a mental reform of the farmers.

* Fund Procurement

The extension staff needs to persuade farmers that activities requiring a certain fund will eventually increase their incomes and maintain a close

relationship with them for cooperation to the very end. Such an effort will lead farmers to rely on the staff and become enthusiastic about this project. At this moment, financial institutions adopt strict standards for individual borrowers. It is advisable for farmers to apply for credit in groups or clubs to take joint responsibility for repayment.

* Organisation of Agricultural Activities

  It is better for farmers to discuss problems about agricultural activities which occur everyday and to jointly solve them than to worry about them individually.

* Gender

  In villages, men are still conventionally thought to be superior to women. The first step to the solution of this problem is to lead villagers to realise that women are currently treated in an unfair and irrational way. For this purpose, the administration should actively set up several clubs for women in villages, which will address the problem of gender to enlighten women themselves at the outset.

  Despite being difficult, it is a necessary step for the administration to enlighten responsible person in administrative agencies, including traditional authorities and require them to enlighten villagers on equal treatment. In this area, society is historically a tribal community whose members share the same fate. The chiefs of group villages and the heads of villages still have absolute power and authority. It seems to be an effective means of solving this problem that these chiefs and heads will enlighten villagers.

  To solve the problem of gender, opportunities should be created for the administration and villagers to discuss it and make efforts to jointly solve it.

5-2 Effects of the Proposed Measures

The social infrastructure in a particular area cannot improve unless the government and the local community work together as one body, and all members share the fate and dedicate themselves to the community in order to improve by themselves. This voluntary and devoted attitude is most important in improving area's social environment.

If the extension staff of every agency strengthens their loyalty towards work and farmers become more enthusiastic towards agriculture, agricultural activities will be diversified and a higher income level will be eventually achieved. Thorough education will strengthen the loyalty of the extension staff towards work. The staff will be able to change the mental attitudes of farmers through extension activities. By doing so, the foundations and agricultural environment of the community will be improved, and farmers will be able to increase their incomes and live a richer life.

If the living conditions of farmers are improved, they will understand how important the natural environment is for not only a higher income but also their lives and agriculture, and will be willing to protect the environment and overcome their resource-dependent life. Moreover, they will recognise their gender through various agricultural activities and be willing to create a life in which both males and females are equally treated.

VI. Reserve Management and Operation Plan

6-1 Zoning

1. Present Zoning

The basic concept of zoning of national parks and wildlife reserves in Malawi is presented in the "Principal Master Plan for National Parks and Wildlife Management--- DNPW(1983)." According to the plan, national parks and wildlife reserves are to be categorised into four or less than four areas. Objectives, sizes, and management principles for each category are as shown below.

Special Area

Purpose :	To protect sites that have unique,unusual, or otherwise important biotic or abiotic features.
Size :	Variable
Management strategy:	Protect. Carry out restorative work if needed to perpetuate the inherent characters of the site.
Permitted development :	Trails, minor interpretive displays, and animal viewing hides.
Entry restrictions :	Non-motorized vehicles only. Day light hours only, and no overnight stays.

Wilderness Area

Purpose :	To provide large tracts of relatively undisturbed land for scientific study and wilderness experience.
Size :	25 km^2 minimum.
Management strategy :	Manage to achieve purposes without the use of motorized surface transport, and without leaving permanent traces except for those listed against permitted development.
Permitted development :	Trails and non-permanent camp sites. The latter not to exceed 0.25 ha each
Entry restrictions :	Non-motorized only. All equipment and supplies to be carried in and out . All non-burnable rubbish to be carried.

Semi-Wilderness Area

Purpose :	To provide tracts of relatively undisturbed but accessible land for scientific study and semi-wilderness experience.

Size :	Variable
Management strategy :	Manage as main locations of vacationing visitor use, keeping the areas as little disturbed as possible commensurate with this.
Permitted development :	Trails, roads, firebreaks, picnic sites, minor interpretive display, animal viewing hides, minor management camps, and limited accommodation camps
Entry restrictions:	Motorized or non-motorized, but the former is restricted to roads and navigable waterways.

Utility Area

Purpose :	To provide sites for management and visitor purposes. They include airfields.
Size :	200 ha maximum. The total for any one park or reserve is not to exceeded 500 ha. No Utility Area is to extend further than into a park or reserve 1 km.
Management strategy :	Manage for purpose stated above but aiming to minimize impacts on inherent park or reserve value. In the current master planning exercise, Utility Areas are designated around existing utility amenities. Thereafter, all new Utility Areas will be designated only in locations that are adjacent to park or reserve boundaries.
Permitted development :	Subject only to design criteria laid down from time to time by the department.
Entry restrictions :	Subject only to criteria laid down from time to time by the department.

(a) Walking in Special, Wilderness, or Semi-Wilderness Areas may be limited to designated trails or roads, and for reasons of safety may also be subject to supervision by an authorized guide, or may be prohibited.

(b) Handicapped persons may be allowed to use motorized devices in Special Areas provided that the terrain is suitable. This is subject to the discretion of the officer in charge of the park or reserve.

As described above, national parks and reserves in Malawi are operated based on principles presented by the "Protected Areas Master Plan for Northern/Central/Southern Region---DNPW".

Nkhotakota Wildlife Reserve is categorized as shown in Figure 12-1 based on the "Protected Areas Master Plan for Central Region---DNPW." According to the figure, the

reserve contains three categories other than the utility area, as shown below.

Special Area : Chipata Mountain

Wilderness area: The northern area of the Reserve from the road that connects Mbobo, Tongole and Bua, not including Chipata Mountain, the area around Chipata Visitors' Camp, and the areas around scout camps of Chipala, Navunde, and Kasaka.

Semi-wilderness area: The rest of the area which is not included in the two categories described above.

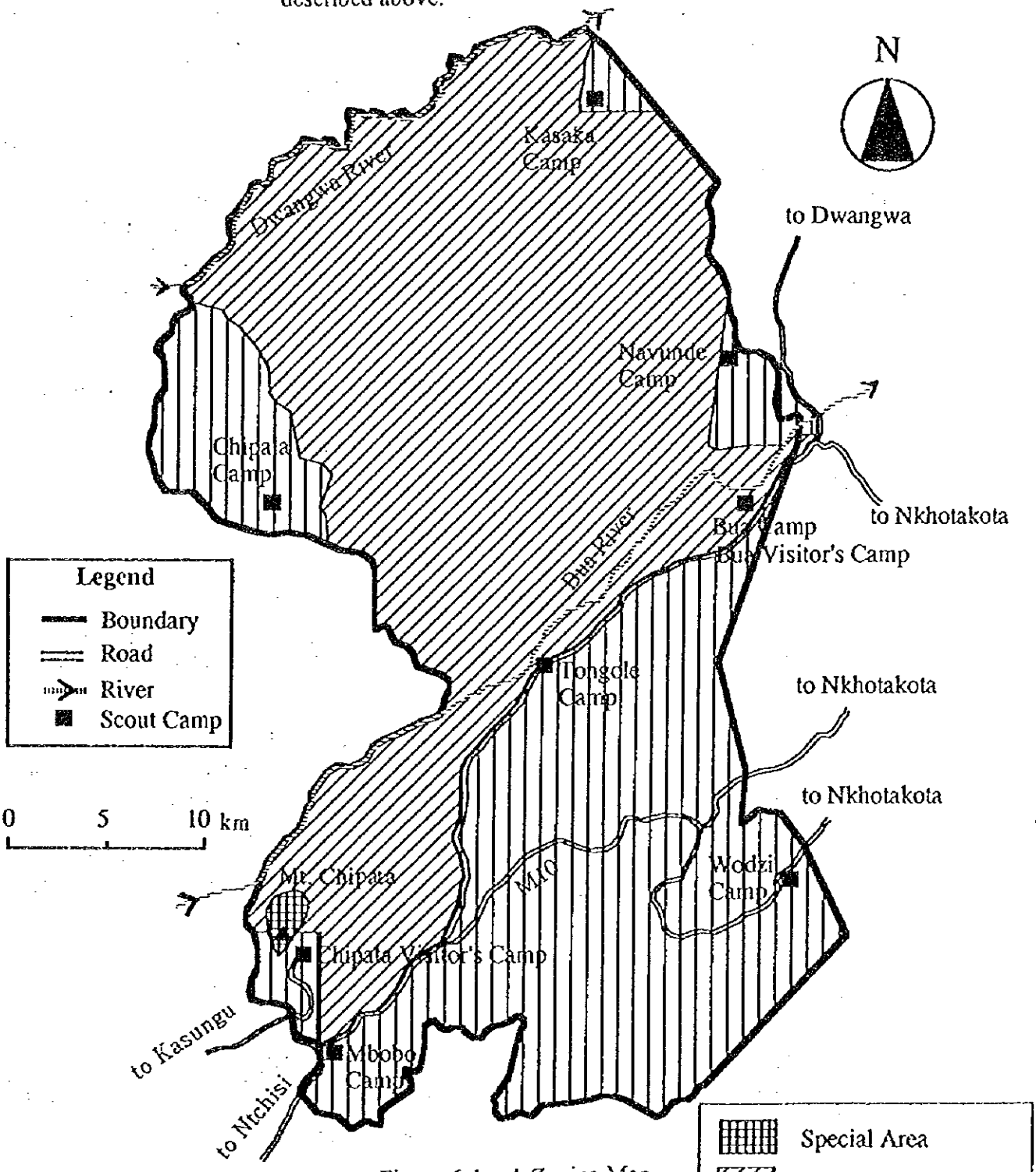

Figure 6-1 A Zoning Map

2. New Zoning Plan

Looking at the Reserve as a whole in terms of vegetation, places that were previously used for agriculture and grass land are found around the border in the south and southeast, but inside the border there are not many differences to categorically differentiate one place from another, since almost all the areas, except Chipata Mountain, are covered with Miombo forests. In terms of wild animals, the Reserve can not be divided, because there isn't any particularly important animal habitat in the area and the difference in animal density from one place to another is not clear. In other words, more animals tend to be observed in the south of the Bua River, but, for certain animals, it is just the opposite. In terms of geographical features, the difference can be observed. It has a sense of steep mountains and deep valleys in the north of the Bua River where the land undulates steeply and where there is not road at all.

Thus, the Reserve as a whole has similar natural conditions except Mt. Chipata, and all the area except Mt. Chipata and the vicinities of the scout camps could deserves to be a wilderness area. Nevertheless, the current zoning classifies the southeastern part as a semi-wilderness area probably because the existence of the national road M10 and the Wodzi Bypass, and the road leading to Bua, Tongole and M10 is recognised as an established fact. The zoning is probably on the assumption that if this area were classified as a wilderness area, these roads would be denied on the above-mentioned administrative policy.

Another presumable reason for the current zoning is that this area as a semi-wilderness area may provide an opportunity for observing relatively abundant species of animals from these roads and their vicinities.

The current zoning is generally proper and requires no drastic changes.

However, the following changes do seem to be necessary:

① It is improper that a road directly bounds on the wilderness area. An area about 200 m wide along the road should be classified as a semi-wilderness area. Accordingly, the northwestern 200 m wide area along the road leading to Tongole, M10 and Mbobo should be changed from a wilderness to semi-wilderness area as a buffer zone.

② There is an old road now out of use between Bua and Tongole (joining the new road halfway). It would be a good idea to reserve the possibility of reusing this road in the future. In addition, the current zoning could be improved, if the semi-wilderness area between Bua and Tongole were expanded to the Bua River, because it is now being planned to establish a utility area on the south side of the Bua, where necessary facilities, including trails and temporary campsites, will be constructed.

③ As for the new scout camps, the vicinity of the camp which will be established newly near Chikoko should be changed from a wilderness to semi-wilderness area.

④ The 130 ha area around the Bua Visitors' Camp and the 180 ha area around the Chipata Visitors' Camp should be changed from semi-wilderness to utility areas.

⑤ The special area of Mt. Chipata does not need to be changed.

These proposed changes are summarised in Fig. 6-2.

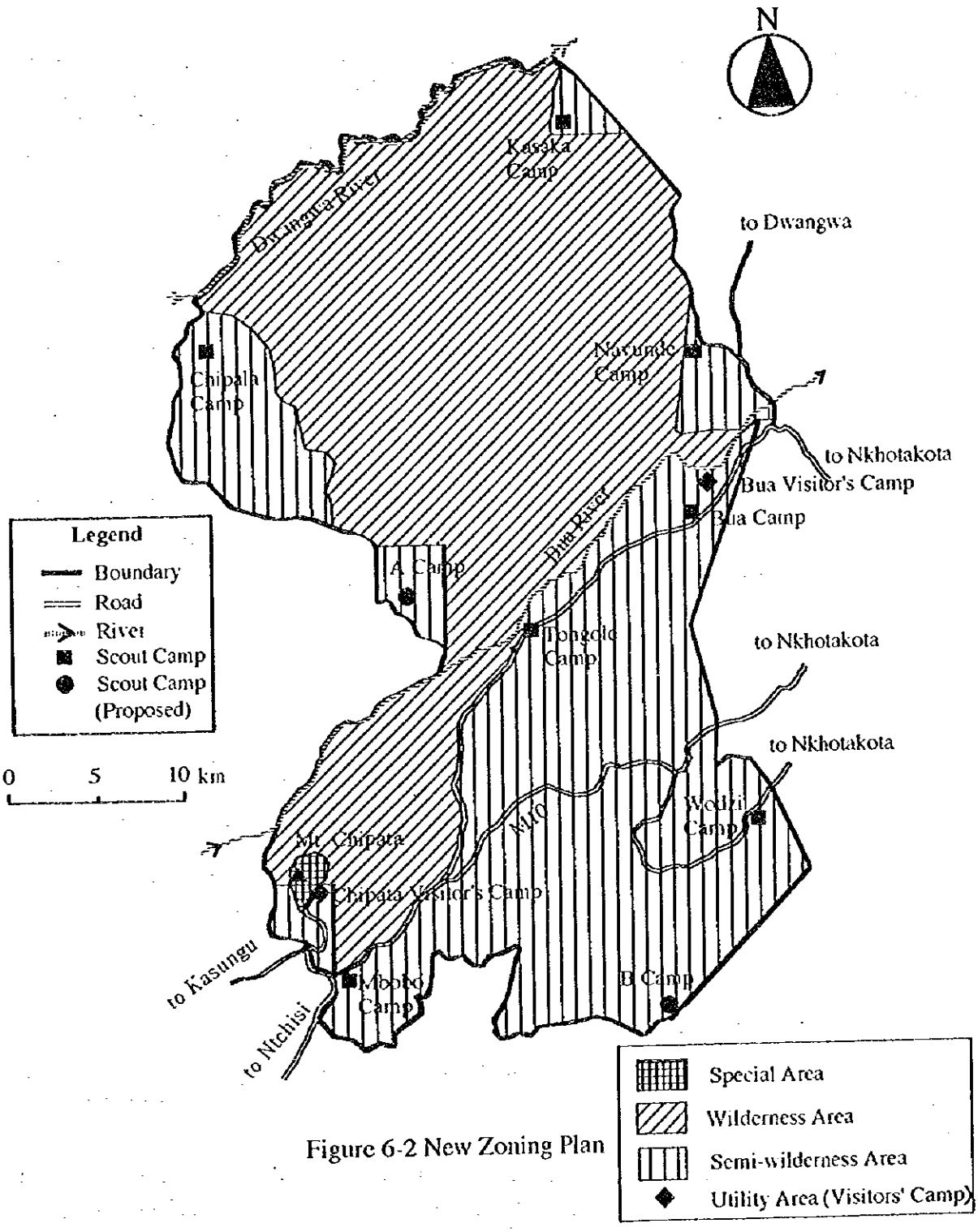

Figure 6-2 New Zoning Plan

3. Activity Area

This is an area which visitors will be allowed to enter for various activities. It is a subcategory the above four categories in the operation of reserve management.

This is a sort of zoning intended to specify certain areas where local people will be allowed to collect honey, mushrooms and other forest products in the Reserve, or where tourists will be allowed to walk, camp and perform other activities.

As the latter case is discussed in detail in Chapter VIII, Ecotourism, only activity areas for local people will be described here.

When local people are allowed to collect forest products in the Reserve, appropriate products shall include honey, mushrooms and medicinal plants which are produced every year. It will take much time and labour to specify suitable places for the collection of these products. various steps must be taken, policy making for allowable activities (what product may be collected in which area), field surveys by the administrator, who must also listen to and consider what local people wish, decision making and zoning.

Therefore, this master plan will merely propose fundamental policies for such zoning.

① Activity areas should not be located in special, wilderness or utility areas but limited to semi-wilderness areas.

② Activity areas should be limited to within a one-hour walk (about 4 or 5 km) from the boundary of the Reserve.

③ Forest products should be collected under the control of local scouts. Allowable areas should be limited to the vicinities of scout camps.

④ Concessions for forest products should be given not to individuals but to groups whose leaders will take responsibility. The annual amount of collected products should be grasped and appropriately regulated in order to not adversely affect the sustainability of these resources.

These policies may be summarised as follows. Activity areas on the north side of the Bua River should be located in the semi-wilderness areas established around a total of four scout camps, namely the existing three (Kasaka, Navunde and Chipala) and a newly constructed one (Camp A). On the south side, activity areas should be located within several kilometers of the existing three camps (Bua, Wodzi and Mbobo) except for the Tongole Camp and a newly constructed one (Camp B). In these areas, suitable places will be specified for each allowable product.

6-2 Reserve Management System

The current management system of the Reserve is shown in Figure 6-3. As seen in the figure, there are 31 scouts as field staff members who patrol together with 11 porters in the Reserve.

A problem is the number of scout camps and the size of the staff. Annon (1992) proposed that ① the number of required scouts for protected areas, including national parks and reserves, should be one per 50 km^2, and ② the optimal number of scouts for an isolated camp is six because the minimum number of scouts for effective patrol is five and one scout should keep the camp during the patrol by the others.[1] If his proposals are accepted, the number of scouts for the Nkhotakota Reserve should be 42 persons. The number of scout camps should be seven sites. In other words, 11 more scouts should be

[1] Department of National Parks and Wildlife, Submission for the Strengthening of the Department of National Parks and Wildlife, P12.

employed, while the number of existing camps is reasonable. If porters are educated and trained to be promoted to scouts; the numbers of scouts for patrolling will be enough with no other change to the present state in the future.

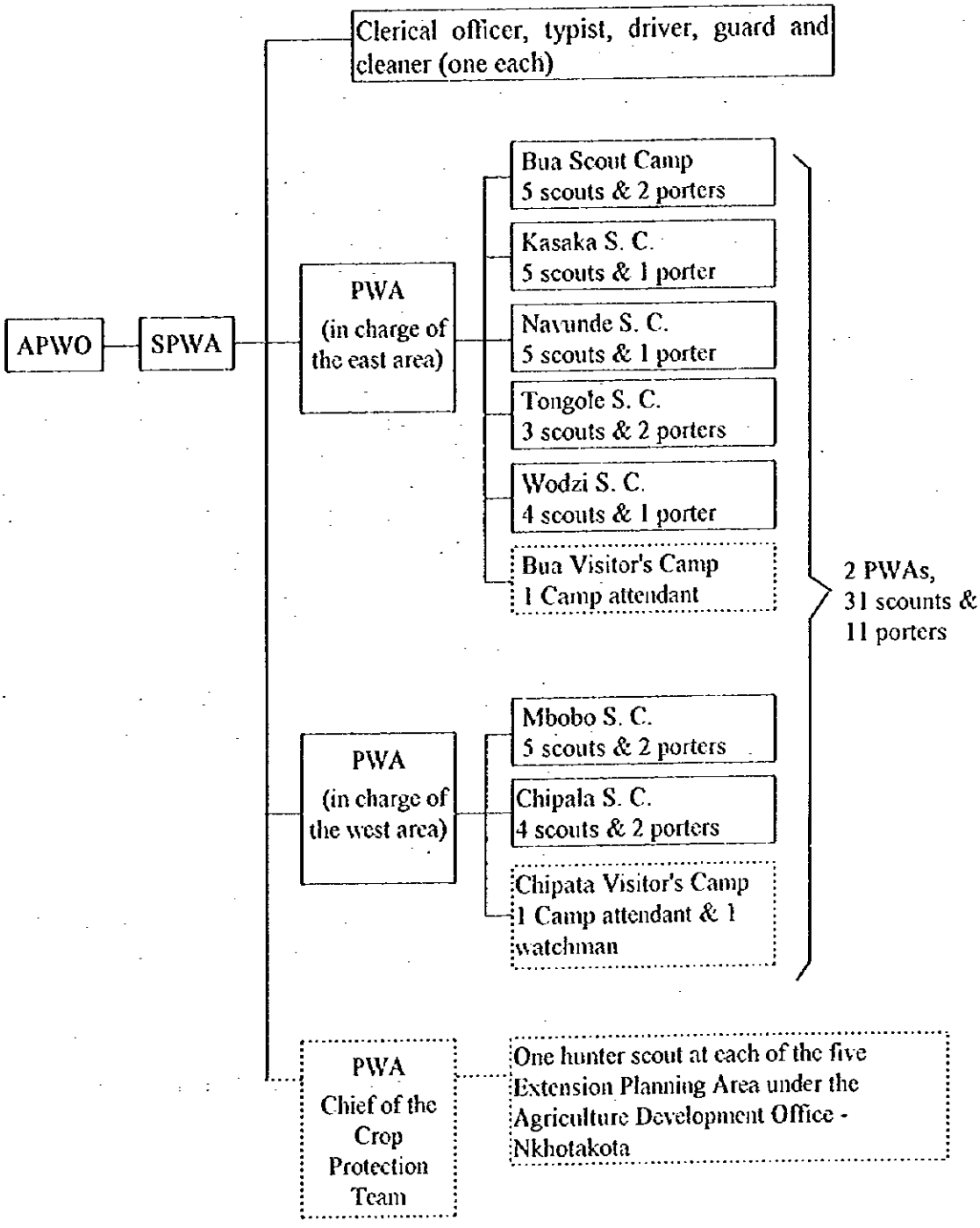

Fig. 6-3 An Organisation Chart of the Nkhotakota Wildlife Reserve Office

However, Annon (1982) proposed just the minimum numbers of scouts and camps for the average reserve, which are not necessarily sufficient for the Nkhotakota Reserve.

Currently, seven camps are supposed to cover the whole of the Reserve through their respective assignments. However, the Reserve is so inaccessible because of its steep and complicated terrain that scouts cannot efficiently and sufficiently patrol. The Bua River traverses the central part of the Reserve and is impassable during the rainy season. This river is one of the factors which reduces the efficiency of the patrol.

To completely cover the whole area, two more camps need to be constructed in view of topographical constraints.

The Reserve is nearly halved by the Bua River, which traverses the center, into the River south and the north sides. There are now three scout camps on the north side of the Bua River and four camps on the south side. Areas where scouts cannot fully patrol are from the center to the northwestern part on the north side and from the centre to the southeastern part on the south side. Therefore, one more camp needs to be constructed on each side of the Bua River.

Before constructing new camps, both the natural and social conditions of their sites should be taken into consideration so that scouts can live there. Accordingly, it seems to be proper to construct one camp in Chikoko in the southeastern part of the existing Chipala Camp and the other in Bamba in the southeastern part on the south side. For convenience's, sake these new camps are called Camp A for the former and Camp B for the latter. In the north, travelling between camps on the east and west sides is difficult in terms of distance and topography. It is recommend that the present Chipala Camp should be relocated a little northerly for the sake of proper camp arrangement. The locations of these new camps and existing ones are shown in Figure 6-2 above mentioned.

The next matter to be considered is the number of scouts. According to second proposal of Annon (1982), six scouts should be stationed at one camp. To do so, a total of 54 scouts will be needed, including 42 scouts for the existing seven camps and 12 scouts for the new camps.

As stated in subparagraph 6-3-(2), four scouts will be additionally needed to control the gates to M10.

As for hunter scouts stationed at branches of agricultural offices, more weight should be given to their duty to take preventive measures against damage to crops by animals should be increased from one to two for every branch.

Scouts required to introduce ecotourism will be discussed in subparagraph 8-1-2.

The above-mentioned system of organisation will be summarised in Fig. 6-5.

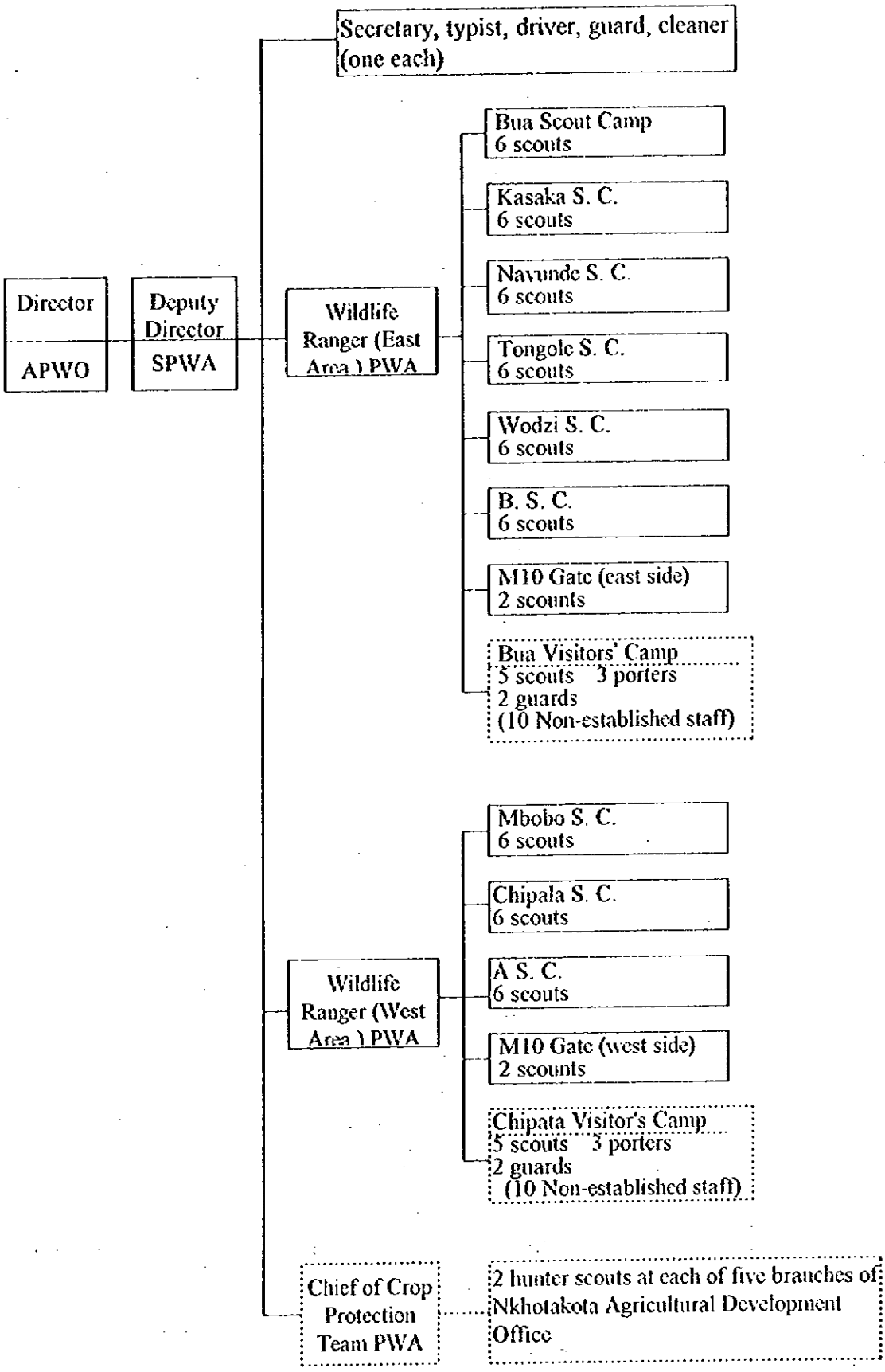

Fig. 6-4 A New Proposed Organization Chart of Nkhotakota Wildlife Reserve Management Office

6-3 Improvement in Facilities and Equipment

Scouts are working hard in the field under conditions so severe that it seems as if the Reserve management has totally depended on their sense of justice and sense of mission. However, their tolerance is not limitless

For example, in the Mbobo camp, there live one PWA, five scouts, and two porters with their families. There, the nearby primary school is seven kilometers away and the nearby town with stores and a clinic are seventeen kilometers away, but people walk to these places, since no vehicles or bus services are available. Some scouts own bicycles, but, since there are many slopes, they have to push bicycles for a almost half of the way. The roads are not paved so they get slippery easily during the rainy season. As for drinking water, scouts share water from a stream located 300 meters away and murky in colour with nearby farmers, since pond exclusively used by the camp has dried out.

Such are the conditions at the most desirable camp site, of the seven camps in the Reserve. The camp site under the severest conditions in Tongole Camp, which is located in 15 kilometers away from the boundary of the Reserve. The severe living conditions of the camp are beyond imagination.

To manage the Reserve more efficiently, it is necessary to not only facilitate the efficient performance of the scouts' duties but also enhance their morale. In such efforts, the following improvements in facilities and equipment will be needed for creating a better environment in terms of both work and life.

(1) Improving Accessibility

Distances between each of the existing scout camps and national roads or main villages are shown in Table 6-1. Roads should be improved (surface leveling, graveling and pressing, and ditch construction) except those referred to in the section on ecotourism (access to Bua and Tongole).

Table 6-1 Distances between Camps and Major Road or Villages

Camp	Distance (km)	Main Road/Village	Note
Kasaka	3	Sugar Factory's plantation	
Navunde	0.5	Major Road (M5)	
Bua	15	Major Road (M5)	
Tongole	16	Bua Camp's Forked road	
Wodzi	8.5	Major Road (M10)	
Mbobo	0	Major Road (M10)	
Chipala	12	Main village (Kapyanga)	Bridge 1 (L=20m)
Camp A (new)	13	Main village (Ntonda)	
Camp B (new)	24	Main village (Mpamantha)	Bridge 1 (L=30 m)
Total	92 (61)		

Note: The total distance in parentheses excludes a distance improved by ecotourism in Bua and Tongole.

(2) Digging Wells

To ensure a reliable supply of drinking water, wells should be dug for every camp. Wells will be about 40 or 50 m deep and similar to those dug and shared in rural areas across Malawi with foreign aid.

(3) Improving the Present Housing

The present housing for scouts is remarkably obsolete and very small. It needs to be improved to an extent that befits them as public servants. The housing planned to be constructed in the Kasungu National Park in 1996 is a preferable model.

(4) Improving Means of Transportation, including Vehicles

To improve the mobility of the Reserve management, a four-wheel-drive vehicle should be provided to each of the Nkhotakota Wildlife Office and the Bua and Mbobo Scout Camps. A total of 15 motorcycles will be provided one by one to the Nkhotakota Wildlife Office, nine scout camps and five branches where hunter scouts are stationed.

(5) Improving Communication and Patrol Equipment

To improve the means of communication and contact between the Nkhotakota Wildlife Office and every scout camp, radio devices should be installed at the Office and the Bua and Chipata Visitors' Camps where electricity is already supplied (the former) or is planned to be supplied (the latter two). Moreover, one transceiver should be installed at every scout camp, each of the two gates to M10 and five branches where hunter scouts are stationed.

(6) Improving the Nkhotakota Wildlife Office

The Nkhotakota Wildlife Office in Nkhotakota occupies a room in the District Commissioner Office. The room is divided into the Officer's office and the secretariat. Both the compartments are very small, 8 m^2 (the former) and 10.5 m^2 (the latter). The secretariat does not have enough space to place desks for all the members of the staff, not to mention a table and chairs for receiving visitors or bookshelves.

Since the Nkhotakota Reserve needs improvement in not only the Management Division but also in the Research Division and the Extension Division, it is recommended that a new building be constructed in order to provide enough space in near future to all these divisions. It is assumed that these divisions have staffs of nine members, six members and five members, respectively.

Regarding the site for constructing a new office, Nkhotakota is optimal in view of its communications with other agencies and for the sake of convenience in managing the Reserve.

(7) Others

a. Constructing Gates to M10

There is a project for repairing and improving the national road M10 in the near future. The improvement of the road may impact the Reserve during the work and common use. When the project is carried out, much consideration should be given to the natural environment in order to minimise the impact of the road on the Reserve. On this point, an environmental assessment of the project was made in the past. As a result of the assessment, some proposals were made for the environment. One proposal is to construct gates at two entrances to the Reserve. The construction and administration of these gates will be assumed by the DNPW. The existence of the gates will make visitors recognise the significance of the Reserve and control and prevent poaching and other illegal acts.

Two scouts will be stationed at each of the two gates. Accommodations for two scouts will be provided near the gate planned on the side of Nkhotakota (including the digging of a well to secure drinking water). The gate planned on the side of Kasungu will be made close to the Mbobo Scout Camp. Accommodations for scouts will therefore be constructed in Mbobo, from which the scouts will go to the gate.

b. There is the idea that administrative roads (for vehicles) should be newly constructed in order to connect scout camps with each other for the sake of mobility and efficiency in managing the Reserve. It is also expected that such roads will be used by visitors observing wild animals. However, this idea should be carefully examined. For one thing, the density of animals inhabiting the Reserve is low and the animals are very cautious. Even if visitors travel by vehicle within the Reserve, they will rarely see animals. For this reason, the introduction of animal observation by vehicle is premature. Another reason for opposing the idea is that the number of roadways should be minimised in order to protect the very nature of the Reserve. Roads themselves may affect the natural environment. Moreover, they may facilitate poaching of wild animals and the fishes and the illegal collection of forest products. The construction of a new road is improper and, it is be preferable to use existing roads after their repair and improvement for the purpose of management or animal observation.

c. Relocation of the Bua Scout Camp

The Bua Scout Camp has a high possibility of being relocated following the introduction of ecotourism. An appropriate site is near the forked road leading to Tongole near the entrance to the Reserve. This site is an important gateway to not only the Bua Visitors' Camp but also the roads from Bua to Tongole and M10 and from Bua to Kaombe and M10.

(8) Budget estimate

The table 6-2 shows funds necessary for the programmes above.

Table 6-2 Expenses for the Reserve Management and Operation

Unit: US$

Item	Calculation	Expenses for Facilities & Equipment	Operating Expenses	Administrative Expenses	Total
1.Access					
(1) Access Road	61,000m x @US$25=	1,525,000			1,525,000
(2) Bridges (L=20m, W=4.0m, steel)	50 m x @US$10,000/m=	500,000			500,000
Subtotal		2,025,000			2,025,000
2. Well Digging (including a prior survey and pumps and other facilities	10 wells x US40,000=	400,000			400,000
Subtotal		400,000			400,000
3. Scout Housing	60 houses x US$11,000=	660,000			660,000
Subtotal		660,000			660,000
4. Nkhotakota Wildlife Reserve Office					
(1) Office building	400 m^2 x US$530/$m^2$ =	212,000			212,000
(2) Garage & warehouse	100 m^2 x US$250/$m^2$ =	25,000			25,000
(3) Housing	10 houses x US$11,000=	110,000			110,000
Subtotal		347,000			347,000
5. Gate to M10 (including a guard houses)	20 m^2 x US$300=	6,000			6,000
Subtotal		6,000			6,000
6. Equipment for scout					
(1) Patrol equipment (for 54 + 2 = 56 person)					
• 28 tents					
• Uniforms, sleeping bags, raincoats, knapsacks, binoculars, flashlights (56 each)					
• Cooking set (9 camps x 2) 18					
28 tents x US$500 + 56 scouts x US$1,000 + 18 setsx US$80 =		71,400			71,400
(2) Vehicle					
Four-wheel-drive vehicles	2 units x US$50,000=	100,000			100,000
Motorcycle	15 units x US$7,000 =	105,000			105,000
(3) Communication equipment					
Radiodevices	2 units x US$10,000=	20,000			20,000
Transceivers	16 units x US$1,200=	19,200			19,200
Subtotal		315,640			315,640

Item	Calculation	Expenses for Facilities & Equipment	Operating Expenses	Administrative Expenses	Total
7. Equipment and Supplies for Nkohotakota Wildlife Office					
(1) Vehicle (four-wheel-drive vehicle)	1 unit x US$50,000=	50,000			50,000
(2) Communication equipment (radiodevice)	1 unit x US$10,000=	10,000			10,000
(3) Supplies					
Personnel computers	3 units x US$10,,000=	30,000			30,000
Copier	1 unit x US$10,000=	10,000			10,000
Desks & chairs	20 sets x US$200=	4,000			4,000
Stacks	10 units x US$500=	5,000			5,000
Table & chair and others for conference room		2,000			2,000
Subtotal		111,000			111,000
8. DNPW Headquarters	for ten years			1,108,200	1,108,200
9.Nkhotakota Wildlife Reserve Office	Ditto			861,180	861,180
Total		3,864,640		1,969,380	5,834,020

Note: For the details of administrative expenses for DNPW Headquarters and the Nkhotakota Wildlife Reserve Office, see Chapter 12.

VII. Resource Management Programme

7-1 Tourism Resources

The small number of major animals in the Reserve does not provide an excellent tourist attraction. However, proper management of the Reserve has protected its natural environment which could be used as a tourism resource. In other words, it is possible to introduce ecotourism, which is less harmful to the ecosystem of the Reserve. Natural environment of the Reserve is a main attraction for ecotourism and its conservation will lead to the preservation of the natural beauty and the fauna and flora in the Reserve. Other tourism resources include sport fishing and bird watching as a non-consumptive use of animals.

7-2 Animal Resources

7-2-1 The Extent of Animal Resources

Consumptive use of wild animals is not strongly recommended at the present level of animal density. Although utilisation of wildlife products in the vertebrate pest control and the proposed fishing by local people in the Reserve may seem consumptive use of animal resources, their objectives are to obtain cooperation from the local community for Reserve management by benefit sharing, and to conserve fish resources by local people's own initiative. In this sense, it is appropriate to deal with these activities as one of the animal resource management programmes.

7-2-2 Animal Resource Management Programme

The animal resource management programme is divided into the following three parts (Fig. 7-1):

① Increase of animal resources.

② Participation of the local people in animal resource management.

③ Streamlining of managing operations.

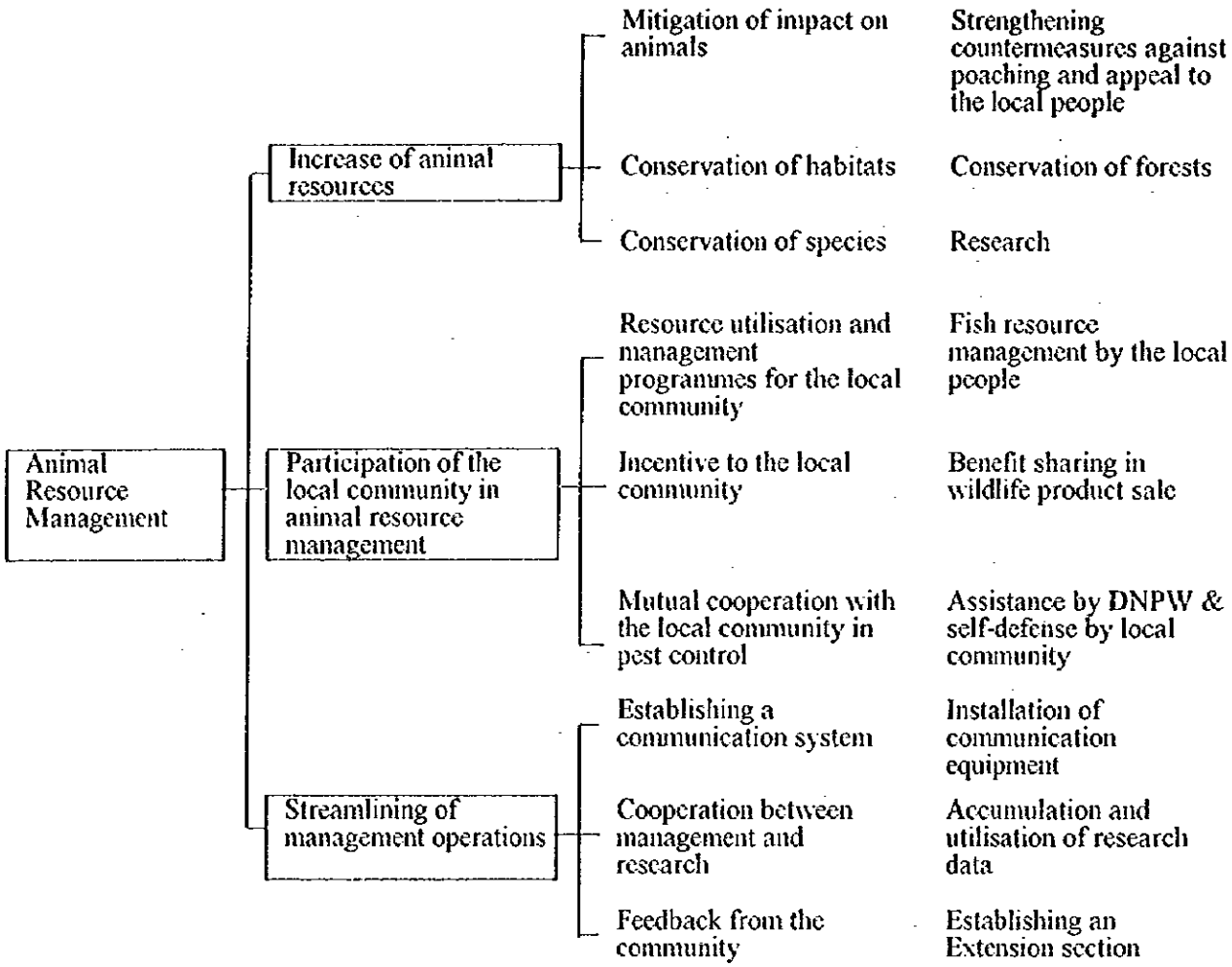

Fig. 7-1: Animal Resource Management

1. Increase of animal resources

The present number of animals in the Reserve is not sufficient to promote active use of animal resources in both consumptive and non-consumptive way. Thus, emphasis is put on increasing the number of animals.. Anti-poaching is particularly essential for the purpose along with protection of natural habitat.

1) Reduction of impact on animals

Poaching pressure in the Reserve may not be intense but it has occurred constantly and its influence on animals is said to be big. The 1994 report said that the average number of animal poaching including fish was 9.5 cases/month and the arrest was 4 persons/month. The number of animals lost by poaching in the same year was; 2 elephants, 1 buffalo, 1 roan antelope, 2 sable antelopes, 1 waterbuk, 1 reedbuck, 3 bushpigs, 2 warthogs, and 1 grysbok (in addition the death of 3 elephants, 2 buffaloes, and 1 eland were reported but the causes of death were not confirmed). Poaching of hippopotamus is reported outside the Reserve but no numerical data is available.

In neighboring Zimbabwe and Zambia, cases of poaching have been drastically reduced because of a successful attempt to have the local people participate in the management of national parks and wildlife reserves based on sustainable use of resources. As a result, the number of animals are said to have increased. It is unclear if a similar attempt will directly result in an increase in the number of animals in Nkhotakota. However, it is meaningful to reduce the cases of poaching and the labour of scouts needed for the prevention of poaching so that it will allow more manpower to engage in other important duties such as the maintenance and management of the Reserve, pest control, and extension activities, since most of the present management operations for the Reserve are for the prevention of poaching.

(i) Strengthening anti-poaching measures

To make anti-poaching activities more efficient, it is necessary to improve the living and working conditions of the scouts. The improvement of anti-poaching measures has two aspects: the visible part including facilities & equipment and the invisible part including systems to enhance the staff's morale. This section deals with the latter as the former is discussed in the chapter 6.

a. Encouragement for scouts

DNPW pays allowances to scouts who patrol a certain amount of days per month. It has also introduced a programme to distribute food in accordance with the number of days scouts spend on patrol. With the assistance from the Wildlife Society, bounties were once paid for collecting snares. These kinds of encouragement are effective, but in most cases financial sponsorships are needed. To get similar results with a limited budget, it is preferable to make good use of both psychological incentives and rewards at the right time.

Encouragement by means of money is not always necessary. For example, it is effective in raising the morale of staff to put up the names of excellent scouts on a bulletin board or commend the best staff member or team for the year based on their performance measured by the number of patrol days or arrests. The important thing is to show all staff members who and what actions are highly evaluated by using a bulletin board or badges that can be sewn onto uniforms. This system will be made more effective with rewards useful in everyday work, such as pens, illustrated reference books, and pocket notebooks for yearly schedule. It will be the strongest incentive if repeated commendations eventually lead to a promotion.

b. Sporadic patrol programmes

It is preferable that the patrol programme be flexible: it is advisable to conduct additional patrols at the end of month when necessary or carry out intensive patrols by setting up a task force when and where illegal activities are rampant.

c. Strengthening penalties

Penalties for illegal hunting within the Reserve is laid down by law. A first offender are fined MK200 and face a three-month imprisonment, and poachers of protected animals will be fined a maximum of MK10,000 and face up to a five-year imprisonment.

Although a revision of the law is necessary to change the penalties, it would be better to punish the habitual offenders more severely if possible.

(ii) Mitigation of dependence on wild animals as a source of protein

Most poachers are local people and are habitual offenders. Their motives include self-consumption of meat and profits from its sale. Because the number of animals including fish have decreased sharply in areas surrounding the Reserve by indiscriminate hunting and fishing, the Reserve is the next spot for poachers to hunt. Villagers in general do not often go into the Reserve for hunting in fear of lions and tsetse files. Still, if wildlife meat is given to them, they will probably consume it. Although an interview survey showed that they prefer livestock meat to that of wildlife, they are not rich enough to buy domestic animal meat and breed a large number of animals by themselves.

The main cause of poaching is the desire of the local people for meat. Relieving such desire is a rational way to reduce illegal hunting. Small animal farming is one such measure.

Since small animal farming is dealt with in the section that discusses measures to upgrade the living standard of smallholders, an example of guinea fowls is discussed below.

DNPW has already embarked on breeding guinea fowls in Nkhata Bay. The purpose of this project is to soothe any negative feelings of the local people toward DNPW through the use of wildlife and to help smallholders increase their income. Guinea fowls, among other small animals, attract attention because breeding method is more or less similar to that of chickens, making it rather acceptable to start a business on this species.

The disadvantage is that breeding techniques have yet to be established, and, therefore, farmers are faced with various technical problems.

Top priority of wildlife farming is to establish breeding techniques by training experts and conducting a pilot project with the help of a certain village. Small animal farming is also an important part of the programme to improve the standard of living in the local community.

2) Conservation of habitats

Wildlife habitats are deteriorated by tree-cutting, bush fire and silting on riverbeds. Regarding conservation methods, see the sections on forest conservation and watershed management.

3) Conservation of species

Increasing the number of animals through introduction or breeding is one way to conserve the species. In particular, conservation of endangered species is also an important task of protected areas. The Nkhotakota Wildlife Reserve can provide not only its land for study but also support other national parks and wildlife reserves in Malawi by providing data. Possibility of black rhinoceros reintroduction into the Reserve was examined in relation to the pilot project in Liowonde National Park.

More than two thirds of existing black rhinoceros live in southern Africa, with many of them inhabiting Zimbabwe and South Africa. In South Africa, the number of black rhinoceros once dropped sharply, but they recovered after being transferred into the Kruger National Parks and other reserves to be protected. Efforts are still being made for this internationally recognised endangered species.

It is meaningful for Malawi to actively contribute to conservation efforts for rare animals that require cooperation of all the southern African nations. Malawi is a nation in charge of wildlife issues in the Southern African Development Community (SADC) and its protected areas account for 12% of the land.

Black rhinoceros is an animal species which generally inhabits forests and once lived extensively in Kasungu National Park, Mwabvi Wildlife Reserve, and Nkhotakota Wildlife Reserve. However, poaching has annihilated them in these areas. At present, only a pair of reintroduced black rhinoceros from the Republic of South Africa are kept under strict protection in Liwonde National Park. This pilot project is still at an early stage of study. If it is successful, it will be possible to introduce black rhinoceroses into other national parks and reserves.

Looking at Nkhotakota Wildlife Reserve, it is entirely surrounded by farmland except two adjacent forest reserves, and has no international boundaries. If cooperation of the local community is obtained, protection of black rhinoceros from poachers will be easier. Moreover, reintroduction of the species will help advertise the Reserve, and become an important tourist attraction. It will help improve the moral of the staff responsible for Reserve management and will encourage the DNPW strengthen the anti-poaching operations. Although the endangered black rhinoceros has already been bred under protection in South Africa and Zimbabwe, it is meaningful for Malawi to conduct research and establish techniques for reintroduction. To establish a healthy rhino population in Malawi, active breeding should also be considered. Intensive breeding of sumatran rhinoceros in Malaysia may provide valuable information as well as information from African countries.

There are many issues to be considered before actual implementation of this type of programme; procurement of initial animals, provision of equipment, breeding techniques, and funding for facility construction/recurrent cost. The programme itself could become a strong measure of animal resource management in future but for the moment, studying its feasibility in the Reserve should be examined.

2. Participation of the local community in animal resource management

Many problems exist in the relationship between the Reserve and the local community. Cooperation with the local community is essential to solve these problems. To promote participation of the local people, the following measures should be implemented:

① Introduction of resource utilisation and management programmes by the local community

② Provision of incentives to promote the participation of the local people

③ DNPW's assistance to the local community on wildlife-related matters

1) Resource utilisation and management programmes: Fish resource management by the local community

Fish is popular wildlife resource local people wish to use Fish constitutes an important source of protein for the people partly because they live near Lake Malawi. People would fish in Lake Malawi if possible but those living far from the lake wish to fish in the nearby rivers in the Reserve. Local fishermen know that fish catch outside the Reserve has been decreasing due to drought and overfishing.

As a study on fish stock has not been fully conducted compared to large mammals, the main purpose of this programme is to incorporate local people into fish resource study and management. Consumption of some amount of fish is only an incentive to local communities. However, implementation of the programme requires prudence and precautions.

(i) Consensus with the local community

First of all, representatives of the local communities should fully understand the following points:

- This program is designed to preserve and manage the fish resources for the future. If enough amount of the resource is maintained, the local community will benefit.
- Fishing in the Reserve will be allowed only if destructive fishing, such as using poison, is strictly prohibited at the community level throughout the area.
- Fishing shall be done in designated areas during a limited time of year excluding the breeding season when fish travel upriver.
- Fishing shall be immediately banned throughout the Reserve if a licensed fisherman violates the rules.

(ii) Establishment of a fishermen's club

Those who wish to obtain a license to fish in the Reserve shall attend an intensive series of meeting to understand the purpose of the programme, rules, the ecology of fish, and the protection of natural resources. Licensed fishermen shall organise a fishermen's club in each village. The Dwangwa branch of the Wildlife Society has begun establishing a

fishermen's club aimed at educating the fishermen. It may be a good idea to make use of such activities. Each club shall be headed by a leader.

Then, fishing season and spot, fishing gears, and species of fish to catch should be determined. Fishermen's clubs shall always record the catch, and the leaders shall report this to the Nkhotakota Office. This data shall be used for the study of fish resource.

(iii) Probationary period

In the initial stage, villagers shall fish for a given period at a given place along rivers accompanied by the staff of DNPW. Club members shall carry licenses at all time in the Reserve. During this trial period, they shall be required to learn how to record fish catches and how to report to the leader. If a fishermen's club strictly abides by the rules, then the club moves onto the next stage.

(iv) Responsibility sharing with the local people

DNPW shall request the fishermen's clubs to cooperate in anti-poaching activities. Such countermeasures include removing wires and nets laid illegally, and reporting illegal activities. If such a system works smoothly, it is possible to extend the fishing area depending on the state of fish resources. Clubs greatly contributing to the prevention of poaching may well be rewarded with an educational visit to the Reserve.

2) Incentives to the local communities by benefit sharing

It will build favourable attitudes toward the Reserve management if the local people understand the importance of resource conservation by benefit sharing. There are several revenue generating activities in the Reserve. Types of park income for benefit sharing and the proportion of community's share are to be decided.

In terms of animal resources, safari-hunting also generates large profit. However, it is rather difficult to introduce sport hunting under the present social and economic conditions of the study area. There is not room outside the Reserve to establish a game management area for hunting maintained by local community, and people would not like tourists to take their share of animal resource from the Reserve. Therefore, our recommendation is to take advantage of existing management operation for benefit sharing. Wildlife products from pest control or confiscation could generate much more profit to contribute crop protection and other community based activities. Wildlife products include meat, trophies, hides, and teeth.

The largest revenue of the DNPW Nkhotakota Office comes from the sale of hippopotamus meat, product of pest control. About 50 hippopotami were killed every year and the average of MK 500 is earned from 1 adult hippo, according to the records. Mkanda (1995)[1] claims that a full-grown male hippo could produce 1,376 kg of meat, 12 kg of teeth, and 80 kg of dried skin, which amount to MK, 10,296. Wildlife products are expected to produce

1) Mkanda F.X. 1995. Some biological and socioeconomic aspects of hippopotamus. *Hippopotamus amphibius*. conservation in the Elephant Marsh. Malawi. DNPW.

greater profit if they are properly handled and marketed.

In case of Nkhotakota Wildlife Reserve, hippopotamus could generate most part of the income from wildlife products. The following statement concerns hippo control as an example of income generation and benefit sharing.

(i) Increasing profits

After killing a hippopotamus, hunter scouts begin to skin it with the help of villagers. Villagers help with not only the butchering but the smoking of the meat using fuelwood they offer. In return, they receive some meat free. Although this is one form of cooperation with the local community, not everyone can enjoy the benefit because some people do not eat this type of meat for a religious reason.

Hippopotamus meat can be sold at a higher price at resorts for tourists. Smoked meat could be sent to the Kasungu National Park to be on the restaurant menu. Some of the hippopotami put into such use will contribute to increase the revenue. If meat of five hippopotami, or 10% of the destroyed animals, is sold at MK 50 per kilogramme, the gross profit will be 10 times larger than at the present price of MK 5 per kg. Suppose the same amount of money as the present hippo meat sale is taken into Treasury, there still remain a fairly good profit to be used for crop protection or establishing beekeeping clubs and small animal farming programme. A two tier price system for urban and rural areas should be taken into consideration.

(ii) Distribution of profits

Profit gained from pest control should be shared with the local communities as local people have a strong interest in crop protection against wildlife and they actually suffer. Although it is difficult to compensate individual farmers, assistance for self-defense should be provided to the areas seriously affected by wildlife. To prevent the hippopotamus from entering farmland, DNPW could provide poles for blocking the animals or give technical information how to cope with them.

3) Mutual cooperation with the local community in pest control

Most complaints reported to the Nkhotakota Office concern damages to crops. There are some reports, though a extremely small number, of cases of injuries resulting in death by large mammals or crocodiles. These complaints are caused by the facts that residential areas and farmland extended into the habitat of wildlife, and that farmers do not know how to cope with dangerous animals. Therefore, ecological and technical advice is important for protecting crops around the Reserve.

Farmland is vulnerable to: baboons and monkeys during the day; duikers, bushbucks and bush pigs at night; and elephants and hippopotami at harvest season. Farmers are allowed to kill vermin such as baboon, monkey, and bushpig on their own if possible. In the case of large protected animals, however, farmers are supposed to report to an Agricultural office or DNPW Nkhotakota Office.

Although no surveys have been conducted on the damage to farm crops in the Nkhotakota area, surveys in other areas show the extent of damage caused by these animals. Areas surrounding Kasungu National Park suffer from the same species of wildlife as in Nkhotakota, with the exception of hippopotamus. Damaged land accounted for about 10% of the farmland, and some 1,100 tons of crops were damaged throughout the areas around the Park.[1] In the Elephant Marsh (549 k m²) in the south, 1,620 hippopotami were confirmed in 1993, and 183.59 tons of maize and 335.77 tons of rice were damaged by them (Mkanda, 1995).[2] Although basically hippopotamus live on wild plants, maize constitutes most of their food during the rainy season. Hippopotamus damage crops by not only eating but stamping on them, and villagers take these damages seriously. Mkanda also points out that although 80 hippopotamus are destroyed every year, the number of complaints has not shown any decline (with the success rate of destroying by hunter scouts below 50%). About 1,000 hippopotamus are believed to live in areas along the central shore of Lake Malawi, extending 295 km from Namikombe to Dwanbazi through Nkhotakota.

(i) Counter measures by DNPW against vertebrate pest

a. Destruction by firearms

DNPW hunter scouts shoot certain kinds of animals including hippopotamus at the requests of the local people. Shooting elephants require permission from Headquarters.

Destruction by firearms plays an important role not only in soothing the feeling of the local people and generating revenue by meat sale. This also makes it possible to obtain information on vertebrate pests, contributing to the determination of the effects of pest control. At present, data on pest control include only dates, places, species, and the number of animals destroyed and bullets used. It is advisable to add sex, age, and body measurements to the list. It is also necessary to reflect the study result in future pest control.

b. Electric fence

Crop damage concentrates on the east side of the Reserve where small-scale farmlands concentrate; the west side is mainly tobacco estates, the north-west and south-west adjoin forest reserves. Because experiences in Kasungu National Park have shown that electric fences are effective to ward off large animals that come from the Park, it is feasible to set up such fences around the Reserve. Priority areas for fence construction are from the Bua River down to the southeastern part of the Reserve as the first; the southwest near Mbobo camp, the second; western side, the third. Boundaries adjacent to the forest reserves are excluded not to prevent movement of animals. Fence maintenance should not be neglected

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[1] Deodatus, F.D. and A.K. Lipiya. 1991. Wildlife management and crop protection, Malawi. Vertebrate pest impact around the Kasungu National Park, January - June 1990. DNPW/FAO.

[2] Mkanda, F.X. 1995. Some biological and socioeconomic aspects of hippopotamus, *Hippopotamus amphibius*, conservation in the Elephant Marsh, Malawi. DNPW.

to prevent vandalism.

c. Reinforcement of hunter scout activities

There are five hunter scouts in the surrounding area of the Reserve, each of whom covers a large area. Increasing the number of hunter scouts, and improving their mobility and communication will contribute to the whole operation of pest control.

(ii) Self-defense by the local people

Proper ways to cope with larger animals are not well known to the local people, partly because large wild animals disappeared from the local community a long time ago. The local people steal or destroy electric fences at times designed to protect them, mistakenly believing that such fences are established to keep the local people from the Reserve. Measures effective to small animals do not always work for large animals, resulting in disasters in some cases. The troubles can be prevented by providing appropriate information for the local people. Such information also will make it possible for the local people to come up with countermeasures against pest animals on their own initiative.

a. Technical assistance by DNPW

Because it is difficult to provide technical assistance for all the areas, DNPW could take the following steps:

① Survey to understand the distribution and extent of damage to farm crops by large pest animals

② Selection of areas that need technical assistance

③ Choice of countermeasures against pest animals and technical assistance suitable to the selected areas

DNPW will consider providing financial assistance for self-defense to the areas seriously damaged. The fund will come from profits gained by selling the meat derived from pest controls.

b. Raising the awareness of wildlife conservation

To raise the awareness of wildlife conservation is difficult when vertebrate pests are damaging crops. It is necessary at least to provide accurate information so as not to cause misunderstandings. When enlightening the local community, topics should be narrowed down to the following three points:

① Why wildlife and humans antagonize each other

② What measures DNPW is taking to cope with the problems

③ What role the local people can play in making such measures more effective

3. Streamlining of management operations

1) Introduction of communication system

A communication system between each camp and the Nkhotakota Office is vital in light of the present location of scout camps and the means of available transportation. Because of the lack of such a system, an emergency operation occasionally stops all other duties. To promptly perform various duties, it is necessary to provide technical training on installing, handling, and maintaining communication equipment. The introduction of a communication system is discussed in the section on the management of the Reserve.

2) Management and research link

The data for research use should be stored separately from those for the management section. It will be necessary to secure personnel for storing data, routinise data extraction, and computerise data storage. For details, see the section on research.

3) Feedback from the local community

It is essential to establish an extension section if DNPW is to promote communication with the local community and to conduct follow-up surveys on various activities.

The extension unit and a public space should be in the same building. Local people drop in the public space to have information on DNPW activities or they can hold a meeting on wildlife related issues. Extension staff promptly provide advice from their office to the local people.

Some more details on feedback from the local community are in the section of extension and education.

4. Budget estimate

The table 7-1 shows funds necessary for the programmes above.

Table 7-1 Expenses for Animal Resource Management

Unit: US$

Item	Calculation	Expenses for Facilities & Equipment	Operating Expenses	Administrative Expenses	Total
1.Increase in Animal Resources					
1) Strengthening anti-porching measures	Expenses for the living environment of scouts and patrolling equipment have been appropriated in the estimate of expenses for facilities and equipment of the Reserve.	Shown in Table 6-2			
2) Conservation of habitats	Habitats for animals can be conserving forests and basins.	Shown in Table 7-2			
3) Conservation of species			Shown on Table 10-1		
2. Participation by the Local People in Resource Management					
1) Resource management programme by Local Communities	Only personnel costs are required for technical guidance and DWPN's initiative.		Included in Items 4 and 5 in this table.		
2) Incentive for the local people to participate	Only personnel costs are required for DNPW's initiative				
3) Mutual cooperation with the local community on countermeasures against vertebrate pest.					
(1) Construction of electric fences	@US$4,000/km 90 km x US$4,000/km	360,000			360,000
(2) Dissemination toward the local community	Material prepared for extension activities will be used.			Shown in Table 7-2	
Subtotal		360,000			360,000
3. Rationalization of Reserve Management	Machines obtained by the sectors of reserve management, research and study, and extension and education will be utilized.			Shown in Tables 6-1, 10-1 and 11-1.	
Subtotal					
4. DNPW Headquarters	(for ten years)			22,000	22,000
5 Nkhotakota Wildlife Reserve Office	(See the above)			33,500	33,500
Total		360,000		55,500	415,500

Note: For the details of administrative expenses for the DNPW Headquarters and the Nkhotakota Wildlife Reserve Office, see Chapter 12.

7-3 Forest Resources

7-3-1 Basic Policy on Forest Conservation

Because forests in the Reserve also have a function to conserve the living environment of wildlife, forests should be under appropriate management.

The following is the basic policy on conservation measures for the environment of forests :

① Beekeepers and collectors of medicinal plants, mushrooms, and grass will be allowed to enter forests along the rivers and miombo. Entry into evergreen and semi-evergreen broad-leaved forests will be permitted only for the purpose of study, education, training, and patrolling because they are under strict conservation. However, ecotourists will be allowed to walk on trails in forests if they are led by staff appointed by DNPW.

② The basic policy on forest conservation has three pillars: prescribed burning, prevention of forest fires, and countermeasures against illegal collection of forest resources. However, evergreen and semi-evergreen broad-leaved forests will be under stricter conservation because they are precious plant communities, and in the case of forests along the rivers, only prevention of forest fires, and countermeasures against illegal collection of forest resources, and not prescribed burning will be applied over worries of soil erosion in basins.

③ The results of research as discussed later will be passed back to those involved in forestry out in the field, contributing to more appropriate management of forests.

7-3-2 Forest management

(1) Organisations for forest management

DNPW will improve skills for forest management, strengthen communication systems, and promote prescribed burning, prevention of forest fires, and countermeasures against illegal collection of forest resources, while maintaining close relations with forest management organisation such as the Forestry Department.

(2) Forest patrolling system

For more effective forest conservation, the forest patrolling system will be upgraded as follows:

① The 58 km-long spur road constructed in the southern part of the Reserve by the Tsetse Control Project will be improved. This road serves many purposes, such as patrolling for protection and management of wildlife as well as for forest management.

② The total of three 4WD vehicle will be introduced into the Nkhotakota Wildlife Office and two camps of Bua and Mbobo each, enhancing mobility of patrols. Such 4WD cars serve many purposes including

patrolling for protection and management of wildlife.

7-3-3 Measures for Forest Conservation

1. Prescribed burning

1) The purposes of prescribed burning

Grass-burning has two purposes: to secure grass for wildlife to eat; and to conserve the vegetation of miombo forests.

2) Implementation plan for prescribed burning

Prescribed burning will be done in miombo forests excluding evergreen and semi-evergreen broad leaved forests and miombo forests along the rivers in the Reserve. Here, forests on the rivers are defined as those within 50 m from each bank of the river.

In implementing prescribed burning, the land to be burned will be divided into three parts: one part for early burning, one part for late burning, and the other for no burning. These three areas of land undergoing different treatment will be rotated every year.

The relationship between prescribed burning and the grass for wildlife is not yet fully known, although studies on miombo forests in African countries is being conducted. Therefore, as the section on research shows later, a continuous study will be conducted on a carefully-selected site, and the results of such study will be passed back to those involved in forestry out in the field.

2. Measures to prevent forest fires

1) Prevention of forest fires

Miombo forests are disclimax forests that are maintained by controlled burning on a regular basis. Uncontrolled burning damages both the management of forests and animal habitats. Major causes of forest fires are bonfires, arson, and smoking by poachers in the Reserve, but prescribed burning also causes fires.

Forest fires shall be prevented by the following measures:

① Reducing the number of poachers from entering the Reserve. A special patrol system should be established and watchmen should be positioned at the entrances to the Reserve, especially in the dry season.

② Education, dissemination of information, and public relations on the prevention of forest fires directed at tourists and farmers who enter the Reserve to collect forest products.

③ Instructing the persons mentioned above to carry out extreme caution against fire when they use it in the Reserve.

④ Limiting smoking to certain areas (e.g., utilitiy areas)

⑤ Checking and maintaining the 3 m-wide fire breaks established to protect evergreen broad leaved forests before the dry season every year.

2) Extinguishing forest fires

Cooperation of the local villagers is necessary in extinguishing forest fires. Firefighting drills shall be conducted regularly so that when a fire breaks out, villagers can put out the fire in its early stages with firefighting rods provided for each village.

3. Preventing illegal collection of forest resources

In light of the situation of resources in the vicinity of the Reserve, illegal collection of forest resources ,such as medicinal plant, mushrooms, and trees, as well as animal poaching, is expected to become a serious problem. The ecosystem in the Reserve is based on a delicate balance of forests and animals. Because disorderly gathering of resources severely damages the Reserve, it is necessary to cope with this problem with the help of the local people.

Measures to prevent such illegal activities include:

① Grasping the state of illegal collection through patrolling by scouts.

② Discouraging illegal collection by the local people.

③ Disclosing illegal activities with the cooperation of resource utilisation groups who regularly enters the Reserve for a specific resource.

4. Budget for forest conservation (for 10 years)

Table 7-2 shows funds necessary for the programmes above.

Table 7-2 Expenses for Plant Resource Management

Unit: US$

Item	Calculation	Expenses for Facilities & Equipment	Operating Expenses	Administrative Expenses	Total
1.Personnel Expenses					
Maintenance of firebreaks (ten years)	@US$3/person/day, 25 m/day 1,000 m/25 m x US$3 x 10 years=		12,000		12,000
Subtotal			12,000		12,000
2. Equipment					
(1) Set for maintaining fire breaks belts (hatchet, sickle and saws)	@US$30/set 10 sets x US$30 x 10 years=	3,000			3,000
(2) Preventing forest fires: fire fighting rods	@US$10/piece 300 pieces x US$10 x 10 years=	30,000			30,000
(3) Preventing forest fires: fire extinguishers (carried on the back)	@US$300/unit 50 units x US$300=	15,000			15,000
Subtotal		48,000			48,000
3. Road Improvement	Included in the Resource Use Plan.	Shown in Table 6-1			
4. Purchase and Maintenance of Vehicles	Included in the Resource Use Plan.	Shown in Table 6-1			
Subtotal					
5. DNPW Headquarters (for ten years)				Shown in Table 7-1.	
6. Nkhotakota Office (for ten years)				See the above.	
Total		48,000	12,000		60,000

VIII. Resource Utilization Programme

8-1 Tourism Resources

The plan emphasises ecotourism because of its negligible impact on the ecosystem. Moreover, the excellent natural environment and scenery makes the Reserve ideal for ecotourism.

8-1-1 The State of Utility Facilities

(1) Bua Visitors' Camp

Bua Visitors' Camp is located on the bank of the Bua River near the Bua Scout Camp. Although it is 400m away from Bua Scout Camp by vehicle, it is only about 100m on foot. A attendant for this camp is stationed at the scout camp.

The camp has a good environment with beautiful scenery of the Bua River. The campsite lies on flat land of the bank, with open forests of tall trees providing comfortable shade and bringing in moderate winds. The outline of the facility is as follows:

- Tent site: about 1,500 m²
- Camper: one old camper fixed to the ground
- Rondaval (1): for two to three persons
- Lodging house (ferroconcrete building with a roof of iron sheet): not completed

No lavatory or kitchen is provided. Regarding drinking water, water from the Bua River is used after subjecting it to boiling. Two wells (one is 6m deep and the other 3.6m) were dug in 1995, but no water has been obtained.

The construction of the unfinished lodging house mentioned above started in 1983 and continued until 1987, but was suspended partly because a water source could not be secured and partly because of financial difficulties. The building has: two halls of exposed concrete; five two-bed rooms; a bathroom and a shower room for common use; and a storage area. This lodging house is usually out of use, but can be used as a shelter when it rains.

(2) Chipata Visitors' Camp

Chipata Visitors' Camp stands on a gentle slope about 1,250m above sea level south of Mt. Chipata (1,638m). It commands a fine view of Mt. Chipata, and as far as Lake Malawi and mountain ranges in the south. It is relatively cool in summer and no tsetse flies are found. The location and environment are excellent, with a clump of trees providing comfortable shade. Spring water is available about 100m down the slope; the water is drinkable without boiling. The output is stable throughout the year and the water does not dry up. Evergreen broad-leafed forests at the top of Mt. Chipata probably play a part as one of the sources of this spring. A survey in July (during the dry season) 1995,

shows that the output is 20 liters per minute, or some $30m^3$ (30 tons) a day.

An attendant and a watchman live in the Camp with their families for administration.

The Camp is about 9 km from the nearest Mbobo Scout Camp, and 5 km from S54 (a road). The 5 km-local road from S54 leading up to the Camp is so steep that during the rainy season, even a 4WD vehicle cannot climb the slope at some points. DNPW is scheduled to change part of its route to avoid such steepest parts of the slope by the end of 1996.

The Camp has the following facilities, most of which are those for educational camp constructed in 1992:

- One hall (built of brick, with a thatched roof and walls constructed in wellhole style, 43.8 m^2): for meetings and taking a rest; a storage area installed in a corner.
- Four hostels (built of brick, with a thatched roof, $29.05m^2$ for each): each building has 12 pairs of bunk beds; 48 beds in total (24 for males, and 24 for females).
- Two buildings of toilet and shower room (built of brick, with a roof of iron sheet, $13.6m^2$)
- One building of kitchen (built of brick, with hatched roof, $22.1m^2$)
- Two rondavals (built of brick, with hatched roof, $15.6m^2$ for each): for leaders of educational camping; each house has two beds.
- One rondaval (with the outer walls and roof made of iron sheets, $15.6m^2$); with two beds
- Tent site: about $1,000m^2$

8-1-2 Programme for Introducing Ecotourism

1. Basic policies for introductioning ecotourism

   (1) Much consideration should be given so that the introduction of ecotourism will not have a negative impact on the natural environment in the Reserve. In addition, facilities should not be too luxurious.

   (2) Resources for ecotourism are rather concentrated along the Bua River and around Mt. Chipata. Therefore, as areas where ecotourism is to be introduced, two utility areas (see Chapter 6, the section on zoning) of Bua and Chipata should be given priority.

   (3) Means of traveling in the Reserve should be basically walking, and new trails will be built mainly in the areas mentioned above.

   (4) It is premature to consider using the Reserve by vehicle, in light of the fact that animal density is low there. The use of vehicle should be minimised and driving should be allowed only on the existing roads; the construction of roads is problematic for the conservation of the Reserve.

(5) As a base for exploring the two areas mentioned in (2), Bua and Chipata visitors' camps, located in fine places, will play a central role, and the two camps will be improved and expanded as follows:

① The two camps will be bases for ecotourism and field education.

② In addition to basic facilities such as roads, electricity, and water, lodging and administration facilities will be improved or newly constructed.

③ A visitor centre will be established at the centre of each base. Such a centre is expected to promote the idea of nature conservation to visitors by displaying data and providing explanations on the features and importance of the natural environment in the Reserve or in Malawi overall. It will also function as a base for various kinds of information services and interpretation services for exploring the natural environment in and around Chipata.

④ Detailed ground plans such as the position of facilities should be mapped out separately. Here is a grand design for such plans. In the case of Bua, one possibility is to position a tent site for ecotourists and a free tent site within and on the east side of the existing campsite, and to replace the scout camp with a tent site for field education (the existing scout camp will move somewhere.). As for Chipata, it is feasible to position a tent site for ecotourists and a free tent site in the northwest and in the southeast, respectively, with the existing tent site for field education intact.

⑤ In the Reserve, as in national parks, buildings and constructions should have an appropriate scale, design, and color so that they harmonise with the natural environment around them.

It is preferable to thatch buildings, especially their roofs with grass. That way, buildings match the surroundings and are more comfortable. Local people say that a thatch will hold for 20 years if the material, i.e. grass, is carefully selected and its skin and heads are thoroughly removed. Visitors would prefer a building made of traditional materials characteristic of Africa to one made of steel sheets.

(6) Because the administration of a visitors' centre concerns the sections of management, research, and education, communications and coordination among them should be strengthened.

(7) It is necessary to publish brochures on the history, culture, and the natural environment of the Reserve and its vicinity, or pamphlets on features of the natural environment (such as evergreen broad-leafed forests). Such publications will be sold to visitors.

(8) Training guides and the public relations of ecotourism are necessary in addition to formulating a program for ecotourism with the help of the education section.

(9) As for know-how to administer such bases and other relevant expertise, it

deserves consideration to ask the Wildlife Society of Malawi and other non-governmental organizations (NGO) for help.

The thought of natural protection needs to be taught to students who will shoulder the future of Malawi. On the other hand, the Ministry of Education should make efforts to promote the use of the Reserve for the sake of education and training. For example, the ministry will encourage primary and secondary schools to use the Reserve as an opportunity for field work as part of environmental education and invite wild life clubs to use the Reserve.

2. Facility construction plan

(1) Bua Visitors' Camp

① The area of the Camp will be divided into the three sections of lodging for ecotourists, free tent site, and field education, and each facility, with the exception of those for common use, will be positioned where it belongs.

② The following facilities will be constructed or improved:

○ Common facilities

- Electric wiring: L=6.5km
- Water supply: well-digging (including preliminary survey), 40-50m deep; water pumps, elevated tanks, water pipes, etc.
- Visitors' centre ($300m^2$): a hall, an information room, a lecture room, an exhibition room, a room for guides, etc.
- Exhibition facility/equipment: TV, stereophonic phonograph, a projector, etc
- Administration building ($50 m^2$): a camp administration office, stand (selling camping/fishing gear, etc.), a storage area.
- Restaurant ($100m^2$)
- Access road (improvement): L=21.5km, W=4.0m
- This road includes the side road (L=6.5km) from Kalilangwe along road M5. This access road is not in frequent use, but if improved, a convenient excursion route between Road M5 and Bua will open.
- Ten lodgings for administration staff

  For two guide scouts for interpretation, and other resident staff such as managers of the visitors' centre, the administration building, and the education/training building.

○ Facility for ecotourists

- Rondaval (two-bed-room with toilet and shower):

  $25m^2$ x 10 units

○ Free tent site (accommodating 20 people): $1,000m^2$

- Building of toilet and shower: $15m^2$

- Building of kitchen and storage area: $15m^2$

○ Field education facilities

- Lodging house for six persons: $35m^2$ x 5 units
- Rondaval for two persons: $18m^2$ x 2 units (for leaders)
- Building of toilet and shower: $12m^2$ x 2 units
- Building of kitchen: $20m^2$
- Building for education/training (built of brick with a roof made of steel): $150m^2$ (with a lecture room, a library, an office, and a storage area)

Each area will have a purification tank and parking lot of a different size according to its needs for the sake of efficiency and convenience.

(2) Chipata Visitors' Camp

① The area of the Camp will be divided into the three sections of lodging for ecotourists, free tent site, and field education, and each facility, with the exception of those for common use, will be positioned where it belongs.

② For field education, the existing facilities will be effectively used.

③ The following facilities will be constructed or improved:

○ Common facilities

- Electric wiring: L=12km
- Water supply: a reservoir will be constructed at the existing water source and the water of the reservoir will be pumped up to the Camp; reservoir, water pumps, elevated tanks, water pipes, etc.
- Visitors' centre ($300m^2$): a hall, an information room, a lecture room, an exhibition room, a room for guides, etc.
- Exhibition facility/equipment: TV, stereophonic phonograph, projector
- Administration building ($50m^2$: a camp administration office, s stand, a storage area.
- Restaurant ($100m^2$)
- Purification tank for 100 people
- Because this area has a slope steep enough to facilitate drainage, one purification tank, if installed below any facility, will do.
- Access road (improvement): L=5.0km, W=4.0m
- Ten lodgings for administration staff

  For two guide scouts for interpretation, and other resident staff such as managers of the visitors' centre, the administration building, and the education/training building

- Facility for ecotourists
  - Rondaval (two-bed-room with bathroom and shower):
    $25m^2$ x 10 units
- Free tent site (accommodating 20 people): $1,000m^2$
  - Building of toilet and shower: $15m^2$
  - Building of kitchen and storage area: $15m^2$
- Field education facility
  - Building of toilet and shower: $12m^2$ x 2 units(rebuilding of the existing facility)
  - Hall building: $150m^2$ ($50\ m^2$ for existing building, $10\ m^2$ for new building), including a lecture room, an office, and a storage room.

Each area will have a parking lot of different scale according to its needs.

(3) The vicinity

① The areas along the Bua River provide a suitable field for ecotourism; a relatively large number of animals including wild birds inhabit the areas and the scenery of the flowing river is marvelous.

- To explore the bank of the river, facilities such as trails, a bridge for walkers, and temporary camp sites will be constructed. Fishing and canoeing will be allowed.
- Fishing should be allowed only if it is sport fishing of catch-and-release as a form of ecotourism based on non-consumptive use of resources.
- Regarding canoeing, a part of the river between Tongole and Bua deserves consideration as an area where canoeing will be allowed in the future. There are a few rapid stream in some parts of the river, and therefore, although it may be dangerous to canoeists of up to intermediate level, it is probably attractive to advanced canoeists. Consequently, to allow canoeing, thorough preparation is necessary, such as training skilled canoeists and careful selection of courses and the season.

② The Chipata area needs the following construction as a base for climbing Mt. Chipata and as a field for exploring evergreen broad-leaved forests and observing wild birds and other animals.

- On the trail up to Mt. Chipata, parts surrounded by evergreen forests should remain basically intact. However, because it is easy to get lost in the forests, some guideposts, boards showing names of trees, and those providing explanations will be set up.

  An observatory will be set up at an appropriate site along the trail.

- A pond will be developed by constructing a small dam along a stream 500 m downstream the Chipata Camp. Such a pond will not only function as a waterfront scenic spot that gives visitors peace of mind and brings changes to the scenery, but also place which is expected to attract more wild birds and other animals. A trail will be constructed from the Camp to the pond, and a cabin for observing wildlife will be built.

  It could be effective in attracting more animals if blocks of rock salt dug out in the improvement process of Road M10 are brought to the bank of the pond

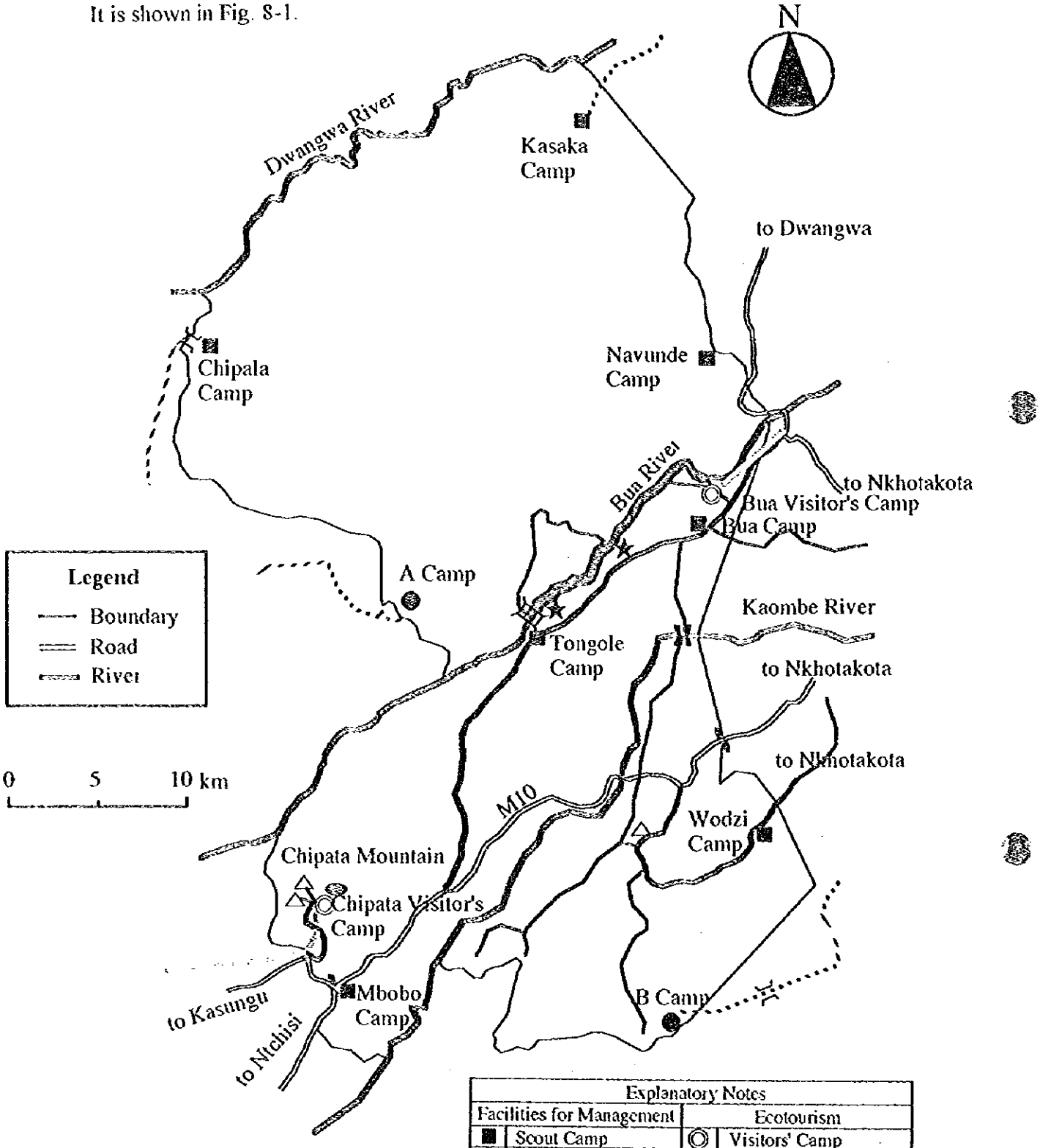
- The following existing roads, which run through areas where the density of animals is relatively high, need improvement so that the roads can be used for administration and observing wildlife.
  - The road from Bua to M10 via Tongle
  - The road from Wodzi to M10: at Mbonekela, from where a good view is observed, a parking lot and other spaces will be constructed.
  - The road connecting Bua and Mbonekela via the Kaombe River and M10 (a road for work to exterminate tsetse flies)
  - The roads going south and southwest from Mbonekela (a road for work to exterminate tsetse flies)

③ The following facilities are planned to be constructed in the vicinity

- Trail from Bua to Tongole to Dwafuni (including signposts): L=34km, W=1.0m
- A temporary campsite between Bua and Tongole, and one at Tongole (including simple toilets, a fire site, and a tent site)
- Trails in and around Bua (including sign posts): L=7km, W=1.0m
- A bridge for walkers (suspended bridge): L=80m, W=1.5m; both main towers and main cables will be made of steel; the bridge will be constructed over the river at its narrower point near the Camp.
- Trails in and around Chipata (including signposts and an observatory): L=2km, W=1.0m
- Small dam: L=60m, H=3m
- Animal view hide: 15 m^2
- Road improvement (road-grading and construction and/or maintenance of side ditches): W=4.0m
  - From Bua to Tongole to M10: 45 km
  - Ten corrugated drainage facilities between Bua and Tongole
  - From Wuodzi to M10: 20 km
  - From Bua to Kaombe to M10 to Mbonekela: 28.5 km (including a bridge: L=40m, W=4.0m, made of steel)

3. Facilities Planning Map

It is shown in Fig. 8-1.



Explanatory Notes			
Facilities for Management		Ecotourism	
■	Scout Camp	◎	Visitors' Camp
●	Scout Camp (New)	—	Road
- - -	Access Road	---	Trail
][	Bridge	][	Suspension Bridge
═══	Gate	★	Temporary Camp Site
		△	View Point
		⊛	Man-made pond
		∿∿∿	Power Line
		][	Bridge (for vehicle)

Fig. 8-1 Facility Planning Map

4. Budget estimate for facilities and other necessities

The table 8-1 shows funds necessary for the programmes above.

Table 8-1 Expenses for Ecotourism

US$

Item	Calculation	Expenses for Facilities & Equipment	Operating Expenses	Administrative Expenses	Total
1. Bua Visitors' Camp					
1) Power and Water Supply					
• Power line	6.5 km x US$ 14,000=	91,000			91,000
• Water facilities					
One well		40,000			40,000
Complete set of a pump and elevated tank		30,000			30,000
Subtotal		161,000			161,000
2) Visitors' Centre					
Building	300 m^2 x US$ 670=	201,000			201,000
Facilities for exhibition		35,000			35,000
Equipment for exhibition		2,000			2,000
Subtotal		238,000			238,000
3) Administrative Building	50 m^2 x @US$ 570/m^2=	28,500			28,500
Restaurant	100 m^2 x US$ 670/m^2=	67,000			67,000
Access road	21,500 m x US$ 25/m=	537,500			537,500
Accomodation for administrative staff	10 houses x US$ 11,000/house=	110,000			110,000
Rondavels	25 m^2 x 10 x US$ 670/m^2=	167,500			167,500
Building of toilet & shower	15 m^2 x US$ 570/m^2=	10,050			10,050
Building of kitchen	15 m^2 x US$ 570/m^2=	8,550			8,550
Student hostel	35 m^2 x 5 x US$ 670/m^2=	117,250			117,250
Rondavels	18 m^2 x 2 x US$ 670/m^2	24,120			24,120
Building of toilet & shower	12 m^2 x 2 x US$ 670/m^2=	16,080			16,080
Building of kitchen	20 m^2 x US$ 570/m^2=	11,400			11,400
Subtotal		1,097,950			1,097,950
Lecture hall	150 m^2 x US$ 570/m^2=	85,500			85,500
Set of purification tanks facilities		40,000			40,000
Parking lot		3,000			3,000
Subtotal		128,500			128,500
Total		1,625,450			1,625,450

2, Chipata Visitor's Camp					
1) Power & Water Supply					
Power line	12 km x @US$ 14,000/km=	168,000			168,000
Facilities for water		35,000			35,000
Visitors' Centre					201,000
Building	300 m^2 x @US$ 670/m^2=	201,000			
Facilities for exhibition		35,000			35,000
Equipment for exhibition		2,000			2,000
Subtotal		441,000			441,000
2) Administrative Office and Housing					
Administration building	50 m^2 x [@US$ 570/m^2=	28,500			28,500
Restaurant	100 m^2 x @US$ 670/m^2=	67,000			67,000
Set of purification tanks		40,000			40,000
Access road	5,00 m x @US$ 25/m=	125,000			125,000
Accomodation for administrative staff	10 m^2 x @US$ 11,000/m^2=	110,000			110,000
Rondavel	25 m^2 x 10 x @US$ 670/m^2=	167,500			167,500
Building of toilet & shower	15 m^2 x US$ 670/m^2=	10,050			10,050
Bulding of kitchen	15 m^2 x US$ 570/m^2=	8,550			8,550
Building of toilet & shower	12 m^2 x 2 x US$ 670/m^2=	16,080			16,080
Lecture hall (extension)	106 m^2 x US$ 570/m^2 x 1.15 (15% increase)=	69,483			69,483
Parking lot		3,000			3,000
Subtotal		645,163			645,163
Total		1,086,163			1,086,163

3. Surrounding areas					
Trail (including guidepost, etc.)	43 km x @US$ 500/km=	21,500			21,500
Suspended bridge (1.5 m)	80 m x @US$ 5,000/m=	400,000			400,000
Temporary campsite	2 x @US$ 400/ site=	800			800
Subtotal		422,300			422,300
Small earth dam (height: 3m, length: 60m)		21,000			21,000
Animal view hide	15 m^2 x @US$ 300/m^2=	4,500			4,500
Road improvement					
Road maintenance (4m width)	120.5 km x @US$ 8,000/km=	964,000			964,000
Corrugated facilities	10 site x @US$ 7,000=	70,000			70,000
Bridge (4m width, Iron)	40 m x @US$ 10,000/m=	400,000			400,000
Subtotal		1,459,500			1,459,500
Total		1,881,800			1,881,800
4, DNPW Headquarters (for ten years)				17,000	17,000
5. Nkhotakota Wildlife Reserve Office (for ten years)				29,500	29,500
6. Operating Costs of Tourism (for ten years)			1,558,275		1,558,275
Grand Total		4,593,413	1,558,275	46,500	6,198,188

Note: For the details of administrative expenses for the DNPW Headquarters and the Nkhotakota Wildlife Reserve Office, see Chapter 12.

5. Profitability

(1) Preconditions

① DNPW directly administers and manages ecotourism-related facilities including two visitors' camps in Bua and Chipata.

② Prices used in the estimate of the annual expenses for administration and revenues are those as of 1996.

③ As for personnel expenses, each visitors' camp will have about 10 DNPW staff members including two guide scouts, managers of the visitor centre, the administration building, and the building for education/training. Another 10 people will be employed mainly for accommodations as non-staff members of DNPW. Consequently, the two visitors' camps will have 20 DNPW staff members and 20 general workers (non-DNPW staff members) in total.

④ Of the annual expenses for administration, the maintenance expenses for facilities are estimated to be 3 % of the facility construction expenses after taking into account the maintenance expenses of a certain resort facility in Malawi and the general situation of maintenance expenses in Japan.

⑤ The number of visitors used in calculating the annual revenue is estimated as follows:

○ With regard to ecotourists, the ratio of overnight visitors to one-day ones is expected to be 2 to 1 by making reference to data (1995) available from Liwonde which has already made a plan and recent trends in visitors to Nkhotakota. Although the average stay of these visitors is 1.5 nights, 2 nights are expected here after ecotourism is introduced[1]. The ratios of foreigners to Malawian people are expected 4 to 1 in overnight stay and 3 to 2 in one-day visit.

○ The annual (actual) number of visitors after the introduction of ecotourism is estimated as follows.

- First of all, with regard to overnight visitors, the rate of use is estimated at 45% in the dry season(seven months from April to October) and 20% in the rainy season (five months from November to March) by making reference to the annual average rate of about 40% for a resort near the Reserve.

  The rate of use of tents is estimated at 25% in the period from April to October and 10% from November to March. The capacity of tent sites at Bua and Chipata is 40 persons each. Therefore, the number of users is estimated as follows:

1) Hiroshi Kidono "Kosutarika ni okeru ekotsurizumu no gaiyou (The outline of ecotourism in Costa Rica)" Kokuritsu Kouen (National Park) (magazine). No. 487, October 1990

Lodgings:

April to October: 40 persons/day x 0.45 x 7/12 x 365 days=	3,800 person
November to March: 40 persons/day x 0.20 x 5/12 x 365 days=	1,200 persons
Total:	5,000 persons

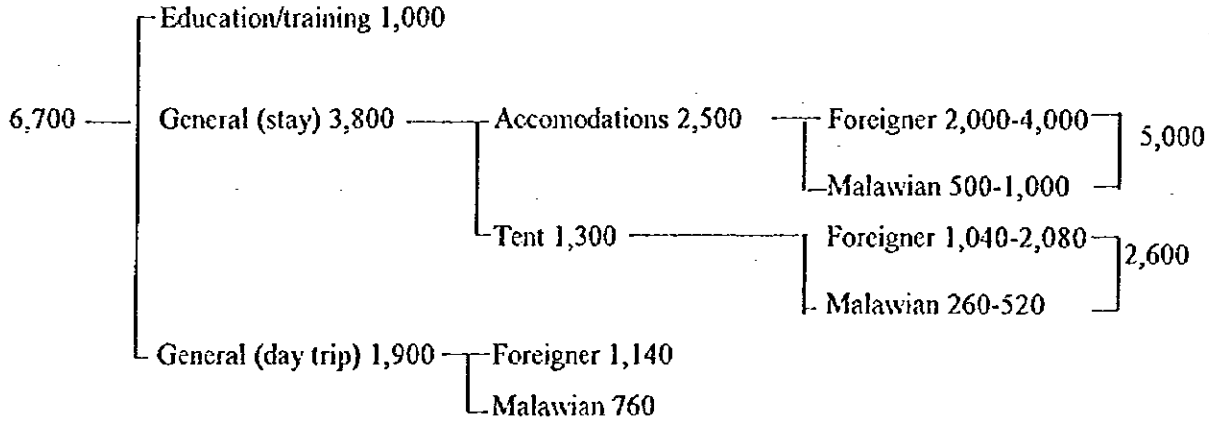
Tent Sites:

April to October: 40 persons/day x 0.25 x 7/12 x 365 days=	2,100 persons
November to March: 40 persons/day x 0.10 x 5/12 x 365 days=	600 person
Total	2,700 persons

These numbers are for tourists supposed to stay for the average period of 2 nights. Therefore, the actual numbers of overnight tourists are half these numbers, namely 2,500 users of lodgings and 1,300 uses of tent sites, totalling 3,800 persons.

- The number of day-visitors is estimated about half of over-night visitors, totalling 1,900 persons.
- In addition to these, educational trainees (free admission and accomodation except for actual meal costs) are expected to be about five times the present level or 1,000 persons.

The following diagram shows the above-mentioned figures (unit: person):



○ The following shows the revised charges such as admission fee to the Reserve. The rates were drastically revised in April, 1996. Until March, 1996, the admission fee was MK20 for a foreigner, MK5 for a Malawian, and MK50 was charged for fishing.

- Admission fee
- Foreigner: MK75 (or US$5)/day
- Malawian: MK15/day
- Malawi-registered vehicle: MK15/day
- Foreign-registered vehicle (small): US$2/day

- Foreign-registered vehicle (large): US$5/day
- Rondaval (without bathroom or shower): MK75/head/day
- Free tent site (users bring in their own tents): MK45/head/day
- Fishing: MK300/rod
- Guide fee (by scout): MK150/day, MK30/course
- Porter: MK250/day

Rondavals with a toilet and shower do not exist in the Reserve, and therefore the charge for such a lodge is not on the list. However, the charge is estimated at MK150/head/day in consideration of examples of other national parks.

(2) Annual revenue (US$)

① Admission fee (calculated at the rate of MK15 to one dollar)

- Lodger Foreigner: (2,000+1,040) x 3 days x US$5/head/day= 45,600
  Malawian: (500+260) x 3 days x US$1/head/day= 2,280
- Day-tripper Foreigner: 1,140 x 1 day x US$5/head/day= 5,700
  Malawian: 760 x 1 day x US$1/head/day= 760

② Accommodations: 5,000 x US$10/head/day = 50,000

③ Tent site: 2,600 x US$3/head/day= 7,800

④ Fishing: 100 rods x US$20/rod= 2,000

⑤ Vehicle (three people per vehicle)

- Lodger: 3,800/3 x3 days x US$1= 3,800
- Day-tripper: 1,900/3 x 1 day x US$1= 633

⑥ Guide fee

- Every five lodgers are to hire one scout for US$10/day (MK150/day), two scouts for US$2/course (MK30/course), and one porter for US$ 16.7/day (MK250/day);
- 3,800/5 x (US$10+US$4+US$16.7)= 23,332
- Every ten day-trippers are to hire one scout;

1,900/10 x US$2= 760

Subtotal 142,665

⑦ Restaurant and shop

The average lodger, camper, and day-tripper are to spend US$20, US$5, and US$2, respectively;

Lodger: 2,500 x US$20= 50,000

Camper: 1,300 x US$5= 6,500

Day-tripper: 1,900 x US$2= 3,800

Subtotal : 60,300

Calculated at a profit rate of 20% :

US$60,300 x 0.20=	12,060
Total: 142,665+12,060 =	154,725

(3) Annual management expenses

Annual management expenses are estimated as table 8-2.

Table 8-2 Annual Management Expenses

US$

Items	Personnel expenses
① SC Ⅱ: 4 x US$60/head/month x 12 months=	2,880
SC Ⅲ: 6 x US$50/head/month x 12 months=	3,600
Porter-class: 6 x US$40/head/month x 12 months ¥=	2,880
Security guard-class: 4 x US$35/head/month x 12 months=	1,680
Others (non-DNPW staff members): 20x35(average)x12 months =	8,400
Subtotal:	19,440
② Facility maintenance expenses: 4,593,413 x 0.025 =	114,835
③ Lighting and fuel expenses (mainly electricity): US$1,000/month x 12 months=	12,000
④ Miscellaneous expenses: US$800/month x 12 months=	9,600
Total: ① ~ ④	155,875

(4) The result

Depreciation expenses are not included in the annual management expenses mentioned in (3) above. If the durability of facilities is 10 years and the annual depreciation expenses are estimated at 10%, the annual management expenses will be 155,875 + 4,593,413 x 0.1= US$615,216), and therefore no profitability will be expected. However, if the depreciation expenses are excluded, they are almost payable with the annual revenue of US$154,725 and the annual management expenses of US$155,875.

8-2 Animal resources

Besides already mentioned programmes for wildlife products from management operation and co-management of fish stock, possible way of animal utilisation is for tourism. However, it is not easy for animals in the Reserve to play a central role in ecotourism due to the low sighting rate. Therefore, in this section, utilisation of animal resources is not discussed in detail.

As for fish, the local people are allowed to fish under certain conditions as a measure

to conserve fish resources (see 7-2-2, 2). This is not to positively approve the use of fish, but rather to encourage the local people to perform their duty to conserve fish by letting them fish with an appropriate method during a limited period. Those who want to catch fish are supposed to organize a fishers' club, and they are encourage to disclose unlawful fishing methods and report catches to the proper authorities. Therefore, this is not so much of the use of fish as it is a means to conserve fish.

Rather a small number of edible caterpillars inhabit the Reserve but the use of the insects is so low that it can be ignored.

If black rhinoceroses would be introduced, some people would go into the Reserve for them. However, it is unclear at the moment whether or not black rhinoceroses will be introduced, and therefore, the animals will not be a resource for tourism soon.

Consequently, the use of animal resources does not deserve further discussion here at the moment.

8-3 Forest resources

(1) The use of dead trees and branches (fuel for household consumption)

The use of dead trees and branches shall be allowed in the model areas designated by the social forestry clause of the plan for use of resources. Users shall report the amount of dead trees and branches they collect to DNPW.

(2) Beekeeping and gathering of medicinal plants, mushrooms and grass

Beekeeping and gathering of medicinal herbs, mushrooms and grass, together with animal resources, give the local people a precious opportunity to think about their relationship with the Reserve.

Farmers in the vicinity of the Reserve shall be allowed to keep bees and gather mushrooms and grass as before. Setting up clubs for collecting mushrooms and thatch will be promoted as in the case of bee-keeping. As for medicinal plants, however, collection of the species that can be found in the vicinity of the Reserve shall be prohibited in the Reserve over worries of indiscriminate gathering.