Summary & Conclusions

1 BACKGROUND

In all the developing regions of the tropics and in most West African countries, draught animals provide a valuable source of agricultural power using renewable sources of energy.

In Sierra Leone several small ox-training projects have been undertaken since 1928 and these have illustrated the potential for using Ndama cattle for crop cultivation and farm transport. In areas of the Northern Province, where about 90% of the nation's herd of 333 000 cattle are found, farmers have continued to use old Ransome 'Victory' ploughs for over 30 years, despite serious problems in obtaining spare parts. In the 1960s and early 1970s, while the attention of the Ministry of Agriculture was concentrated on various mechanical cultivation schemes, small farmers in the more remote areas showed their interest in draught animal power by privately importing ox-ploughs across the Guinea border.

As the cost of mechanical cultivation schemes rose dramatically during the 1970s, more interest was shown in the potential use of draught animals for increasing the efficiency of crop production in the country. In 1979, the Ministry of Agriculture & Forestry began funding the Sierra Leone Work Oxen Project which was set up to investigate and develop the use of draught oxen with appropriate equipment and management techniques.

2 MANAGEMENT

Oxen, or castrated bulls, are considered most suitable for training and, although Ndama oxen are small (160-300 kg/350-660 lb), they are hardy and can work efficiently in simple village conditions.

Details have been provided of the training of oxen and their handlers, which takes just three weeks. Oxen should be 3-4 years old and should weigh 160 kg/350 lb at the start of training.

Oxen should be yoked in pairs with neck yokes and a system of control from behind using reins attached to nose rings is recommended. During the cultivation season, oxen can generally work 4-5 hours each morning for five days a week and, provided adequate natural grazing is available, special feeding is not considered necessary; salt and local mineral supplements should be offered.

Work hours should be reduced to 3-3½ hours a morning when strenuous work such as swamp ploughing is undertaken; work must also be reduced if the animals appear to lose condition.

With adequate grazing, animals generally grow during their working lives reaching 300 kg/660 lb at the age of eight years. They can then be sold at a profit and younger animals trained to replace them.

3 FIELD OPERATIONS

Oxen can be used successfully in a variety of on-farm operations and production rates per team hour are listed below:

Farm operation	*TEAM HOURS per Hectare*	*Acre*
Upland		
Ploughing	25	10
Harrowing	12	5
Swamp		
Puddling & levelling	35	14
Seeding & weeding		
Pulling seeder	12	5
Inter-row weeding	9	4
Groundnut Harvesting		
Lifting	12	5
Ridging	11	4½

Oxen can also pull carts for village transport work, carrying the farmer and for loads of half a ton or more.

4 EQUIPMENT

Various designs of ox-drawn equipment have been tested in Sierra Leone and evaluation reports are presented in Chapter 5. The primary objective has been the identification of an appropriate ox-plough for the country with the potential for developing additional ox-cultivation techniques as an important secondary consideration.

It should also be possible for the toolbar to take weeding and ridging attachments so as to encourage the use of ox-cultivation for cash crops such as groundnuts and laborious operations such as ridging. A large 20 cm/8" wheel is recommended, with a skid as a cheaper alternative.

All bolting and clamping systems must be easily repairable and replaceable; heavy duty ringbolts or ringnuts are recommended.

It is suggested that the well-equipped, Rolako Workshop near Makeni could be used as an appropriate centre for the fabrication of ox-ploughs from imported components. An adequate supply of spare parts must be made available for ox-ploughs and Rolako could provide a convenient base for their storage and distribution.

The 'Pecotool' meets all the requirements of an ox-plough for Sierra Leone and the firm "Project Equipment" is prepared to supply the designs and jigs for use in local manufacture. Designs have also been presented for ox-carts which could be made at Rolako or other small workshops; old car axles or imported axles could be used.

Details of simple triangular harrows, swamp harrows and swamp levellers are also available; these could be made by village carpenters and blacksmiths.

5 EXPERIMENTAL TRIALS

During 1980, experimental trials were carried out at Njala University College and the results (Chapter 6; Appendices 1-4) illustrate the increases in labour efficiency that can be achieved using oxen to plough uplands and swamps to grow maize, groundnuts, cowpeas and rice.

The use of oxen for weeding was of particular note, for not only were time savings of 50-80% recorded compared with hand labour, but also measurements of weed regrowth showed significant reductions following ox-ploughing and ox-weeding.

6 ECONOMIC ASPECTS

Using information obtained from the Njala trials, the comparative economic advantages of ox-cultivation, tractor cultivation and manual cultivation have been considered (Chapter 7). Using comparable assumptions on labour rates, interest rates and animal and equipment costs, budgets have been presented to illustrate the costs of land preparation. It was shown that costs could be of the following order:

	Per hectare	*Per acre*
Ox-cultivation	Le 74	Le 29
Tractor cultivation	145	57
Hired labour	191	75

If cheap family labour is used on farms, then the cost of ox-cultivation and hand cultivation is greatly reduced; tractor cultivation costs remain high, as 90% requires foreign exchange.

Budgets have been made for the growing of maize, groundnuts, cowpeas, upland rice and swamp rice; the overall margins illustrate the attractiveness and profitability of ox-cultivation.

It is concluded that a farmer could realistically consider a commercial loan of Le 1200 to invest in oxen and a toolbar if he were to grow at least 3 ha/7 ac of crops each year.

Investment in an ox-cart is justified if the farmer uses it at least once a week; the value to him of each journey would be at least Le 1, plus the cost of wages for his workers.

7 CONCLUSION

The use of work oxen has been thoroughly tested in areas of the Northern Province and farmers have demonstrated their enthusiasm for the use of draught animals by their continued investment in ox-ploughing. Improved designs of equipment have been successfully tested and indicate that further benefits to farmers could come from the use of multi-purpose toolbars and ox-carts.

Draught animals clearly increase the efficiency of a farmer's labour which is likely to lead him to cultivate more crops with improved timeliness and greater crop output.

The potential of ox-cultivation for individual farmers is such that private investment may be realistically considered. For the country as a whole, improved agricultural efficiency could result from a more widespread use of this form of appropriate technology based, as it is, on renewable sources of energy.

Finally, it is concluded, that farmers, private organisations, agricultural projects and government institutions should seriously consider channelling their resources into the development of farming with work oxen in Sierra Leone.

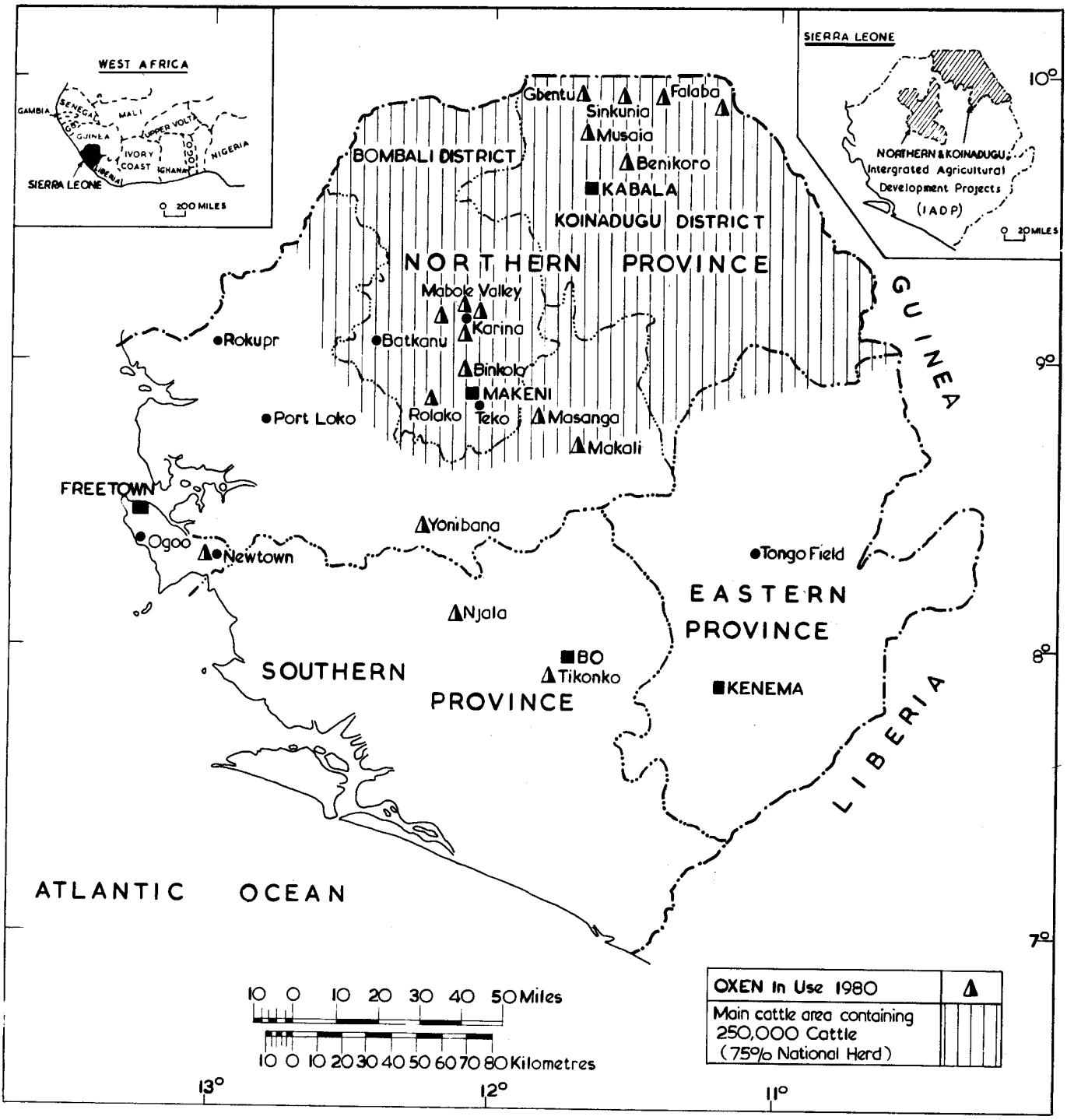

Figure 1. Map of Sierra Leone. Showing selected ox cultivation sites

Fig 1 **Map of Sierra Leone showing selected ox-cultivation sites.**