



TOGETHER
for a sustainable future

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10. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Phase 2 of the project, which encompasses the training and technical programme together with associated monitoring and evaluation activities, has been completed and the objectives satisfactorily achieved. Fifty workshops have been trained in the use of the wheel manufacturing technology and about half of these are currently implementing the technology in producing wheels and axles for ox-carts and other transport devices. The technology has proven appropriate for and acceptable to the workshops and there have been no technical problems in transferring it. A local infrastructure has been established with the capability to continue training and support for the technology. There is a growing demand for ox-carts produced by trained workshops and this is expected to continue as more carts are put into service and rural households become more aware of the quality and reliability of the axle assemblies. It is therefore confidently concluded that the project has established a sustainable technology which is having a significant impact on the supply of ox-carts and which has a high potential for further expansion.

A Summary of the conclusions and recommendations for each of the activities of Phase 2 is presented below.

1. Manufacture of Production Tools

- * a sustainable and accessible supply of production tools has been established through a small number of medium-size, commercial workshops. These are market orientated and have a better approach to promotion and customer satisfaction than some smaller workshops. They should also have adequate cash-flow to hold sets of tools to demonstrate to potential customers and to be able to readily respond to orders
- * over 60 sets of tools have so far been produced. The current selling price is around US\$ 200. This incorporates roughly a 100% mark-up for overheads and profit margin which is considered reasonable.
- * there have been some problems with quality of tools produced, resulting mainly from attitudes of one or two workshops rather than any lack of capability. This has not caused major difficulties for the project but could be more of a problem to customers buying directly from the suppliers. It is known that one workshop is advertising tools in the press and another has displayed at an agricultural field day. This is encouraging in terms of dissemination of the technology but raises some concern regarding the quality of wheels and axles produced by inadequately trained workshops, possibly using sub-standard tools, and the effects that this may have on the reputation of the technology. IAE should monitor this and liaise with the suppliers of tools to encourage good quality of work and proper training of workshops taking up the technology.

2. Training Programme

- * a successful programme of training has been carried out. Training courses were held in six regional centres and fifty workshops trained. All areas of the country were covered apart from the North-west where there is only limited activity in cart-making. IAE plan to run a course in this area in January 1995.
- * there was an enthusiastic response to the training since almost all the selected workshops were experiencing problems in obtaining wheels and axles for ox-carts and could therefore see direct benefits from the technology.

- the "hands-on" approach to training was very effective. Trainees have had few problems in implementing the technology in their own workshops and there have been no reports of workshops not adopting the technology because of problems in using it.
- an effective regional network of training centres has been established to provide on-going training and support. It may confidently be anticipated that this will provide a sustainable base for the technology and for on-going dissemination.
- training was offered to almost all workshops which met the selection criteria. However, as experience was gained it became possible to accurately predict which workshops would benefit from and use the technology. It was apparent that workshops needed a certain level of technical and business sense to make effective use of the technology. It became possible to judge that some workshops, generally small workshops producing only a few carts a year, did not have the commitment or business drive to adopt the technology. A similar or greater impact could probably have been achieved by concentrating training on the more competent and committed workshops. The benefits to these workshops are elimination of time wasted in searching for scrap axles and the ability to produce more and better quality carts on a regular and reliable basis.

3. Implementation of The Technology

- only about half of the trained workshops are using the technology. This is partly due to the present low demand for ox-carts resulting from the depressed state of the rural economy and also to the fact that some workshops are continuing to use up their stocks of scrap axles. It is therefore likely that some additional workshops will take up the technology as stocks of scrap axles run out and the demand for carts picks up.
- there has been less take up of the technology around the major urban areas such as Harare where scrap axles are more available. The wheel-making technology therefore tends to be more beneficial to workshops in rural areas where scrap axles are far more difficult to find and consequently more costly.
- workshops reported some initial customer resistance to carts incorporating an unfamiliar technology but this is gradually being broken down by the good quality of carts and guarantees of workmanship provided by some of the better workshops. It is anticipated that demand will accelerate as more carts are put into the field and people become more aware of the good performance and reliability of the wheel/axle assemblies.
- up to February 1994, 328 ox-carts, 112 replacement wheel-axle assemblies and 67 wheelbarrows/ water barrows have been produced using the technology. This level of sales is considered quite promising considering the newness of the technology and the depressed state of the market. In addition a few workshops are using parts of the technology to overcome shortages of specific scrap components i. e. producing hubs for scrap rims and rims for scrap hubs. This is contributing to an increase in the supply of carts at the lower end of the price range.
- an axle costs around US\$ 70 to produce (without tyres and tubes). Trained workshops are selling their carts in the range US\$ 300 to 375 which is in the mid-price range. Lower cost carts are often of poor quality and unreliable. Surveys have shown that up to 40% of these carts may be out of service awaiting repair. It is

therefore considered that carts produced by trained workshops represent better value on investment by virtue of better reliability and availability and lower maintenance costs.

4. Support to Trained Workshops

- the main support needed to remove constraints on implementation of the technology was to provide workshops with access to supplies of suitable bearings and hubs for ox-cart wheels. Arrangements have been made with a local agency to stock affordable ball bearings imported from China. Arrangements to supply machined hubs from workshops with lathes did not prove very satisfactory because of their relatively high cost and distribution problems. A fabricated hub which does not require machining was therefore developed by the project to give an alternative option. The arrangements for access to bearings and hubs are proving satisfactory.
- small to medium sized workshops are generally disadvantaged in their access to materials and components. Limited cash-flow means that they usually buy materials as they need them so that costs tend to be high and availability variable. Often they must spend considerable time in making the rounds of suppliers to search for the materials they need. These workshops could benefit from some form of co-operative buying and stocking of materials. The project has not become involved in this but it is an area which needs to be considered if these workshops are to become more productive and competitive. This was shown up by attempts by trained workshops to produce and market a wheelbarrow.
- other common complaints of workshops were the high interest rates for business loans which place a major constraint on workshop development, and variability in demand for their products. The latter is inevitable for businesses that depend on the rural economy but these workshops are probably in a better position to respond to variations in demand than the larger, centralised producers because of their flexibility and closeness to the rural communities.

5. Development and Testing

- the development and testing programme has been very valuable in adapting and improving designs to meet the needs of workshops and their customers and in developing devices to extend the applications of the wheel-making technology. A sound engineering approach using rig and field testing with appropriate forms of instrumentation has enabled new designs to be fully proven and introduced in relatively short periods of time.
- an improved ox-cart wheel and hub developed in the programme have been successfully adopted and used by trained workshops. Wheels for a wheelbarrow and for a handcart have also been developed and are being used. The latter wheels incorporate solid rubber tyres developed in collaboration with the local rubber industry. Development is continuing on a puncture-resistant tyre for ox-carts which is considered to have good potential. Both workshops and cart users have shown considerable interest in initial prototypes that have been tested.

6. Development and Dissemination

- based on assessments of transport needs in rural areas and discussions with workshops, a number of other transport devices have been developed which could diversify and expand the applications of the wheel-making technology. These are mainly lower-cost devices aimed at specific target groups of the project, women and poorer households. They include a wheelbarrow, water-barrow and a handcart which can also be used as a light conkey-cart. Although a good number of wheelbarrows have been sold, the production cost is of the same order as the selling price of imported wheelbarrows and it is not economic to sell them through retailers. However, it does appear that the wheels are competitively priced and work should be continued to disseminate and market these. At present, dissemination is concentrating mainly on the water-barrow and handcart.
- whereas dissemination of wheels and axles has been mainly through workshops, dissemination of new transport devices has to be aimed at potential users to create an awareness of and demand for the devices. This is a longer term process which requires considerable time and effort in organisation, monitoring and support. This will be the main activity of Phase 3 of the project, but it will need to continue beyond the end of the project.
- dissemination is being set up in collaboration with organisations working with the target groups in order to improve access to these groups and to obtain more effective control over and feedback from demonstration and field testing of the transport devices. Water-barrows and handcarts have so far been located with four projects being run by collaborating organisations.

7. Monitoring and Evaluation

- monitoring of trained workshops showed that those that have adopted the technology are generally prospering and that a significant number of carts have been produced or rehabilitated which would not have been possible without the project. Monitoring of users has confirmed the findings of previous surveys that ownership of an ox-cart is of considerable benefit to rural households (as also indicated by their willingness to invest a substantial amount of income in purchasing a cart). Since it was clear that the project was achieving its overall aim of benefiting the rural community through increasing the supply of good quality, affordable carts it was decided that it would be more productive to concentrate socio-economic activity on improving the dissemination strategy of the project, particularly in relation to the target groups. This has resulted in the dissemination activity described above and to be continued in Phase 3 of the project.
- a survey of owners of broken-down carts confirmed that breakdowns are a significant constraint on the availability and use of ox-carts. There is a strong demand for repair of carts but this is constrained by the limited availability of suitable rims, hubs, bearings and axles. In most cases the frame and body of the cart are still in reasonable condition and it is substantially cheaper to replace the wheel and axle components than to buy a new cart. It is clear that wheels and axles produced through the project could play a significant role in bringing carts back into service and a good number of replacement axles have already been sold. However, it appears that the cost of axles, around US\$ 75, is limiting further demand even though they may give much better value for money than most scrap axles. Since this is a relatively low-cost method of getting more carts into use it is felt worthwhile to continue dissemination in this area.

8. Institution Building at IAE

- at the end of Phase 2 of the project the wheel making technology has been fully integrated into the activities of the Rural Technology Training Centre at IAE. Staff are committed to and very capable of continuing dissemination of and support for the technology. The technology fits in well with blacksmith training at IAE and the extension service of Agritex provides a good two-way contact with workshops and rural communities. An important recent innovation has been the introduction of a training course in business management for small enterprises which should prove very beneficial to trained workshops.

RECOMMENDATIONS FOR ON-GOING WORK

The above conclusions show that the project has established a sustainable base for the wheel-making technology and that it is achieving its overall aim of increasing the supply of lower-cost carts to rural communities both through increased production and also through rehabilitation of broken-down carts. It is also making good progress in developing and disseminating more affordable transport devices to particular target groups of the project, namely women and poorer households. It is confidently anticipated that the impact of the project will continue to grow as more carts and other transport devices are put into the field to create a greater awareness and demand.

The conclusions also indicate areas where on-going work is needed to further increase the effectiveness and impact of the project. These are listed below:

- the development of puncture-resistant tyres for ox-carts. These would be of great benefit to cart users in eliminating the inconvenience and costs of punctures and in reducing the time that carts are out of service.
- development of a donkey cart. These are more appropriate and affordable to women and poorer households and would have adequate capacity for the majority of loads that have to be transported. The cart would have pneumatic (or puncture resistant) tyres and be of better quality than the handcart/donkey-cart at present being tested but would cost substantially less than an ox-cart.
- continuing support to workshops to promote and disseminate devices that are being produced, particularly axles for animal-drawn carts and handcarts, and wheels for wheelbarrows.
- monitoring the spread of the technology and liaising with the suppliers of the production tools to try to maintain acceptable standards of implementation. Provision of training and refresher courses for workshops that wish to adopt or improve their use of the technology.
- working with partner organisations to disseminate lower-cost transport devices to target groups and organising ways in which these groups can gain access to these devices. Training and organising workshops to produce these devices.

This work can be carried out by IAE with some support from ITDG.