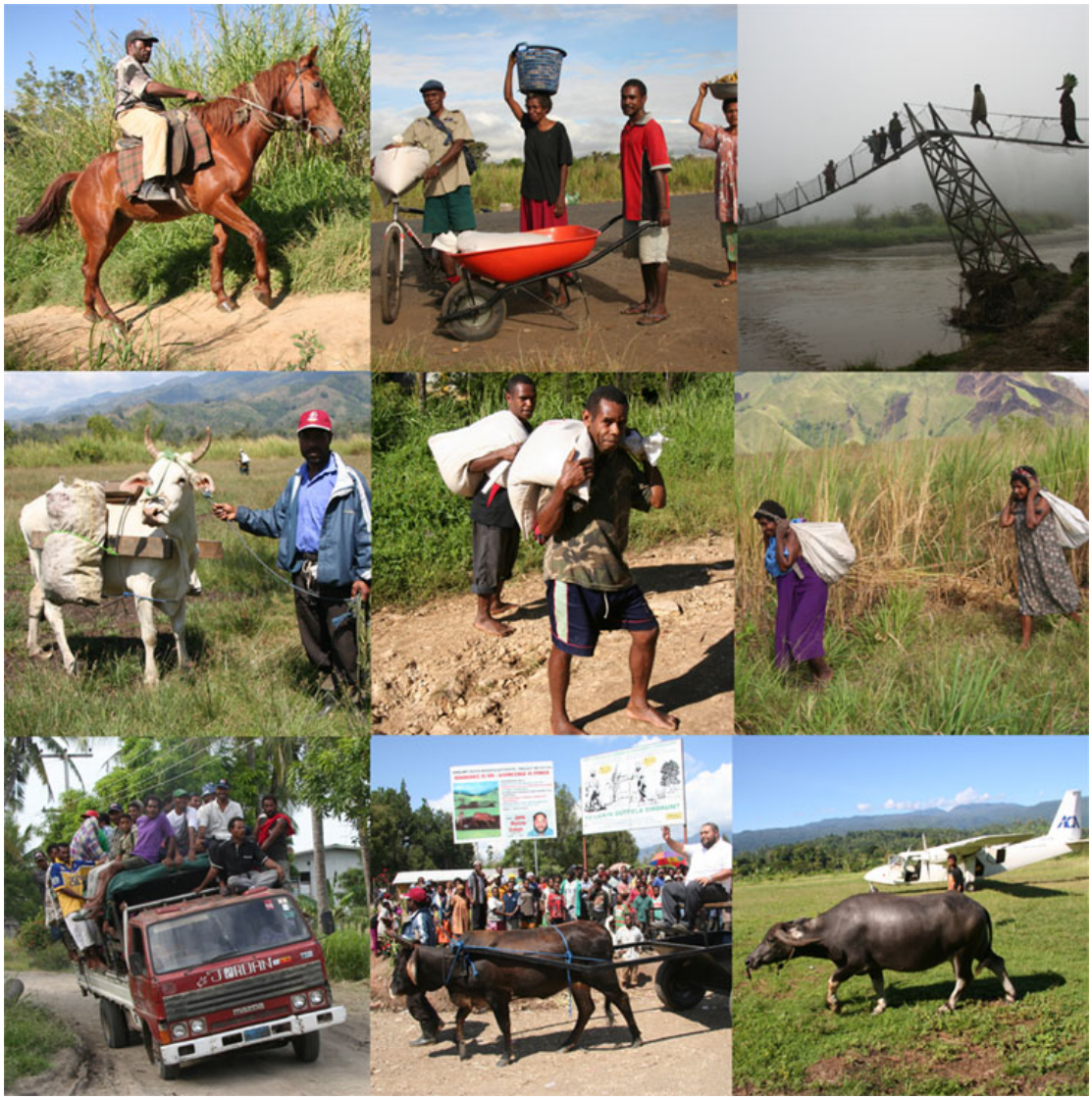
# Local transport solutions in Papua New Guinea

*options for animal power and intermediate means of transport*



***Paul Starkey***

*Report of appraisal mission*
2006

*The opinions expressed in this report are those of the author.*
*They do not necessarily reflect the views of the*
*Office of Rural Development of the*
*Independent State of Papua New Guinea*
*for whom the document was prepared.*

**THE INDEPENDENT STATE OF**

# PAPUA NEW GUINEA

**OFFICE OF RURAL DEVELOPMENT**

# Local transport solutions in Papua New Guinea

*options for animal power and intermediate means of transport*


***Report prepared by***

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# Acronyms, abbreviations and exchange rates

| | |
|---|---|
| ADB | Asia Development Bank |
| ACP | Africa, Caribbean and Pacific |
| AFVP | Association Français des Voluntaires du Progrès (French NGO) |
| ATNESA | Animal Traction Network for Eastern and Southern Africa |
| AUD | Australian Dollar AUD 1 = 2.2 PGK (approx) in June 2006 |
| AusAid | Australian Government's Overseas Aid Program |
| CIC | Coffee Industry Corporation |
| CTA | Centre for Agricultural and Rural Cooperation, The Netherlands |
| DFID | Department for International Development, UK |
| ed | Editor |
| eg | for example |
| EU | European Union |
| EUR | Euro EUR 1 = 3.7 PGK (approx) in June 2006 |
| GBP | Great Britain Pound (UK Sterling). GBP 1 = 5.2 PGK (approx) in June 2006 |
| IFRTD | International Forum for Rural Transport and Development (Secretariat in London, UK) |
| ie | that is to say |
| IMT | Intermediate means of transport |
| ISBN | International Standard Book Number |
| kg | kilogram |
| km | kilometre |
| LDS | Lutheran Development Service |
| MBE | A conferred honour (literally Member of the British Empire) |
| MP | Member of Parliament |
| NARI | National Agricultural Research Institute |
| NGO | non-governmental organisation |
| NRI | National Research Institute |
| OBE | A conferred honour (literally Order of the British Empire) |
| ORD | Office of Rural Development |
| p | page(s) |
| PGK | Papua New Guinea Kina<br>1 Kina = (approx) USD 0.35 = EUR 0.27 = AUD 0.46 = GBP 0.19 in June 2006 |
| PMV | Public motor vehicle |
| PNG | Papua New Guinea |
| SSATP | Sub-Saharan Africa Transport Policy Program, World Bank, Washington DC, USA |
| UK | United Kingdom (of Great Britain and Northern Ireland) |
| Unitech | University of Technology |
| UPNG | University of Papua New Guinea |
| US | United States of America |
| USD | United States Dollar USD 1 = 2.9 PGK (approx) in June 2006 |
| VSO | Voluntary Service Overseas (British NGO) |

# Contents

# Acknowledgements

The author of this report wishes to thank the many people who contributed to the planning and implementation of the appraisal visit and to the contents of this report.

The inspiration for this work, as well as its planning and facilitation was the Honourable Jamie Maxtone-Graham MBE, MP, Member for Anglimp South Waghi. Having understood the transport problems that rural people face, he used the internet to look for solutions to the problems in Papua New Guinea and came across many references to the work of Professor Paul Starkey. Following email contacts and a meeting in London, the aims and objectives of an appraisal visit were agreed.

The visit was subsequently arranged and funded, with support from Hon Arthur Somaire, Paul Sai'i, Director of the Office of Rural Development, Valentine Kambori, Secretary, Department of National Planning and Monitoring and David Gordon-Macleod, the British High Commissioner.

The author is very grateful for the opportunity and privilege of visiting Papua New Guinea and learning from many people in the government, the civil service, research institutions, NGOs, the private sector, aid agencies and many rural women and men. Staff of the Office of Rural Development provided planning and logistical support, including Paul Sai'i (Director), Kelly Lovuru (Deputy Director), Vaia Vai'i (Policy Advisor) and Kino Wenge (Consultant). Many other people in the capital city, provincial towns and in rural areas also provided advice, assistance, logistical support and hospitality.

Particular thanks go to the very many people who were interviewed and provided the information that is central to this report. These included Politicians (Prime Minister, Deputy Prime Minister, Minister for Health, Minister for Community Development, several Members of Parliament for remote constituencies), Government administration (Planning and Monitoring, Rural Development, Agriculture and Livestock, Transport, Health, Education, Community Development), Provincial administrations (Morobe, Eastern Highlands, Chimbu, Western Highlands), Research organisations and universities (NARI, NRI, UPNG, Unitech), Aid agencies and diplomatic representatives (ADB, AusAid, British High Commission, European Union, French Embassy, World Bank), Private sector (ATProjects, Ramu Beef, Ramu Sugar, Rural Industry Council) and NGOs (Catholic Church Dioceses, Community Based Health and Development, Lutheran Development Service, VSO).

About 1000 people contributed through their participation at seminars and the national workshop. Special appreciation goes to Stanley Peng and Jake Ainga from Jimmi. These two farmers, like so many others, have a huge problem transporting and selling coffee in the absence of PMVs and local transport solutions. After they heard about the Banz seminar on the radio, they walked for two whole days in order to attend. This example of rural transport problems and the enthusiasm of rural people for local transport solutions made an unforgettable impression on the author. To these, and to everyone who assisted this work, a very big 'thank you'.

**Paul Starkey**
*Reading, July 2006*

# 1: Summary

Very many rural women, men and children in Papua New Guinea face transport problems. Two million people live more than four hours walk from the nearest road with public motor vehicles (PMVs). Their only way of reaching towns (and their hospitals, shops and markets) is to walk to the road, carrying their burdens. Lack of rural transport reduces school attendance, access to health care, incomes and agricultural production. In most countries in the world, people benefit from local transport solutions, such as riding or pack animals, carts, bicycles and motorcycles. In Papua New Guinea the use of such intermediate means of transport is exceptionally low, there is a 'missing middle' in rural transport. Experience from other countries suggests that it is possible to promote the use of animal traction and intermediate means of transport, and that adoption can be rapid and the benefits are great.

Missionaries, plantations and military forces have successfully used work animals for their own purposes in Papua New Guinea, proving the technology can work. There are breeding feral herds of horses, buffaloes and cattle showing animals can thrive. Rural people now see that such animals could solve some transport problems, provided there were sustainable and affordable supplies and support services.

It is difficult to adopt transport technologies when they are scarce, expensive and have no support services (training, repairs, replacements). Supply and support services do not develop spontaneously where there is no apparent demand. Papua New Guinea is in such a vicious circle in terms of bicycles, motorcycles and animal power. There is no 'critical mass' of users to justify competing suppliers. If both supply and demand could be stimulated ('priming the pump'), a virtuous spiral of growing demand and increasing support services could develop, making subsequent adoption easier. Successful technology promotion depends on creating that 'critical mass' of users, by concentrating initial efforts within a suitable target area.

It is recommended that the Government of Papua New Guinea makes a policy decision to address the 'missing middle' in rural transport, encouraging intermediate means of transport that can reduce the burden of walking and carrying. Greater use of local transport solutions should reduce poverty, increase access to health care and education and increase agricultural production and marketing. All relevant government ministries and institutions should formulate strategies to assist the process in their technical domains.

The long-term aim should be for widespread and safe use by women, men and children of a range of transport technologies. These should be appropriate to the users and the local environment and should be supplied and supported by the private sector. They may include bicycles, motorcycles, handcarts, ox carts, buffalo carts, riding and pack horses and pack donkeys and mules. Some animals can also be used for soil tillage and road maintenance.

In the short term, promotional efforts (supported by the government and aid agencies) will be required. Efforts should be concentrated and targeted to create the necessary critical mass of users and suppliers of particular technologies in suitable areas. Baseline survey estimates will be needed to measure progress.

A devolved system of many linked projects undertaken by different organisations is likely to be effective and have a wide impact. An independent network should be established to coordinate initiatives, encourage information exchange and learn from experiences, within Papua New Guinea, the Pacific region and other parts of the world.

# 2: Planning and implementing this study

## Background

The Honourable Jamie Maxtone-Graham MBE, MP is Member for Anglimp South Waghi. He remembers as a child, seeing the burdens carried by women, often in the traditional 'bilum' bags. He recalls that in the evenings the exhausted women would rub each other's backs with a special plant leaf that stung the back but relieved the deep pain. The burden of rural women, and the traditional remedy continue to this day, and Hon Jamie Maxtone-Graham resolved to see if the transport problem could be solved through the use of animal power.

Hon Jamie Maxtone-Graham used the internet to research the issue and looked for solutions to the problems in Papua New Guinea. He came across many references to the work and publications of the present author, Paul Starkey, an international consultant concerned with improving rural transport systems and sustainable animal power. In a professional career spanning 35 years, Paul Starkey has directed animal traction research, extension and training at a national level and helped to develop effective international networks for sharing knowledge and experiences. He has visited more than 125 countries in Africa, Asia, Latin America and Europe, with consultancy work involving networking skills, a farming systems perspective and participatory methods. He has been appointed a Visiting Professor at the University of Reading and Chairman of the International Forum for Rural Transport and Development. His work has been based on a worldwide vision that encompasses lessons from past experiences, the present priorities of all stakeholders and the needs of economic and social development.

Hon Jamie Maxtone-Graham invited Paul Starkey to visit Papua New Guinea to advise on realistic animal power and transport options that can benefit the people of Papua New Guinea. With cooperation from Hon Arthur Somaire, Paul Sai'i, Director of the Office of Rural Development and Valentine Kambori, Secretary, Department of National Planning and Monitoring and David Gordon-Macleod, the British High Commissioner, Hon Jamie Maxtone-Graham was able to make the necessary arrangements.

## Terms of Reference

The Office of Rural Development prepared the contract and the full terms of reference of this study are included in Annex 1. They envisaged Paul Starkey would:

- Hold initial discussions with institutional stakeholders (government, aid agencies, NGOs) concerning the visit, its objectives and proposed itinerary.
- Visit the Highlands and other rural areas and discuss with a range of rural stakeholders the current situation relating to rural transport services and intermediate means of transport and the potential for animal power.
- Discuss with relevant institutional stakeholders possible options for interventions that could improve the existing situation.
- Prepare a PowerPoint presentation relating to the potential for animal power and intermediate means of transport in Papua New Guinea and participate in seminars.
- Prepare a brief report summarising the visit, findings and recommendations, with some outline suggestions for possible follow-up actions.

## Implementation of the study

Paul Starkey visited Papua New Guinea from 12 May to 8 June 2006. During this time he had discussions with a wide range of stakeholders, including:

- Politicians (Prime Minister, Deputy Prime Minister, Minister for Health, Minister for Community Development, several Members of Parliament for remote constituencies)
- Central government administration (Planning and Monitoring, Rural Development, Agriculture and Livestock, Transport, Health, Education, Community Development)
- Provincial and local administration (Morobe, Eastern Highlands, Chimbu, Western Highlands)
- Research organisations and universities (NARI, NRI, UPNG, Unitech)
- Aid agencies and diplomatic representatives (ADB, AusAid, British High Commission, European Union, French Embassy, World Bank)
- Private sector (ATProjects, Ramu Beef, Ramu Sugar, Rural Industry Council)
- NGOs (Catholic Church Dioceses, Community Based Health and Development, Lutheran Development Service, VSO).

In addition to meetings held in the National Capital District, Paul Starkey travelled to meet stakeholders in six rural provinces. This involved flying to remote communities in Central Province (Woitape, Ononge, Tapini, Fane), Gulf Province (Kanabea, Kaintiba, Kerema), Eastern Highlands Province (Menyamya) and Morobe Province (Kabwum, Wasu). It also involved driving to communities and towns in Central Province (Porebada, Kanosia), Morobe Province (Lae, Markham Valley, Ramu), Eastern Highlands Province (Kainantu, Aiyura, Goroka), Chimbu Province (Kundiawa) and Western Highland Province (Mount Hagen, Minj, Domil, Banz). While visits to other provinces had been planned, lack of resources and pressure of time made this impracticable. A summary of the itinerary is provided in Annex 2.

During his visits, Paul Starkey gave seminars with PowerPoint presentations and discussions at Lae (NARI), Aiyura (NARI), Goroka, Kundiawa, Minj, Domil, Banz and Mount Hagen. The visit culminated in a national seminar at Port Morsely. About 1000 people participated in these seminars. In addition, the consultant with Hon Jamie Maxtone-Graham took part in three radio interviews to discuss the issues of animal power, rural transport and local transport solutions.

## Reporting

Prior to his departure, the author prepared a 4–page policy brief, that summarised the key issues and lessons emerging, and the main policy and strategy recommendations. He also provided Hon Jamie Maxtone-Graham with copies of the final PowerPoint presentations.

This present document provides a more detailed summary of the visit, highlighting key issues and providing some specific suggestions for the future. As envisaged in the Terms of Reference, this document concentrates on land transport. There are also aquatic intermediate means of transport that provide coastal transport and operate on waterways. Small boats powered by paddles, poles, sails or small motors complement larger-scale water transport. During this visit, emphasis was place on land transport, and there are only passing references to water transport, even though this is known to be extremely important in some provinces. In order to make this document convenient for email transmission, there has been little use of photographs in this particular report.

# 3. Introducing local transport solutions and animal power

## Inadequate rural transport in Papua New Guinea

Inadequate transport and accessibility cause poverty and constrain rural development. In rural Papua New Guinea, much transport involves people walking and carrying burdens. Public motor vehicles (PMVs) are often only available on the main roads, and most people do not live close to main roads. Because motor transport is unavailable or too expensive, very many women and men are excluded from selling produce at a fair price and may be unable to actively participate in the national economy. Access to health care and education is also difficult because motorised transport is unavailable and there are no easy alternatives to walking. Understanding existing rural transport constraints and options for overcoming them is a precondition for appropriate policy action by national and decentralised governments and all government services concerned with health, education, welfare and economic and social development.

## Local transport solutions

In many other countries in the world, between walking/carrying and large-scale motorised transport (PMVs) there is a wide range of land-based intermediate means of transport available. These increase transport capacity and reduce drudgery at relatively low cost, solving local transport problems. Local transport solutions include handcarts, bicycles, tricycles, animal-powered transport, motorcycles and power tiller trailers. These technologies are not yet well developed in Papua New Guinea, and there is much scope for increasing and developing them. For example, in other countries, bicycles empower rural women and men, increasing their transport efficiency at an affordable cost. In some parts of Papua New Guinea bicycles are really important, but in most areas they are not widely used being unavailable, unaffordable and/or unappreciated. In some countries, motorcycle taxis provide much needed transport services, while providing important rural employment. Such services do not yet exist in Papua New Guinea.

### A step forward, benefiting rural women, men and children

Local transport solutions are used in appropriate situations in industrialised countries and developing countries. They are definitely not a step backwards from ‘modern’ transport. They should be an integral component of all modern transport systems, and represent an important step forward from the constraints of walking and carrying.

Local transport solutions complement motorised transport systems, by providing convenient and affordable transport to nearby farms, shops and services. For more isolated people, they provide crucial links to distant markets, education and health facilities. When well-established within societies, local transport solutions are generally affordable and sustainable, environmentally friendly and offer significant benefits to women.

Local transport solutions reduce the drudgery, save time and increase the efficiency of rural women, men and children: for example, using a bicycle, pack animal or cart, a painful 15 kg back load can be replaced by much larger load (80-120 kg) transported with more ease and speed.

### Potential for animal power

Animal power is an appropriate, affordable and sustainable technology for agriculture and transport that is widely used in the world and is increasing in many countries. It has already proved technically successful in many locations in Papua New Guinea with horses, pack mules, donkeys, oxen and buffaloes all having played locally important roles in the twentieth century for missionaries, armies and large-scale agricultural enterprises. However, it appears that people have only recently looked in a broad and strategic way at the potential for animal power to help the women and men in remote areas to improve their livelihoods.

## Examples of successful promotion of local transport solutions

Local transport solutions are generally owned by individuals and supplied and maintained by the private sector. Where intermediate means of transport are widely adopted and well established, the private sector (formal or informal) supplies and maintains them within a competitive market. However, such private markets do not always arise spontaneously (as is the case in Papua New Guinea). This may be because of the lack of awareness of the technologies and their utility for rural development and the absence of nearby examples to copy. There is a need to create a market, providing affordable supplies and stimulating a demand. In appropriate circumstances, rural development agencies (government services, projects, NGOs) can work with both potential users and potential suppliers to start such a market. Assuming the technology has economic and social benefits, once a 'critical mass' of suppliers and users has developed, the market can continue without further intervention. The development agencies need to 'prime the pump' to help create that sustainable 'critical mass'. There have been many recent examples from around the world where governments, NGOs and donor-assisted projects have done just this. They have facilitated the adoption of intermediate means of transport. This has led to increased production and local economic growth and much better access to markets and services. Once the local market for intermediate means of transport has become established, private sector services have been able to maintain it, without further project or NGO intervention.

### Examples of animals, carts and bicycles promoted in West Africa

In the early 1950s, farmers in The Gambia did not use oxen, donkeys or horses. The government started a programme to introduce animal traction. This involved training people who were unfamiliar with large animals, as well as ensuring supplies of animals and equipment and credit to purchase them. Today, all three types of animal are widely used for farming and for transport. Animal power use is now probably found in all villages in The Gambia. Animal traction is now widely considered to be a normal and 'traditional' practice (Starkey, 1988).

In Senegal, in the 1960s, there were very few local transport solutions. Most rural transport involved walking and head-loading around the villages and to access the main roads where there were some motor transport services (PMVs). The government launched an agricultural credit programme that helped people to purchase carts and soil tillage implements made by a private factory. Carts pulled by horses, donkeys and oxen became very popular, and within a few years, there was a 'critical mass' of suppliers, users and repairers in many parts of the country. Within 18 years, 130,000 carts were sold, and local transport solutions became a recognised and important part of rural transport (Starkey, 2001).

In Western Burkina Faso, there were no donkeys at all prior to the 1980s and no one was used to managing them. In about 1981, a farmer brought in one donkey and started to use it with a cart. People copied the idea, and the local cotton-producing company started to give credit for the purchase of donkeys and carts. Within twenty years, almost all households in the region owned and used donkey carts.

In Burkina Faso in the 1970s, two bicycle factories were established and an assembly plant started to assemble lightweight motorcycles. These were government backed private initiatives and all proved very successful. Thanks to reliable local supplies and a flat terrain, a critical mass of bicycle and motorcycle users developed. Both motorcycles and bicycles are now widely used in towns and rural areas. Men and women own and use them for personal mobility and great variety of social and economic purposes. In most areas there is more than one bicycle owned per family. People find investment in bicycles and motorcycles profitable, and probably more than one hundred million dollars has been invested in these forms of transport since the initiative started. In the past year, local production has largely ceased due to competition from low cost Chinese imports (Starkey, 2006).

**Examples from Eastern and Southern Africa**

There had been no tradition of animal power in the remote North-Western Province of Zambia, when a development project started operations in about 1978. The rural population depended on smallholder farming and agricultural transport and marketing was a key constraint. There were few cattle and no carts, but the project started a training programme and a workshop that made carts. The ox carts proved popular and their adoption, assisted by extension and credit, was quite rapid. By 1990, about one in ten households owned a cart. The carts facilitated marketing and production and incomes increased stimulating economic development and growth in the area. This growth, in turn, stimulated further demand for local transport solutions (Starkey, 2001).

At Makete, in Southwest Tanzania, transport was a key problem and in 1986 a rural development project discussed possible solutions with local stakeholders. One suggestion was the use of donkeys, but there were only three donkeys in the whole area and almost no experience of using donkeys. The project worked with local people to bring donkeys into the area and train people to use them. By 1994, there were 50 in use. Initial cost-benefit calculation suggested the use of donkeys was highly beneficial, and higher than that of constructing feeder roads (Sieber, 2004). Since then the donkeys have been regularly used and have been gradually increasing in numbers, with about 300 in use in 2005.

In Dar es Salaam, Tanzania, in 1990, an local businessman saw a television programme about the use of tricycles in China. He contacted the Chinese Embassy, who helped him with contacts and some funding support. He imported a container of tricycle components and assembled them for sale. His business grew, and by 2003 he had sold more than 6000 load-carrying tricycles. There is now a growing market for new tricycles and spares.

There are very many more examples where people with no familiarity with large animals or knowledge and tradition of working with animals have been trained to use animals successfully and in a sustainable way. The technology can spread quite rapidly (particularly if credit is available) and widespread impacts have been seen within 10-20 years. There are also many examples where other local transport solutions (handcarts, bicycles, tricycles and

motorcycles) have been introduced, by projects or by the private sector, and have led to rapid adoption.

## Lessons from the successful promotion of local transport solutions

In all the cases cited, the promotion and adoption of animal power and local transport solutions led to economic and social benefits for individuals, communities and the local economies. While there are many local issues that affect the success of a promotional initiative, some lesson emerge. These can be summarised as:

- Discuss transport problems with various local stakeholders (including women)
- Consider environmental and cultural issues
- Offer options, a range of technologies
- Determine whether people can achieve economic as well as social benefits
- Ensure reliable supplies are available locally and are sustained
- Ensure suitable knowledge, skills and understanding (users and suppliers)
- Ensure technology is affordable. Possible mechanisms include:
    - Credit (often the key to adoption)
    - Subsidies (but they can distort choices and markets)
    - Shared costs of ownership (eg, hiring out of transport)
- Concentrate resources and ensure a local critical mass is achieved.
- Ensure local people are trained to maintain the technologies
- Critically monitor and evaluate progress
- Make changes and improvements when required.
- Learn from experiences (good and bad, local and from other situations)
- Collaborate and share information.

Promotion does not necessarily lead to adoption. The circumstances, technologies and methodology must all be appropriate. There have been many 'failed' attempts at promotion, and most of these can be attributed to poor methodology. Some agencies have promoted only 'their' preferred technologies, and have not offered any alternatives. One very common problem has been to fail to concentrate and to create a critical mass of users and supporting services. The author remembers attempts to promote ox carts in villages, by putting one ox cart in each of ten separated villages. After time, there were ten oxcarts unused because of punctures. If the ten carts had been in one village, a puncture repair service could have developed ('one cart, one puncture: ten carts, one puncture repair service!'). The same mistake was made in Ghana when providing two-wheel tractors for farmers to evaluate. Single tractors were placed in twenty villages around the country. They all eventually failed. The villagers could not maintain them, and, since they were far apart, no mechanic could earn a living by specialising in tractor repairs.

Further information on successful and unsuccessful promotion can be found in the publications *Local transport solutions: people, paradoxes and progress* (Starkey, 2001) and *Local transport solutions for rural development* (Starkey, 2002) as well as on the website http://www.animaltraction.com, from which these and other publications can be freely downloaded.

# 4. Appraisal of constraints and experiences in Papua New Guinea

## Transport problems in Papua New Guinea

### Extent of isolation from motorised transport services

A very large number of rural people live a long way away from the nearest road and motorised transport. The national statistics are sometimes presented in a positive light by saying 'the road network in PNG reaches the majority of rural people' (Hanson et al, 2001). 'A considerable majority of people live within four hours walk of a road' (Allen and Lowe, 2005). Both these statements sound positive, and present the glass as 'half full'. However, the same data show that the glass is also 'half empty' and that very many people are a long way from the nearest motorised transport. Table 4.1 gives some 'order-of-magnitude' estimates.

**Table 4.1 Distance of people from national roads in Papua New Guinea, 2000**

| *Distance 'as the crow flies'* | *Population (2000)* | *% of population* |
|---|---|---|
| Under 5 km | 2,748,000 | 53 |
| 5 to 10 km | 547,000 | 10 |
| 10 to 15 km | 302,000 | 6 |
| Over 15 km | 1,595,000 | 31 |
| **Total** | **5,191,000** | **100** |

*After Allen and Lowe, 2005, from PNG National Census 2000.*
*This table does not taken into account road condition (the nearest road may not be passable all year) or the existence of local roads and tracks, which may be nearer*

The distance here relates to 'as the crow flies', and does not take into account topography and obstacles. Mountain paths are not straight, and river crossing may cause long detours. Someone in the most accessible category could be four kilometres 'as the crow flies', which might mean two hours walk from a road – and two hours is a long journey if carrying a 15 kg sack of produce to market or a sick child. Moreover 1.6 million people live more than 15 kilometres 'as the crow flies', and some of these will be more than on day's walk from the nearest motorised transport. During the present visit, the consultant travelled by air to several communities that were more than a day's walk from the nearest road. The scale of the rural transport problem is therefore clear. Perhaps two million people in Papua New Guinea live at least four hours walk from motorised transport services.

As noted, Table 4.1 does not taken into account of road condition or the existence of local roads and tracks. The deteriorating condition of some roads means that the national network of usable road is actually decreasing. This, combined with mountainous topography, means that rural access to public motor vehicles (PMVs) is problematic for huge numbers of people. With ongoing problems of maintaining existing roads, there is little prospect for any significant expansion of the road network in immediate future.

### Effects of isolation and poor access

From discussions with women and men in remote villages, as well as from discussions with government officials and NGOs, a picture emerges of the high economic and social cost of isolation and poor access. People cannot easily reach hospitals, leading to chronic poor health and unnecessary maternal and infant mortality. Rural clinics have difficulty in obtaining basic supplies and in retaining staff. Due to the time required to travel from a village clinic to a town, staff can be away from their posts for several days on minor administrative matters.

School attendance is low, particularly for secondary schools that require greater travelling. Rural primary schools have difficulties in bringing in basic supplies such as books and paper, which are heavy. They also have problems of recruiting staff and keeping them at their posts throughout the term.

Agricultural production is often limited by market access. During the visits we saw evidence of coffee deteriorating through lack of transport. People reported that the 'green revolution' concept of using military transport to bring coffee from rural areas is neither working efficiently nor sustainable in the long term.

In isolated villages, it is difficult for rural women and men to earn significant incomes. There are few jobs and little market for agricultural produce. Because of the problems and costs of transport, local stores have few goods and high prices. People talked about a feeling of helplessness in isolated rural villages. Women and men did not know what they could do to improve their livelihoods and living standards, and the problems of transport were crucial. They felt the government largely ignored their plight. The rural people had immense transport problems and no local transport solutions.

### Missing middle

In most of Papua New Guinea, there is a 'missing middle' of land transport, with nothing between walking and carrying and large-scale motor transport (PMVs, planes). Most rural journeys involve walking and produce is carried in traditional 'bilum' bags.

In most other countries in the world, there are local transport solutions such as handcarts, bicycles, tricycles, motorcycles, animal-pulled carts and pack animals that take the drudgery out walking and carrying. Women, men and children may use intermediate means of transport to travel to trading centres, education, and health facilities and to reach the nearest road or transport hub. They use animals, carts or wheeled transport devices to carry farm produce from field to village and from village to the local market, roadside or transport hub.

However the people of Papua New Guinea seem to have the lowest ownership and use of intermediate means of transport of any country in the world. The consultant cannot think of another country, tropical or temperate, rich or poor, mountainous or flat that has such a small number of intermediate means of transport per head of population.

As reported, this 'missing middle' in transport in Papua New Guinea is adversely affecting the social and economic prosperity of individuals and communities. The lack of intermediate means of transport makes people suffer because of the time and effort needed to reach markets and services. A great deal of effort is needed to transport people and goods for relatively little output. People regularly walk for several hours carrying a bilum of produce weighing 10-15 kg. Because transport takes so much time and effort, rural incomes are low. There is a need to break the vicious circle of poverty and poor transport. Improved transport can stimulate greater rural incomes and investments as well as better access to health, education, information and communications.

## History of animal power in Papua New Guinea

In Papua New Guinea there were no large indigenous animals (such as cattle, horses or camels) that could be domesticated for work. Consequently it was impossible to develop traditions of using work animals.

The first uses of work animals in Papua New Guinea came in the nineteenth and twentieth centuries. Missionaries, colonial authorities and the private sector imported work animals into Papua New Guinea as transport animals to assist their work.

**Catholic missionaries, riding and pack transport**

French catholic missionaries established a base on Yule Island in 1885, and gradually built up a network of mission stations in what is now Central Province. Horses were imported and used to transport materials and supplies. Missionaries also rode horses. Small paths and tracks were specially constructed with their width and gradient appropriate for packhorses and riders. There were tracks from the coast to Tapini in the Owen Stanley mountains and on to Waitapi, Ononge and Fane. Catholic missionaries took horses further north to supply and connect missions, passing through Garaina, Wau, Aseki, Bema, Kaintiba and Menyamya in what are now Morobe and Gulf Provinces. Many of these tracks are still visible and usable today.

In the first half of the twentieth century there were several thousand horses in use by the missionaries in Papua New Guinea. For example, people remember that less than 50 years ago there were about 1000 horses in use in the Bereina Catholic Diocese, including Kerau (600), Kamulai (200), Kosipe (50), Ononge (50) and Yongai (50).

As the first rural airstrips were made, from the 1940s onward, the horses initially complemented the air traffic, taking people and materials from the airstrips to the more remote mission stations. However as more airstrips were constructed in the 1960s and 1970s, the use of horses was reduced. The work of the missions and the number of expatriates declined after independence, and the use of horses has largely ceased.

There exists today much recorded and unrecorded experience relating to the use of horses by the Catholic missionaries. The Bereina Diocese has many photos of the horses in use (some of which were exhibited in 2006 in cooperation with the French Embassy). In the small museum at Ononge, there are examples of saddles, bridles, panniers and other horse-related accessories. Also at the Ononge mission station there is a storeroom containing several saddles, bridles and other harnessing equipment.

**Railways**

The catholic Societas Verbi Divini (SVD) started operations in what is now Madang Province in 1896. In addition to missionary activity, SVD started plantations and sawmills. For transport, light railways were built, with small trucks pushed by people or pulled by locomotives or animals. For example, a large sawmill was established at Alexishafen, 15 km north of Friedrich Wilhelmshafen. SVD missionaries, established a mission station at Marienberg on the lower Sepik River in 1913, and built a sawmill with railway to supply it. The truck loaded with logs descended by gravity, and the empty trucks were pulled uphill by buffaloes (McKillop and Pearson 1997).

There are several photographic records of various animals pulling trucks on such light railways. These include a photo of log bogies pulled by oxen and another photo of a buffalo hauling V-hoppers carrying sand and gravel for construction projects. There are several photos from around 1914 of flat cars pulled by donkeys carrying missionaries and German colonial officials (McKillop and Pearson 1997).

**Plantations and ranches**
From the late nineteenth century, missionaries, colonial authorities and private settlers benefited from the agricultural productivity in various parts of Papua New Guinea by establishing plantations and ranches. From the early days until present times, the operators of plantations and ranches frequently employed animals for transport purposes. Animals were used for riding (mainly horses), pack transport (horses and mules) and pulling carts (buffalo, oxen, horses and donkeys). Records and photographs from the early twentieth century show that horses, cattle, buffaloes, mule and donkeys were already employed in various plantations. The author has not found information as to precisely when and from where the various types of animal were imported for the different enterprises. Some animals escaped and started to breed, leading to feral populations of cattle, buffaloes and horses. There is evidence that some feral populations were in existence in the 1940s, and some feral breeding populations of horses, buffaloes and cattle remain in existence today.

**Second World War**
During the Second World War, horses and mules were used to transport military supplies. Pack animals were used by the warring armies (Japanese, Australian and United States). The horses and mules were mainly controlled by expatriates and sometimes by indigenous people. There are detailed descriptions and photographic records of the use of horses and mules at the Australian War Memorial and its comprehensive website (http://www.awm.gov.au).

The Australian army used locally-available horses in Papua New Guinea. It is recorded that the 1st Independent Light Horse Troop (1 officer and 20 men) trapped some local feral horses for use on the Kokoda trail. Most horses (and harnesses) came from plantations on the Sogeri plateau. They found that mules were the best pack animals for their purposes, followed by the trained feral horses. The plantation horses were less suitable for the narrow mountain tracks. Since the tracks were narrow, the horses and mules were taught to follow in single file, with one man riding at the head of the column and one at the rear. Standard loads were 72 kg (160 pounds) for each animal (McCarthy, 1959).

Examples of the use of horses by the Japanese include reports that Colonel Yokoyama was sent from Rabaul to prospect the Kokoda trail in July 1942 with 2000 soldiers, 1200 local men (including porters) and 52 horses. When the main Japanese force landed at Buna, they had 230 horses (McCarthy, 1959).

**Lutheran missionaries**
Early Lutheran missionaries made use of horses for riding and pack transport. They also used carts and wagons pulled by oxen and buffaloes. In 1890, a simple road was constructed to allow ox carts to transport supplies. Until 1936, when the first mission aeroplanes were employed, animals were the main means of transport. In the mountain areas, mule trains (including horses and mules) were used for transport. Most Lutheran mission stations owned both oxen and horses, and although their use gradually declined, animals continued to be owned until the 1970s.

The early Lutheran missionaries also trained cattle and buffaloes for plowing. In more recent times, since the 1970s, the Lutheran Development Service (LDS) has been working with the Department of Agriculture and Livestock to assisted local farmers to use buffaloes for plowing. It has prepared extension materials to assist the training. While the LDS buffalo-training initiative has been sustained for about 30 years, the total number of farmers and

animals trained has been quite small, in the region of 200 buffaloes. The slow rate of training is mainly due to the limited supply of buffaloes, most of which have been captured from feral herds. As the working buffaloes are generally separated in different villages, there is little opportunity for reproduction. The LDS estimate that if there were a good supply of buffaloes, there would be more than 1000 farmers interested to buy them.

**Donkeys and mules**

While there are numerous records relating to the use of horses in Papua New Guinea, from historical times to the present day, there is relatively scarce information relating to donkeys and mules. From photos of donkeys pulling passenger trucks around 1914, it appears that donkeys have been used successfully. Some people contacted remembered seeing individual donkeys being used for pack transport in the hills around Markham valley. It seems that these were maintained singly in isolated villages and so had little opportunity to breed replacements. It is reported that the donkeys were used for many years, but eventually they 'grew old and died'. In 1990, it was reported that 28 donkeys had been successfully operating in the villages of Papua New Guinea (Nomino, 1990). The present availability of donkeys in Papua New Guinea is uncertain and very limited: the author is not aware of any breeding herds in the country.

Crossing a male donkey with a female horse produces a mule. Mules do not themselves breed. Mules are generally specialised transport animals, stronger and more robust than horses, but not as easy to train and manage. Some mules have been used in Papua New Guinea. There are records of mules being acquired and employed during the Second World War. Mules were probably mainly bred on ranches and plantations for use by professional transporters, such as traders bringing goods into and out of the highlands, prior to the development of the road network. There are reports of 'mule-trains' being used to carry goods, but this term simply refer to the system of linking several animals in single file to carry pack loads. Photographic records suggest that many such pack animals were horses rather than mules. As horse and mule transport was replaced by road and air transport, the demand for mules declined. As few plantations or ranches kept breeding donkeys, mules gradually died out. There appear to be few, if any, mules in use in Papua New Guinea today.

**Animal traction promotion and recent initiatives**

To date, there has never been any large-scale, widespread, sustained and systematic attempt to promote the use of work animals for the people of Papua New Guinea. During the colonial period some missionaries, ranches, plantations and traders used animals for their own purposes, but there seem to have been no efforts to promote wider use of the technologies.

Since independence in 1975, there have been a number of small-scale initiatives to promote animal power in Papua New Guinea. Some of these have had local success, but they have not been combined and consolidated into a national programme to create a 'critical mass' of users.

*Promotion of buffaloes*

A buffalo promotion initiative was stared in 1975, when some feral buffaloes were trained for work at Alexishafen. A draught animal project was established and breeding herds of buffaloes were established at the Department of Agriculture and Livestock farms at Erimahafen (Madang) and Warangoi (East New Britain). Over 100 farmers were trained to use buffaloes in Madang Province, with particular interest in Momase region (Nomino, 1990). The Department of Agriculture and Livestock and several non-governmental

organizations, including the Lutheran Development Service, supported the work. In 1983, a resource publication on 'Draft animals in Papua New Guinea' was prepared, apparently based largely on the experience in Madang (Pumfrey, 1983).

In the 1980s, the Appropriate Technology Development Institute, of the Papua New Guinea University of Technology in Lae (Morobe) was actively concerned with a wide range of rural technologies, including animal power. Its Liklik rural technology source books, first published in 1977, contained information on using and training draft animals, primarily water buffaloes (Bergmann, 1982).

*Interest in Eastern Highlands Province and by NARI*
In 1990, a paper on 'Draught animal for rural development in Papua New Guinea' was presented at the Second Papua New Guinea Animal Society Symposium held 26-29 June 1990 in Goroka (Nomino, 1990). This briefly reviewed the existing situation and future needs, and estimated that since 1978, 594 buffaloes, 28 donkeys and 4 horses had been successfully operating at village level.

In 2002, a senior scientist at the National Agricultural Research Institute (NARI) prepared a paper and proposal concerning the potential for work animal in Papua New Guinea (Quartermain, 2002). The proposal was not further developed or funded, but NARI remains very interested in the topic.

*Use of horses for rural transport in Simbu*
In 1998, the Simbu Department of Education decided to use horses to allow its Elementary Training Inspectors to visit villages. Seven members of staff, including George Nime (see cover photo) were sent to the Ramu Beef ranch in the Markham Valley and were trained to ride and look after horses. Training took less than one month, and the education staff returned to Kundiawa and some outlying communities, each with a horse to use and manage. Some horses were well-maintained and used every week, including that of George Nime. Some others were less well cared for, and a few horses died. Additional horses were purchased and there are now between five and ten horses in regular use by school inspectors in Simbu Province.

*Promotion of work cows in oxen in Western Highlands Province*
In 2004, Hon Jamie Maxtone Graham, Member of Parliament for the Anglimp South Waghi (Western Highlands Province) started to research the potential for animal power. Through the internet, he came across the work of the present author, Paul Starkey, and the Animal Traction Network for Eastern and Southern Africa (ATNESA). Hon Maxtone Graham arranged for working cows to be trained in Minj (Western Highlands Province), and a 'golovan' ox cart was constructed. A packsaddle for use with cows and oxen was developed. Following successful demonstrations and much interest among local people, there are plans to train many more animals and construct more carts.

*National appraisal survey and workshop*
It was due to the optimism arising from the Minj animal traction project that the Hon Jamie Maxtone Graham initiated this present study. This in turn led to a national seminar on local transport solutions and animal power that was held in Port Morseby in June 2006.

## Lessons from animal power in Papua New Guinea

This historical perspective allows some clear lessons to be learned about the potential for animal power in Papua New Guinea. Understanding and interpreting what has happened in the past can also help explain why animal power has not yet spread to the many village communities in the country.

### Work animals can thrive in Papua New Guinea

It is clear that horses, mules, donkeys, oxen and buffaloes can survive and thrive in environment and climate of Papua New Guinea without the need of complicated management systems and veterinary attention. Evidence for this includes the fact that horses, mules, donkeys, oxen and buffaloes have all been successfully used from many years as work animals in several locations in the country. Furthermore, feral populations of horses, cattle and buffalo are breeding successfully, without any human care or attention.

### Reasons for the slow uptake of animal power technology

Although work animals can thrive, they are not widely used today in Papua New Guinea and the reasons for this need to be understood.

*Historic lack of technology transfer and demand*

In colonial times, expatriates used work animals for their own purposes, and did not generally attempt to transfer the technology to the local people. The local people did not rush to adopt the technology, because (until recent times) there was little economic market demand for rural transport or for plowing. During most of the colonial era, rural people were primarily subsistence farmers. The economic demand for rural transport was primarily from expatriate missionaries, administrators, traders, farmers and miners. Nowadays the indigenous farmers are growing a range of cash crops including coffee, for which there is an important economic demand for transport.

*Limited supply*

During the colonial times no one created sustainable supplies of animals that were owned, maintained and bred by local people. At that time, all animals were bred on ranches, plantations, mission stations and some government establishments. Even on some of the smaller mission stations there were no breeding herds with transport animals often males (sometimes castrated) or with isolated individuals unable to breed. As there were no local supplies of animals, it was difficult for villagers to obtain animals, and become familiar with work animals reproducing in the villages.

To the present day, lack of the local supply of suitable animals is a fundamental constraint to any individual wishing to use work animals or any organisations wishing to promote animal power. If animal power is to take off, it will require larger breeding populations of animals, preferably with reproduction taking place at village level.

*Lack of large-scale promotion and a critical mass*

During the colonial times, there were few attempts to transfer the technology. Since the 1970s, some efforts have been made to promote animals (mainly buffaloes). While some of these have been sustained for many years, they have been relatively small-scale and local initiatives.

To date, nowhere in Papua New Guinea has there been promotion of a sufficient scale to allow the development of sustained village-based supplies of animals and equipment, local training and appropriate support services. This means there have never been enough animals in use to develop a 'critical mass' of suppliers, users and support services to allow sustained adoption. The technology has been demonstrated effective, but it has never been able to take-off due to lack of a critical mass of users, supplies and supporting services.

## The use of bicycles and motorcycles in Papua New Guinea

The number of bicycles and motorcycles in Papua New Guinea is extremely low. The percentage of people owning bicycles and motorcycles is among the lowest in the world. While in some locations, steep slopes, mud and the lack of suitable tracks would restrict the use of cycles, there are very many places where cycles could be ridden and/or used as 'pushbikes' to carry goods, and there are many roads and tracks that could be used by motorcycles.

In the 1950s and 1960s some organisations (including colonial authorities) issued bicycles to staff. There appear to have been no attempts to market large numbers of bicycles for the local population at this time. Bicycles were expensive and spare parts were not easily available.

Throughout the 1970s and 1980s, bicycles remained extremely expensive relative to incomes. Lower cost bicycles from the emerging Asian manufacturers (China, India and Indonesia) were not generally available. A classic vicious circle existed of high cost leading to low demand and usage; low usage and demand leading to limited supply and high prices. As a result a 'critical mass' of many users together with affordable private sector supplies, parts and repairers was not established, and bicycles remained unusual, expensive and difficult to maintain in rural areas.

Since the 1990s, the price of bicycles has been falling, due primarily to imports from China. This has led to increasing use of bicycles (although still at a very low level). For example, in the Markham Valley it is now quite common to see people travelling by bicycle and carrying loads on bicycles. While most cyclists are men, some women use bicycles. As a result of the increased use of bicycles, some traders are starting to sell spare parts in markets, and this is making it easier for people to use bicycles regularly. In Wuvulu (Manus Province) there is already a critical mass of bicycle users, suppliers and repairers, so that bicycle use has become normal. A similar situation could develop in other parts of the country.

There have never been many motorcycles in use in Papua New Guinea. The colonial authorities, missionaries and large-scale agricultural enterprises have used small numbers. However these were always expensive and no 'critical mass' of users, suppliers and repairers ever developed. In recent years, some Japanese motorcycles have been allocated to people working in rural areas (extension agents, plantation staff). To date, there have never been enough in any one area to create the necessary 'critical mass'. Unless there is sufficient demand, private sector support services (providing repairs and spare parts) will not develop in rural areas, and so it will remain difficult to use and maintain motorcycles.

There have not yet been large-volume imports of low-cost motorcycles from China. Experience from other countries suggests it will only be a matter of time before Chinese motorcycles become quite widely used in Papua New Guinea.

## The use of other transport technologies in Papua New Guinea

As will be apparent by the phrase ‘the missing middle’, used previously in this report, there are almost no other land-based transport technologies between walking and PMVs that are used in Papua New Guinea. In most countries, there are very many transport devices used in and around markets and villages for the transport of fuel, water, building materials and agricultural produce. In most countries, two-wheel handcarts are common. In Papua New Guinea such handcarts at markets are almost entirely ones commissioned by Coca Cola for the sale of soft drinks. Small numbers of wheelbarrows may be seen (often purchased by the market authorities for litter and waste control or owned by construction companies). Other technologies are either rare or absent.

There is a diversity of water transport technologies, for fishing, for transport along rivers and inland waterways and for coastal and inter-island transport. However, while the subject is extremely important for Papua New Guinea, there was not time during the present visit to study water transport. It is recommended that the proposed network initiates a comparable participatory study and review of water transport systems and their constraints and opportunities, culminating in a national workshop on the subject.

# 5. Analysis of opportunities and risks

## Technologies suitable for promotion in Papua New Guinea

### A range of technological options

There is no single technology that will be ideal for all situations in Papua New Guinea. There are many different agricultural power sources and transport types that are suitable for different users, loads and conditions. Each technology has particular advantages and disadvantages. In most cases, a mix of complementary transport types will prove best. Some technologies (notable bicycles, motorcycles and hand carts) could be introduced rapidly and in large numbers, to have a very significant impact within five to ten years. Other technologies, notably animal power, represent long-term investments. While some people would be able to benefit from animal power within few years, it would take more than ten years for animal power to become a widely used, sustainable and renewable energy source in Papua New Guinea.

### Potential uses of animal power

Animal power certainly has a future in Papua New Guinea. There is evidence from historic and recent experiences that animals can thrive in the country, that rural people can train and manage them effectively and that they can bring valuable and unique transport characteristics. There are five important, economic roles that animals could play in the future development of Papua New Guinea.

- Personal transport (riding) for plantation supervision, ranching, rural access. Horses will be the preferred animals.
- Pack transport, particularly for coffee and other agricultural produce in mountain areas. Suitable animals will be horses, mules and donkeys with a possible role for cattle.
- Cart transport of produce and people, primarily in valleys, plateau and coastal areas. The choice of animals will depending on the location and other uses for the animals, as buffaloes, oxen (and cows), horses, mules and donkeys can all pull carts.
- Land tillage (plowing and weeding). All animals can be used for tillage but buffaloes, oxen and horses are most likely to be employed.
- Road and track construction and maintenance (transport of materials, grading and levelling). While all animals can be used for transport of materials and pulling graders, oxen are likely to be particularly appropriate for sustained work.

In addition, animals can be use in forestry (logging and timber transport), weed and grass control in plantations, irrigation and water raising and some post-harvest processing. Horses could also be used for tourism (riding and pack transport for trekking). These more specialised applications will not be considered in this report, but they could be investigated once an animal power programme has become established in the country.

Initial emphasis has been placed on economic uses, as profitable applications are most likely to lead to the critical mass of users required for long-term sustainability. Once the various technologies become more widely available, greater emphasis can be placed on a wider range of social and economic uses of animal power, including transport for medical services and for marginalised and disadvantaged people.

*Horses*

Small numbers of horses are available in the country and could be used immediately in a promotional programme. While horses can be used for many tasks, including riding, hauling

carts and pulling tillage implements, the priority should be on pack transport. This is because horses have already been proven to be very effective for pack transport (so there will be minimal delays due to investigational work) and the transport of coffee along small tracks has been clearly identified as an immediate need with potential social and economic benefits for remote communities.

A few horses can be easily purchased from Ramu Beef and some other ranches and plantations. Staff of Ramu Beef (and other organizations) can provide training services. Following appropriate consultation with communities and individuals, pack transport services should be first developed in areas where there is known to be a problem of coffee transport, and where tracks suitable for pack animals already exist. Examples of such situations encountered during this visit included tracks from Jimmi River and tracks from the isolated communities in Goilala (Woitape, Ononge, Tapini, Fane), Gulf Province (Kanabea, Kaintiba, Kerema) and Morobe Province (Kabwum). In all these location people are already aware of the potential benefits of packhorses.

There are some feral herds of horses, and individuals from these herds could be captured and trained. During the second World War, horsemen from Queensland in the Australian Independent Light Horse Troop did just this, and found the captured and trained horses (that they called Brumbies) were excellent pack animals.

A national policy and strategy should be developed for the future breeding of horses in Papua New Guinea. In the short term, use should be made of the existing breed of horses which clearly can work effectively. In the longer term, if pack transport becomes widespread, consideration might be given to the use of stockier and more robust types of horse or ponies.

*Donkeys*
In many countries of the world, donkeys are exceptionally good for small-scale transport. They are hardy, and easy to manage and sure-footed on mountain tracks. They can carry about 80 kg on their backs (depending on donkey size and the terrain) and can pull light carts in flat areas. In countries where they thrive, they are generally more affordable than horses and generally live long lives with minimal health problems. If they were readily available, they would seem to be the pack animal of choice farmers and transporters in remote areas.

Unfortunately, donkeys are not readily available in Papua New Guinea. If donkeys were to be promoted, breeding populations would have to be established. This would probably require the importation of animals from Australia.

The reason for the lack of donkeys is not entirely clear. Neither donkeys nor horses are particularly well adapted to the low humid tropics, preferring drier, temperate or highland conditions. However horses have thrived and donkeys are generally hardier than horses. From the limited information available, there is no suggestion that donkeys have suffered from health problems. It seems that donkeys did not establish sustainable breeding populations because there were so few of them. They tended to be kept as single animals rather than as breeding groups.

In many countries, horses are considered expensive and high status animals, suitable for ‘elite people’ and special occasions. Donkeys tend to be cheaper and more mundane, suitable for everyday use by ‘normal people’. Most missionaries, plantation owners and colonial authorities concentrated on animals suitable for themselves. They were the ‘elite’ and were

not really concerned by the transport needs of villagers. Finding that horses were suitable for their own needs, they concentrated on horses and did not promote or develop the use of donkeys for possible transport applications in and around villages. The few donkeys that were maintained were probably mainly kept to breed with horses to produce mules.

Based on the great utility and persistence of donkeys in other countries, it would seem appropriate to promote the use of donkeys in Papua New Guinea. This would require the importation of animals, their adaptation to local conditions and the creation of a national breeding herd. Since donkeys can breed successfully, while acting as working animals, the strategy should be to establish several village-based breeding populations of working animals in appropriate areas. This would allow various aspects of donkey management and utilisation to be assessed and demonstrated at village level as the number of donkeys increases.

Thus, very early in any national animal traction and rural transport programme, a project should be initiated to import donkeys, ensure their initial adaptation, and commence a series of devolved but coordinated village-based donkey breeding and utilisation schemes.

*Mules*

Mules are created when a male donkey fertilises a female horse. Mules tend to be stronger than horses, but can be more difficult to manage, unless they are used very regularly. Professional transporters often prefer mules. The breeding of mules can be expensive, if several horse mares and a male donkey are maintained for this purpose. In areas where horse numbers are low (as in much of Papua New Guinea) people seldom make the effort to create mules. There is evidence that mules have been successfully used for transport in Papua New Guinea, having been bred on ranches or plantations for use by transporters. Some were used during the Second World War, and were considered better than horses for transporting military suppliers.

In the medium term, mules could become the animals of choice for professional transporters moving coffee, agricultural produce, materials and goods to and from remote villages in Papua New Guinea. However, at the moment such professional transporters do not exist, horses can be used successfully as pack animals and mules are not readily available. It is therefore suggested that breeding and working with mules is not an immediate priority. It is an option that can be considered after pack transport has been successfully re-established in Papua New Guinea.

**Bicycles, tricycles and trailers**

In general, the Chinese bicycles that are available are colourful and often seem attractive with many gears. However they are not very strong, and generally come without a front basket or a rear luggage carrier. Some local artisans have begun to make and sell luggage carriers. Nevertheless, a surprising number of people use their bicycles only as a means of personal transport, without any load carrying devices, which seems to waste much of the transport capability of the bicycle. It may be that stronger, reliable bicycles without gears but with baskets and/or luggage racks should also be available as an alternative for those wishing to transport loads.

Some people have expressed concern that bicycles are not perceived as modern. This is a mistaken idea as bicycles are widely used in many very modern situations, especially in

Holland and Denmark. The ‘old-fashioned’ perception is not likely to be a fundamental problem once people see the utility of bicycles and a ‘critical mass’ of users has been created.

A more serious constraint could be the fear of theft. People fear that their bicycles could be stolen outside markets or shops, or ‘rascals’ might even push people off their bicycles. The problem of security affects all means of transport. One solution is the provision of secure parking for bicycles in strategic locations, such as markets, transport terminals, shopping centres, hospitals, schools, etc. In UK, special bicycle parking areas are provided in such locations, with secure stands to which bicycles can be locked. In other countries, including Burkina Faso, China and Cuba, there are controlled and guarded bicycle parking places, where people pay a small fee to leave their bicycle safely, while they go about their business.

The use of tricycles for carrying people and loads is common in many countries in Asia and in Latin America. This is mainly in and around towns where roads are relatively smooth and flat. Tricycles are seldom used in rural areas along paths and tracks. Bicycle trailers are much less common than tricycles, and cycle trailer promotional projects have had little success. The conclusion is that it inadvisable to promote cycle trailers, but tricycles could be promoted for use on good roads around towns.

**Motorcycles**

Although it may seem surprising, the author believes that motorcycles could make a significant contribution to rural transport in Papua New Guinea in the near future. This is despite that fact that there are very few motorcycles in the country at the moment.

In some countries of the world, including many European and Latin American countries, motorcycles occupy a minor niche market, with small motorcycles and scooters used for urban transport, and high performance motorcycles enjoyed by rich enthusiasts. In the middle of the last century, some motorcycles with sidecars were used for rural transport. While this tradition can still be seen in Eastern Europe and Cuba, in other areas this transport system has been largely replaced by pickups.

In several Southeast Asian countries, notably Cambodia and Vietnam, motorcycles are widely used for urban transport, both for individual use and as taxi services. In Cambodia, motorcycles are also used for rural transport, carrying people to and from market and also transporting agricultural produce and live adult pigs. In the flat areas of Cambodia, motorcycles also pull trailers that carry goods and/or people. These uses of motorcycles are unregulated and are often dangerous. In some South Asian countries, including Sri Lanka, there has been a rapid increase in the use of motorcycles for individual transport. This has been assisted by the importation of second hand motorcycles.

The rapid growth of motorcycles in some countries in Africa is also interesting. Most countries in Africa have only small numbers of motorcycles. These are often Japanese models used by government extension workers. However, in at least three countries, Cameroon, Nigeria and Rwanda, low-cost Chinese motorcycles have recently had a real impact on urban and rural transport, and their numbers are rapidly increasing. These motorcycles are mainly used as taxi services, in urban and rural areas. Relatively wealthy people, living in urban areas generally purchase the motorcycles and rent them out to young men to operate for a daily fee. The system is basically profitable, and the owners recovers their money within six

months, and often purchase more than one replacement, making the market expand rapidly. An example from Cameroon illustrates this (with prices converted to Kina).

- An urban-based trader or civil servant buys a new motorcycle for 1800 Kina (USD 600)
- This is hired to a young operator for 10-20 Kina a day (USD 4-6)
- The young operator profits and gains employment by making eight journeys at three Kina (for example)
- The owner recovers all capital in just three-to-six months
- The owner replaces the motorcycle every six months, selling for half price (PGK 900)
- This creates a second-hand market for less wealthy people (who will also be faced with repair bills)
- Rural people gain a convenient and available transport service at prices they can afford (three Kina)
- As a critical mass of motorcycle users, suppliers and repairers develop, it becomes increasingly easy to adopt and run motorcycles, for private use as well as service provision.

The cost of a ride on a rural motorcycle taxi is generally more expensive than that charged by a PMV. For this reason, rural motorcycle taxis do not generally operate on roads that have good PMV services. They do however link outlying villages to PMV stops on main roads, and they do operate on roads where people may have to wait a long time for a PMV. There are many places in Papua New Guinea, where villages have no PMV services and or very irregular ones, and in these cases, people may be prepared to pay the transport cost of a motorcycle taxi, for themselves and/or for their produce. If motorcycle taxis prove to be profitable, then they could spread quite rapidly in Papua New Guinea.

This could raise issues of safety and regulation. Motorcycle taxis are generally more dangerous than PMVs, partly because their young drivers may enjoy taking risks. They are also generally willing to carry excessive and dangerous loads. In Rwanda, motorcycle taxis are regulated, with drivers wearing overvests with clearly visible personal numbers, and they have to carry crash helmets for themselves and one passenger.

**Handcarts and wheelbarrows**

Simple two-wheel handcarts and wheelbarrows are widely used in many countries. They are particularly useful for short-distance transport in and around markets and villages for transporting agricultural produce, water, market goods, firewood and building materials. Women are often the major beneficiaries of handcarts. In some countries, people make a living by transporting other people's goods in handcarts to and from transport terminals and markets. Wheelbarrows are really only suitable for very short distances as they require more effort from the user than handcarts. Handcarts with two large wheels are better than ones with small wheels, as they are easier to manoeuvre over rocks, potholes and other obstructions. Normal bicycle wheels are not really strong enough for handcarts, and stronger wheels with thicker spokes are more appropriate. The handcarts commissioned by Coca Cola could easily be modified for use as multi-purpose handcarts. There is a wide range of different handcart designs that could be used, and the limiting factor for artisans is generally the availability of appropriate wheels and bearings. In order to promote the use of handcarts, one of the first actions would be to identify a source of suitable wheels and axles and these would probably be imported from China.

### Two-wheel tractors

In the past fifty years, two wheel tractors or power tillers have become widely used in parts of South and Southeast Asia. They are mainly used for irrigated rice production, post-harvest operations (threshing and grinding) and transport using a two-wheel trailer. They are seldom used for tillage of rain-fed rice or other crops. They are used for transport services in some countries, including Sri Lanka, partly due to favourable importation tariffs as agricultural machinery. As they are slow and relatively uncomfortable, passengers tend to prefer pickups, three-wheelers (tuk-tuks), or motorcycles taxis, if these are available and affordable. Like most other technologies, they spread quite rapidly once there is an affordable supply and a critical mass of users and repairers. They have not yet become widely used in Africa or Latin America. At night, there is a danger if their single lamp is confused with that of a motorcycle.

The introduction of two-wheel tractors specifically for transport does not seem a priority at this stage. If two wheel tractors were introduced for irrigated rice production, it would be appropriate to consider their transport roles. If a clear transport role for two wheel tractors were identified, then it would be extremely important to concentrate resources in one or more suitable locations, and ensure there were sufficient numbers acquired to create a local critical mass of users, repairers and suppliers. Recent attempts to introduce two-wheel tractors in some African countries failed because a critical mass of users and services was not achieved.

### Three wheeler taxis

In many countries of the world, particularly in South and Southeast Asia, motorised tricycles are used to transport people and goods, mainly around towns. Such taxis are sometimes known as tuktuks in Thailand and Bajajs (a manufacturers name) in India. They carry more people and goods than motorcycles, and they are generally protected from the weather. They are cheaper and more manoeuvrable than conventional four-wheel taxis. Such motor tricycles could be used for transport in and around the towns of Papua New Guinea. Their small wheels and relatively low power mean that they are mainly appropriate in relatively flat areas without too much mud or many potholes.

From experience in other countries, motorised three wheelers are most likely to be used initially for urban transport. However, if they were to become widespread in one or more towns (ie, if a critical mass were established), some might start to be used for transporting people and goods between villages and towns or their access roads. In countries such as India, small market towns and large villages have become transport hubs for three wheelers (but only after widespread urban usage had established the critical mass). Thus it is suggested that any promotion of such vehicles be considered primarily for urban transport, with any rural transport benefits considered as secondary ‘spin offs’.

### Long-tail motors

While water transport is not covered in this report, mention can be made of discussions held relating to ‘long-tail’ propulsion units. In Papua New Guinea, the main types of propulsion are human (poles, oars), wind, outboard motors or large inboard engines. In many other countries, including many South and Southeast Asian countries, there is the additional option of long-tail propulsion systems. Their main advantage over outboard engines is that they can be more easily and cheaply made and repaired by artisans, using a wide range of motors, including diesels. It is recommended that this option be discussed with boat owners in situations where it is proving difficult to maintain outboards. If people appeared positive, then an exchange visit involving boat owners and artisans could be arranged to a country,

such as Vietnam, where these motors are widely used. Such a visit could be set up in cooperation with a donor agency (such as the World Bank) and/or with the International Forum for Rural Transport and Development (IFRTD).

## Possible reasons for caution and for optimism

### Anticipating possible problems

During the many visits and discussions, some people raised possible problems that might be encountered. Interestingly, these were mainly problems perceived by aid agencies, expatriates and a small number of urban-based people, who did not feel optimistic about the future of Papua New Guinea. People in rural areas seemed more confident that local transport solutions could work for them. However, it is important to consider each constraint, to see which could cause fundamental problems and to consider how it could be addressed.

### Cultural traditions and experience

Some people were pessimistic because the population of Papua New Guinea has no cultural traditions or experience relating to large animals. It was suggested that work animals would be badly treated and/or eaten. Of course, this is a possibility, and it could occur in some situations. However there is much evidence from other countries and from Papua New Guinea itself that this is not a fundamental constraint.

In many countries of the world, the use of work animals has been successfully introduced to people with no previous knowledge or tradition. In the Americas, the use of oxen and horses was successfully introduced to populations with previous experience. In much of SubSaharan Africa, animal power was introduced in the past fifty years, to people with no experience of using or owning animals. For example, in the early 1950s, there were no oxen, donkeys or horses in use in The Gambia. Today, all three types of animal are widely used for farming and for transport. Animal power use is now found in all villages and it is now widely considered to be a ‘traditional’ practice.

In Papua New Guinea, the author came across people in several areas with positive attitudes, knowledge and skills relating to animal power. They include the proficient horsemen of Ramu Beef and of Chimbu Province, as well as people from Goilala and Kaintiba. There are also farmers successfully managing buffaloes in villages in Madang Province and cows at the South Waghi animal power project. While it will be necessary to be culturally sensitive in all situations, there is clearly no fundamental cultural constraint to animal power use in Papua New Guinea.

### Roads and PMVs are more important

Some people suggested that Papua New Guinea needs more roads and PMVs rather than bicycles and animal traction. This is a misunderstanding, because it suggests there is a choice between these options. In fact all are complementary technologies and Papua New Guinea needs good roads, reliable PMVs services *and* local transport solutions. They are not alternatives but are complementary. The development of local transport solutions will not adversely affect either roads or PMV services. On the contrary, they are likely to stimulate rural economies and the overall transport market, making it more profitable to run PMVs and making it easier to justify investment in rural road construction and maintenance.

**Forwards not backwards**

Some people see local transport solutions as a step backward. It has already been explained that this is not the case. Existing PMV services will continue to be used. People will be 'moving forwards' from the walking and carrying. Local transport solutions will mainly be used to replace human drudgery. They will not replace, but will complement existing motorised transport services, and may well lead to improved and better motorised services (as the whole transport market increases). Negative attitudes do not seem to be prevalent in rural Papua New Guinea today. During the present assignment, almost all stakeholders contacted (rural people, government officials, politicians, NGOs, universities, aid donors, private sector and the media) understood the problem of the 'missing middle' of transport and enthusiastically affirmed the modern relevance of local transport solutions.

**Security is a serious constraint**

Some people have argued that security is a serious problem in Papua New Guinea, and as a result of tribal conflicts and general lawlessness, people will kill work animals and steal bicycles and motorcycles. It must be acknowledged that in some areas, security is a serious constraint to the well-being and economic development of rural communities. In this case, there may well be some local problems of theft and the killing of animals. However the existence of possible security problems does not justify inaction. Rather security issues need to be addressed in various way including though the provision of infrastructure, through education and through community participation. Programmes to promote local transport solutions should be endorsed by rural people from the outset, so that the local communities assess, manage and address any local security risks.

**Transport technologies are too expensive for poor people**

Some people have suggested that local transport solutions (bicycles, horses, buffaloes, oxen, motorcycles) are too expensive for many rural people and that they are not appropriate in all situations. While there is some validity in this argument, it is not a reason to ignore the clear transport needs of rural people. The promotion of local transport solutions will depend on local conditions, with initial emphasis on situations where the technology is highly appropriate and adoption will be easiest. The benefits of local transport solutions will mean that they should pay for themselves in the medium term, but in the short term, there may be need for some form of subsidies, credit or 'hire-purchase' schemes. In some cases, poor individuals can benefit from intermediate means of transport if people who can afford them lend them, hire them out or start transport services carrying other people or goods for an affordable payment.

**Safety is a problem and there will be accidents**

Some people have argued that increasing the number of work animals, bicycles and motorcycles will lead to accidents, particularly when animal drawn carts and cycles are used on main roads. While the argument has validity, (yes, there will be accidents) it is erroneous to conclude that this is a reason not to proceed with the promotion of intermediate means of transport.

All transport types are safety hazards (aeroplanes, PMVs, bicycles, motorcycles) and all are involved in accidents from time to time. This does not mean that all transport types should be banned. Safety has to be balanced with the genuine benefits of transport, which can include

improved nutrition and standard of living, better health, wider access to education and fewer injuries due to walking and carrying.

The great majority of accidents could be addressed through changes in people's behaviour, facilitated by education. Greater awareness of risk (for drivers and pedestrians), avoidance of alcohol and drugs and regulation of speed are fundamental to improving road safety. Any programme to promote local transport solutions should consider safety issues. This is particularly important if the intermediate means of transport are to be used on main roads where there are cars, trucks and PMVs. It will be important to address safety through education and training (of all road users), as well as appropriate infrastructure (bicycle lanes), materials (availability of reflectors) and regulation (load control, safety helmets).

# 6. Policy implications

## Policy issues to be addressed

### Address the 'missing middle' of rural transport

Many rural people in Papua New Guinea live in isolated settlements far from any transport network. This isolation means they have very difficult access to markets, health services, school and urban centres. Travel and transport require a high cost in people's time and effort, and is particularly arduous for young children, the sick and pregnant women. This has important implications for the development of their livelihoods. It is unrealistic imagine that roads and motor services will reach all villages in the foreseeable future, or that comprehensive social and commercial services could ever be provided in all villages. It is therefore vital that the Government of Papua New Guinea addresses the problems of poor rural access and mobility. Addressing the 'missing middle' in rural transport will benefit rural people and rural economies and should become a national policy.

In addition to motorised transport services and 'walking and carrying' there should be a range of intermediate means of transport available. These local transport solutions should allow rural women, men and children to reach motor transport systems, markets and health and education services. Most other countries in the world, rich and poor, people have the option to use intermediate means of transport. In order to improve rural economies, livelihoods, health, education and social welfare the Government of Papua New Guinea should address the lack of local transport solutions in rural areas.

### Stimulate sustainable supply and use of local transport solutions

Policies should aim to stimulate the adoption and growth of local transport solutions (including animals, bicycles and motorcycles). In line with worldwide experiences in this sector, policies should ensure that the private sector (formal and/or informal) provides sustainable and affordable supplies of intermediate means of transport and related maintenance facilities and training support. Public investment may be required to stimulate and develop the market, 'prime the pump' and establish a 'critical mass' of users and suppliers. However, government policies should seek to achieve as soon as practicable sustainable and affordable supplies in rural areas (through importers, local production, local breeding and distribution) that are provided by the private sector, with free-market competition.

### Adopt effective policies throughout government

All relevant Government Ministries and their related institutions, projects and development initiatives should develop specific policies and strategies to facilitate the adoption and use of intermediate means of transport, in appropriate situations in Papua New Guinea. All Ministries should adopt policies in their domains of influence. Key Ministries include Planning, Transport, Agriculture and Livestock, Public Works, Health, Education and Community Development. The policies in each of these (and other) sectors should address ways to improve knowledge of, supply of, acquisition of, use of and management of intermediate means of transport. This will include (but not be restricted to) policies concerning training, capacity building and awareness (in all sectors), regulatory and infrastructure implications of increasing intermediate means of transport, animal breeding, supply and health, use of local transport solutions for women, for healthcare (for medical services and for patients), for education (for pupils and staff), for agricultural marketing and

for road maintenance. Government Ministries should ensure that private sector companies, research and training institutions and non-governmental organisations operating within the domain of influence of the Ministry should also develop their own policy initiatives that will help achieve the relevant policy objectives of the Ministry.

**Develop integrated transport systems**

Government Ministries (including the Planning, Transport and Public Works but also Health, Education, Agriculture and Community Development) and Provincial and District Authorities should plan and develop more integrated rural transport systems, that consider the requirements for intermediate means of transport in addition to complementary PMVs, boats and air transport. Policies should encourage the development of rural transport hubs served by roads, air and/or water. These hubs should become focal points for a wide range of public and private services, communications and markets. Policies should ensure that intermediate means of transport become an integral part such hub systems, particularly for linking the outlying populations to the hubs and services. The rural transport hubs and spokes may require appropriate infrastructure, including secure parking, loading and interchange facilities at the hubs (for PMVs, intermediate means of transport and possibly boats) as well as graded paths/tracks and footbridges on some outlying spokes.

**Facilitate information sharing and collaboration**

The Government and all relevant Ministries should develop policies that will encourage and ensure sufficient information exchange, cooperation and collaboration between the many stakeholders concerned with promoting local transport solutions and addressing the ‘missing middle’ of rural transport. At present, there is relatively little expertise concerning intermediate means of transport in Papua New Guinea. This makes it particularly important for individuals and organisations to share knowledge and experience and work closely together within Papua New Guinea. People should also link with sources of information and experience outside the country. Within Government there is need link the various Ministries that will be involved in developing and implementing relevant polices and strategies including Planning, Transport, Agriculture and Livestock, Public Works, Health, Education and Community Development. Also required are close links between Provincial and District Authorities, research and training institutions, nongovernmental organisations, aid agencies, the private sectors and external sources of knowledge, experience and technologies. Most importantly, it is essential that all these organisations listen to and work effectively in partnership with the rural women, men and children who are to be the main beneficiaries of local transport solutions. The Government policy should be to encourage and facilitate effective links, cooperation, collaboration and ‘networking’.

# 7. Suggested strategies

## Overall strategy for promotion

### A ten-point strategy

Based on discussions with many stakeholders in Papua New Guinea, as well as lessons from other countries, it is proposed that policies should be implemented using the following ten inter-related guidelines. In all cases, the actual practices must be based on local circumstances, including stakeholder wishes, local priorities and available resources. These guidelines are not linear or sequential. Several of these processes must continue in parallel throughout the implementation of the strategy.

- Work with all stakeholders using participatory processes
- Define needs and promote various options appropriate to the needs
- Prioritise and concentrate resources to achieve a 'critical mass'
- Develop active supply and maintenance systems
- Ensure technologies are locally affordable
- Inform stakeholders at all levels, ensuring training where required
- Promote decentralised actions and local initiatives
- Promote complementarity and appropriate infrastructure
- Collaborate and share information
- Learn from experiences.

### Ensure participative approaches and stakeholder involvement

From the outset, and throughout the implementation of the proposed programme, the various stakeholders must be integrally involved in the processes of planning, implementing, monitoring and evaluation. The stakeholders, in this case, include the ultimate beneficiaries (rural women, men and children). They also include all service providers who will be needed to supply and maintain the transport technologies. Key stakeholders also include the partner organisations involved or who will be affected (national and local government, relevant institutions, nongovernmental organisations and the private sector). To ensure the principle of complementary uses of transport, the operators of PMVs should also be considered as stakeholders who should be consulted and involved.

During the present study, a large number of relevant stakeholders were contacted and their opinions sought. They included rural women and men living close to roads and far from roads, operators of existing transport systems, market traders, NGOs, professionals in several sectors, civil servants and politicians. During the various discussions, the suggestions being put forward in this report were debated and there was a consensus that it would be appropriate and realistic to promote intermediate means of transport to address the problem of the 'missing middle'. Some reservations were made (concerning security, safety, affordability, acceptability, etc) and these will need to be addressed in the planning and implementing of all related initiatives. Before, during and after each initiative, it will be necessary to consult and involve the local stakeholders, to ensure that the technologies, methods of promotion and systems of utilisation are acceptable and appropriate in local circumstances.

As the technologies are introduced, some of the stakeholders may be encouraged to collaborate as user groups. These can assist each other and can lobby for local authorities to provide appropriate infrastructure. Groups of professional transporters (motorcycle taxis or

pack horse operators) may be encouraged to develop professional standards for self regulation.

**Ensure technological diversity and options**

Healthy and efficient rural transport systems have a range of complementary technologies, including (where appropriate) motor vehicles, motorcycles, bicycles, animals, boats and other options. As far as practicable, individuals and communities should be offered a range of realistic options from which they can chose. Depending on the circumstances, they should be encouraged to opt for more than one technological option. While there are advantages in standardisation and the promotion of individual technologies (eg, horses or bicycles or buffaloes), there are great dangers to the 'one size fits all' approach. Encouragement of options and diversity has to be balanced with the need for a critical mass of users and supporting services (achieving 'half a critical mass' for each of two technologies is not going to work!). An appropriate balance is likely to be achieved if the emphasis is always on working with communities to encourage 'local transport solutions' rather than promoting one specific technology, such as oxen, bicycles or motorcycles.

**Ensure the development of 'critical masses' of users and services**

The long-term aim is to have work animals and intermediate means of transport in use in all suitable areas of Papua New Guinea. However, the short-term object should be to secure a sustainable 'critical mass' of suppliers, users and supporting facilities in a number of locations. Once this has been achieved (and important lessons learned by all concerned) the technologies may start to spread spontaneously and they can be promoted in other areas.

In the first instance, there is a need to prioritise resources and efforts on those technologies, users and locations where success is most likely. In the medium and long term, local transport solutions should reduce poverty among the most disadvantaged people in the remotest rural areas. However, in the absence of any 'critical mass' of suppliers, users and support services, the more disadvantaged and remote people are unlikely to be able to benefit from local transport solutions. Therefore while poverty reduction, gender awareness and social equity concerns should be part of the overall strategy, the first stage will involve getting the various transport technologies adopted and operating effectively in Papua New Guinea.

Provided there are appropriate local support facilities (private supply systems, supporting NGOs and/or government agencies), initial promotion could be carried out in (say) ten different provinces, including some of the poorest and most disadvantaged provinces. The first promotional initiatives should concentrate on users with a strong likelihood of success operating from favourable locations. For example, several villages could be selected around a market town (hub) where there is strong market demand for rural transport (eg, a coffee crop) and have suitable infrastructure already in place (eg, paths and tracks about 20 km from a market or its approach road). In the first instance, success is more likely to come from working closely with entrepreneurs, who will probably (but not necessarily) be men. The technologies should also be those most likely to succeed (eg, pack animals for mountain paths, carts in flatter areas of agricultural production and bicycles and motorcycles in a wide variety of situations). This strategy does not preclude working in remote areas or with women's groups, if the local situation favours adoption. However the pragmatic strategy is to first get the technologies firmly adopted by concentrating resources on favourable situations, and secondly promoting the adopted technologies for more disadvantaged people.

**Ensure supplies**

It is crucial to ensure that the technologies being promoted are available within the target area on a long-term basis at affordable prices and that they can be locally maintained. In practice this means it will be necessary to work with the local private sector (formal/informal) and NGOs to develop adequate and sustainable supply and maintenance systems. Each technology has a different system of supply, but the principles are the same. Wherever possible, a local person or organisation should be facilitated to arrange the supplies and backup services (perhaps with assistance from a project).

For example, if bicycles are being promoted in a village, it should not be for a project to buy bicycles in a town and bring them to the locality. Rather, a local person (storekeeper, artisan, unemployed youth) should be assisted to travel to a wholesaler and return with one or more boxes containing bicycle kits (bicycles are almost always imported in kits in cartons) as well as a pump and some basic tools. He or she should be trained to assemble the bicycles in the village, and stock common spare parts required for maintenance. This could then be the start of a local business selling and repairing bicycles. Naturally this is a simplified example, and in any real situation, many issues would need to be addressed (need for capital, realistic volume of business, competition with other suppliers, etc). In the case of motorcycles, the local supply will probably be based in a market town. At an initial stage, there might be one or two suppliers of new machines per province, with artisanal repair services established at key markets.

In the case of animals, the same principles should apply where practicable, and one or more local people or organisations should be facilitated to establish local supply and support systems. In the short term, with relatively few animals available, 'local' suppliers may actually be at the Provincial level, or even beyond. For example, in the case of horses, the 'local supply' could be Ramu Beef in the Markham Valley. Even though this is a long way from many areas, it does represent a sustainable supply of horses on a regular basis, and potential users of horses could be facilitated to travel there. Establishing a supplier in the highlands would make much sense, and as the use of horses increases, suppliers could be developed in several provinces. Similarly provincial suppliers could be established for cattle. Due to lower numbers, it will be more difficult to establish local suppliers of buffaloes and donkeys, but as far as possible the principle of a local, private supplier should apply.

**Ensure affordability**

Intermediate means of transport, whether bicycles, motorcycles, carts or animals are expensive relative to rural incomes, and they are often unaffordable, if people have to pay the full price at the outset. There should be a strategy to make sure local transport solutions are affordable. The three main options are subsidies, credit and shared cost of ownership.

Subsidies can be very effective when introducing technologies. However, they do tend to distort markets and choices and are difficult to remove. It does seem reasonable for imported intermediate means of transport to be exempted from taxes and duties. Several countries have de-taxed bicycles and motorcycles as these are tools for rural development. It is also reasonable for the set-up costs of establishing breeding herds of animals to be supported from development funds. Direct subsidies on the purchase price should only be used with caution, having considered the timescale and assessed the likely distorting impact on the market.

In many cases, rural people can afford local transport solutions, if they can pay for it over time. Thus credit or hire-purchase schemes can be very effective, if operated by rural people with appropriate social cautions and control. Locally organised micro-credit schemes can be very effective. Government-operated credit schemes often have poor rates of reimbursement, as rural people do not feel it is necessary to refund money to the government. Formal private sector loans are generally only viable when rural people take out quite large loans and are prepared to travel to the towns. They can work for motorcycle purchases, but are unlikely to be commercially viable for bicycle loans.

In some communities, shared ownership works well, particularly if there are strong family or social ties. However, in most communities, individuals own and maintain intermediate means of transport (including animals). They share the cost of ownership by hiring out the transport technology to their neighbours at an affordable price. This can be a sustainable way of getting affordable transport within remote rural areas.

There is no single method or model for ensuring that rural people can afford local transport solutions. As part of each promotional initiative, the promoters and the end users should consider ways of ensuring the technologies are affordable, and this may result in subsides, credit systems and/or shared costs of ownership.

**Ensure adequate information and training**

Since very few intermediate means of transport or work animals are owned in Papua New Guinea, there is little local expertise available. Furthermore, since the subject has not been included in standard educational curricula, there is little general knowledge concerning the topic. Schools, colleges, universities, government advisory services, NGOs and the private sector all have roles to ensure that appropriate information and training is available to the users, suppliers and support services of intermediate means of transport.

General publicity and information is needed to ensure intermediate means of transport and work animals are given a modern, positive and dynamic image. There is a danger that these technologies will be perceived (incorrectly) as old fashioned. Therefore publicity should highlight modern uses in Papua New Guinea and throughout the world (eg, widespread use of bicycles in Europe and a Brazilian buffalo patrol). Publicity should also stress the diversity of uses for local transport solutions (eg, the slogan ‘What do you use your bicycle for?’ could accompany pictures of different uses of bicycles by women, men and children).

The people who will repair bicycles and motorcycles and who will manage work animals will need more specific and specialised training. Local on-site training is particularly suitable for artisans. Where possible, training should involve local technical experts, such as the existing operators of horses or buffaloes. There may well be scope for NGOs to facilitate this. If required, expatriate ‘volunteer’ experts could be asked to assist capacity building in specialised areas, such as cart construction and the husbandry of work animals.

The people importing bicycles are most likely to place their orders on the basis on existing contacts, cost and appearance. They are unlikely to consider durability. There will be a need to cooperate with importers to encourage them to import bicycles of appropriate design quality.

**Ensure a range of devolved programmes**

Successful promotion of local transport solutions is most likely to come from many small programmes, working closely with local users and suppliers. While national coordination is a prerequisite, one large centralised project is not likely to be as effective as many independent local projects, working in collaboration. All the institutional stakeholders who have expressed interest should be encouraged (and where appropriate, funded) to develop and implement initiatives in their particular domain or area of intervention. Other organisations should also be encouraged (and where appropriate, funded) to develop relevant programmes and projects. For example, organisations planning, developing and implementing programmes throughout the country could include NGOs, universities, research institutes, community-based organisations, local government and national ministries. While each of these geographically dispersed projects would be autonomous, all the projects would collaborate and share ideas and experiences through the national network. Organisations that achieve progress in one area should become centres of expertise and inspiration for other projects. Thus organisations wishing to develop a buffalo programme, might first visit the Lutheran Development Service team. People interested in working with cows or oxen would be encouraged to first consult with the team at Minj (Western Highlands) to learn of their experiences.

**Promote complementarity and appropriate infrastructure**

Efficient rural transport systems often involve complementary transport systems, and this should be encouraged. Intermediate means of transport often provide 'feeder' transport to and from PMV terminals or rural 'bus stops'. This benefits all concerned, as the 'feeder' transport increases the number of passengers and amount of goods carried, which, over time, leads to more and better motor transport services. Ensuring the motor transport is predictable and reliable will encourage more people to use the service, which again should lead to better and/or cheaper services.

When introducing intermediate means of transport, it is important to consider whether some specific infrastructure needs to be provided to allow them to operate efficiently and safely. Small bridges may be vital. In the remoter areas, some new tracks or 'bench cuts' may need to be made. Cycle lanes may need to be constructed or designated at the edges of roads. Cycle parking facilities may be required at markets, transport terminals, schools, hospitals and shopping centres. Areas may need to be designated near markets where transport animals and carts can wait.

**Ensure coordination and collaboration through networking**

It is strongly recommended that a national network be established to ensure collaboration and coordination within Papua New Guinea. A network is a group of individuals or organisations who exchange information and undertake joint activities on a voluntary basis, in such a way that their individual autonomy is strengthened by the interactive process of networking (Starkey, 1998). There are many advantage networks.

- Networks facilitate the exchange of information, skills, knowledge, experiences, materials and media, through meetings, workshops, publications and cooperative programmes. This increases the competence of members.
- Network information exchange reduces unnecessary duplication of work and effort, facilitating faster progress and a wider overall impact.
- Networks effectively link people of different levels, disciplines, organisations and backgrounds who would not otherwise have an opportunity to interact and bring

together funding and technical cooperation agencies with those in need of resources and support.
- Networks create an awareness that many others have similar concerns and development problems and provide the critical mass needed for local, national or international advocacy and policy change.
- Networks help address complex development problems and issues that seem overwhelming to those working at village level. They are a source of peer support and encouragement, motivation and professional recognition (Starkey, 1998).

In any country, a network model would be appropriate as a way of linking the different government ministries and departments, universities, NGOs, private sector, research institutes, aid agencies, projects and users. It will be particularly important in Papua New Guinea because the many stakeholders are physically very separated by mountains and sea. Furthermore, since the country has had relatively little experience of promoting the various technologies, it will be vital to exchange ideas and experiences, and learn from each other as well as from external sources of information.

The proposed network, which might be called the Papua New Guinea Network for Rural Transport and Development, would comprise all interested organisations that are likely to be involved in the development and promotion of animal power and local transport solutions. The network would link all local stakeholders and encourage collaboration between them. It would facilitate exchanging information and ideas with individuals and organisations in other countries, in the Pacific Region and elsewhere. This network should be linked with international networks, including the International Forum for Rural Transport and Development (IFRTD).

**Ensure progress is monitored and lessons are learned**

From the outset of the programme, attention should be paid to monitoring and evaluating, to ensure that targets are being met and lessons are being learned and shared. Realistic targets should be set, in terms of envisaged achievements. 'Milestones' could include research undertaken, reports prepared, numbers of people trained, numbers of technologies tested, numbers intermediate means of adopted, numbers of regular users, weight of goods transported and levels of adoption by gender or other criteria. Such monitoring should be a transparent and open process, with emphasis on ensuring a positive focus on envisaged achievements and the meeting of targets, without allowing this to distort any promotional efforts.

In this document, there has been some attempt to learn from past experience in Papua New Guinea, and this process should continue in greater depth. As the programme develops, there will be both successes and disappointments. These must be widely shared, and the lessons learned. People and organisations are always happy to discuss their successes, which they tend to exaggerate. They are often reluctant to mention their disappointments or 'failures', which they tend to underplay. However, with a programme such as this 'negative lessons' concerning technologies or approaches can be extremely helpful, provide they are analysed and the reasons for the 'failure' are understood and shared.

# 8. Some specific suggestions of ways forward

## General

The author's visit and the related national workshop and briefing report have helped to stimulate greater interest in the subjects of animal power and intermediate means of transport in Papua New Guinea. It is suggested that the key stakeholders now work together to develop a coherent national programme, involving several different organisations and institutions. The following sections provide some outline ideas of what could be done. The various suggestions provided are neither intended to be prescriptive nor comprehensive. They are put forward to stimulate debate among the interested parties. It is hoped that such discussion will lead to detailed planning and that appropriate funding and support can be found, so allowing a dynamic national programme to be implemented.

## Networking, workshops and visits

### Establishment of a network

An enthusiastic network that links the different stakeholders in Papua New Guinea with each other, and with external contacts, is considered fundamental to the success of the programme. The advantages of networks have noted. From the outset, the network should aim to:

- Involve many organisations and stakeholders
- Formulate clear objectives
- Establish a committed core group of individuals or organisations
- Develop an active programme of activities based on enthusiastic member participation interaction and sharing.
- Explore the scope for complementary networks and linkages
- Have sufficient resources for activities and coordination.
- Gain a good reputation through activities, publicity and influential champions
- Regularly monitor and evaluate network progress.

At the Local Transport Solutions workshop held in Port Moresby on 7 June 2006, it was agreed that such a network should be established, and that in the first instance, the Office of Rural Development would ensure initial planning and liaison. This is a sensible approach in the short term, provided sufficient staff time is allocated to this.

In the medium term, there will be need for a dedicated network secretariat to assist with planning and coordination. If possible, the government should fully support the network without controlling it. It might be better to have the network secretariat linked with another organisation. The network should be seen to be an independent entity linking all stakeholders, including several government departments. Given the need for close liaison with government departments and with potential funding agencies, it would be pragmatic to base the secretariat in, or close to the capital. However it will be important that organisations in other parts of the country are closely involved, and the network secretariat should try to delegate appropriate tasks and responsibilities (such as leading thematic working groups) to other organisations.

Given the physical separation of many of the organisations likely to be involved in the network, the various stakeholders should form local network groups to make meetings and interactions easier. These might be at the provincial level, or might link two or three adjacent provinces. It may also be appropriate to organise some thematic working groups interested in particular topics (eg, horse transport, cycle promotion). Each thematic working group might

have a different lead institution to help coordinate work in that particular field. In this way the network would help link everyone, without the risk of the central coordinating unit becoming bogged down with too much work (or being too dominant).

**National liaison and provincial planning workshops**

Developing an effective national network will require a series of planning meetings or workshops in various parts of the country. The Local Transport Solutions workshop held in Port Moresby on 7 June 2006 started a process that needs to be followed up. Some important stakeholders were unable to attend that meeting, and should now be involved. While some things can be done by correspondence, email and telecommunications, there is no substitute for face-to-face meetings. It will be necessary to discuss the issues, define problems, identify and prioritise possible solutions and plan activities to address the key issues.

Ideally, local stakeholders (local government, institutions, NGOs, user groups, etc) in each province should be encouraged to arrange meetings (or small workshops) in the presence of some national network representatives in order to discuss the issues and make proposals. It will probably be more pragmatic to allow some provinces to group together, to make the process faster and more manageable. The meetings/workshops should be well publicised in order to attract all the key institutional stakeholders as well as people with specific interest or expertise concerning the topics.

The outcome of these meetings would be a

- more detailed understanding of the local priorities and possibilities
- resource bank, with details of key institutions and individuals able to participate in projects and programmes, at a national, provincial or local level.

While this process is taking place, there should also be a series of meetings in the capital to identify national and international sources of financial and practical support for the network and its planned activities.

**Planning a national workshop with an international dimension**

The proposed regional/provincial meetings should culminate in a national planning workshop. This would be an opportunity for all the key institutional stakeholders (including government, universities, NGOs and aid agencies) to debate the finding and conclusions of the provincial workshops. It would also allow the key national and provincial stakeholders to agree priorities, proposed actions and an outline work programme.

This national workshop might be a valuable opportunity to invite some international representatives from the Pacific region. Potential resource people could be invited from the International Forum for Rural Transport and Development (IFRTD) and some Asian countries that might be able to provide useful partners.

An alternative possibility is that this second national workshop would concentrate entirely on planning the national programme (with only limited international involvement). A subsequent international workshop could be held in Papua New Guinea, hosted by the network (or one institution). This could concentrate on specific themes of interest to all countries in the Pacific region. Separating the national and international events would have both advantages and disadvantages in terms of networking, workshop content, organisation and timing.

One outcome of such an international workshop could be an initiative to establish an IFRTD Pacific Coordinator, based in Papua New Guinea and possibly supported by an aid agency such as AusAid.

### Networking exchanges and visits

The network should actively promote exchanges within Papua New Guinea and between Papua New Guinea and countries of particular relevance. It should seek funds to support such exchanges. Colleagues undertaking such visits should share the results of their findings within the thematic groups and with other network members. The thematic groups should develop ideas for visits as part of their planning activities. There could be external visits relating to the promotion and testing of bicycles, long-tail propulsion systems, road maintenance using animal power, the management of pack animals, the use of rope ways, and many other subjects.

It is suggested that Papua New Guinea sends a representative to an international colloquium on working equines (horses, mules and donkeys) due to be held in Addis Ababa, Ethiopia from 30 October to 2 November, 2006 (contact information is in Annex 3).

## Projects and initiatives to be developed

Detailed mechanisms for the funding of proposed projects and initiatives have yet to be established. It is likely that projects will be funded in a variety of ways, depending on the implementing organisation and supporting aid agencies.

It is envisaged that network coordination will be fully funded by government (perhaps with the support of an aid agency). The network coordination unit may be allocated some funds to support small projects. However it is not envisaged that the network would control a large budget. Rather various organisations (network members, including ministry departments, local government, research and training institutions and NGOs) would prepare and submit separate proposals for funding from central government and/or suitable funding agencies to undertake projects in their area of work. It would be appropriate for central government, perhaps with donor funding or credit, to prepare one or more ‘local transport solutions’ budget lines that could be used to meet approved proposals.

### Development of horse pack transport

A series of linked projects should be initiated as soon as practicable to re-establish the use of pack transport using horses. Initially areas should be selected based on the greatest likelihood of success. These are likely to include places where there is:

- clear and unmet transport market (particularly for coffee)
- existing infrastructure (tracks)
- some knowledge of the technology
- suitable local organisation(s) able to support the work
- reasonable options for bringing horses into the area.

Based on this visit, possible areas might be Goilala, Kabwum, Kerema, Menyamya and Jimmi/Baiyer River, although these may not necessarily fit all the above conditions. There are also likely to be suitable locations in other areas. Given the limited supply of horses, it may be sensible to concentrate on a small number of projects and ensure that a critical mass of horses can be achieved in each of these.

While there is local expertise concerning the management and use of horses, it may be appropriate to supplement this with some external assistance (for catching and training feral horses and/or working with local people in horse harnessing, management and husbandry). Australia might be willing and able to assist. The French Embassy indicated it might be willing to assist the recruitment of a French horse expert in collaboration with French volunteer agency (such as AFVP - Association Français des Voluntaires du Progrès). Voluntary Service Overseas (VSO) might also be willing to assist, providing the job specification and geographical area coincide with its particular target areas. Since some of the selected areas are places with strong past and present links to the Catholic Church, it might be that the old mission stations and/or their respective dioceses could become involved. One Catholic priest thought that raising funds for such a project through partner churches in Australia or elsewhere would be straightforward, indicating that money could always be found for a good project likely to succeed and bring benefits to the local people.

**Donkey project**

On the basis of opinions and evidence, there should be some project to assess the potential for donkeys. As it will take several years to implement, it should start as soon as possible. The first task will be to undertaken a more detailed appraisal and planning exercise. Assuming this is positive, it will then be necessary to arrange the selection and importation of suitable donkeys from Australia. Following any quarantine and time for adaptation, several decentralised breeding systems should be established. These should allow animals to reproduce successfully while undertaking some useful work for rural communities.

**Buffalo promotion**

Organisations with experience of using buffaloes should form a thematic working group, under the umbrella of the network, to discuss and plan in detail how to increase the use of buffaloes. This working group, which might be led by the Lutheran Development Service, should discuss the existing supply of buffaloes and how to ensure more effective breeding of buffaloes, including those engaged in work. It should be remembered that the reproductive rate of village-based buffaloes in often below that of cattle, partly because it is more difficult the oestrus time when buffalo cows have to be inseminated.

The buffalo thematic working group should prepare one or more project proposals. This should include some promotional work to be carried out in at least three provinces, and if required, some investigations relating to equipment (carts, tillage tools, harnessing) and systems of utilisation. The Forestry Department should be a member of the buffalo group, and it could perhaps lead an associated initiative relating to the use of buffaloes for logging.

**Cow and oxen project**

Organisations with experience of, or interest in, using cows and oxen for work should form another thematic working group, under the umbrella of the network, to discuss and plan in detail how to increase and diversify the use of oxen and cows for work. The South Waghi project should be a key member of this working group, and the expansion of their initiative should be one of the planned outputs. Other organisations should plan comparable initiatives in several other areas. There should be collaboration in facilitating one or more sources of affordable ox carts. There should be further trials of the use of cows or oxen as pack animals.

NARI may wish to join this thematic group and could collaborate with related investigations on the use of animals for soil tillage.

**Bicycle promotion programme**

There is need to encourage greater ownership and use of bicycles. Initial emphasis should involve promotion and networking. A publicity campaign should be launched. For example, posters might have different pictures of profitable and/or socially beneficial uses of bicycles. There could also be pictures of people with common transport burdens and tasks, with a slogan to the effect of 'Why not use a bicycle?'.

A series of well publicised 'bicycle days' could be held in the capital and provincial towns. National and local suppliers of bicycles should be closely involved in the planning and implementing these days. Other key actors will be the local authorities, and local NGOs concerned with transport. The 'bicycle days' could last for more than one day and could be linked to other local events. They would include a range of activities including publicity, competitions and training in safe bicycle practices. Events could include a parade of bicycles, with prizes could be offered for

- Best and safe bicycle system for carrying coffee or other agricultural produce
- Best and safe bicycle system for carrying young children
- Best and safe bicycle system for carrying wood and/or water
- School children (of different gender/age) able to cycle and manoeuvre safely
- Most interesting decoration (a fun category of carnival theme)
- Slow bicycle race (another fun category, that could involve celebrities).

There could be some gender-specific categories to encourage women to ride bicycles and enter the parade/competition. There could also be a competition for bicycle repairers or sellers based on a 'race' in public to first completely (and correctly) assemble a bicycle from its box. For fun, several local dignitaries (with no prior training) might try to assemble bicycles. The main prizes for all these activities could be new bicycles. Some bicycle importers or local suppliers (who have a vested interest in an expanding market) might donate a number of new bicycles. Such prizes are likely to motivate people to participate.

In addition to some parades, competitions and publicity, these bicycle days would include some serious meetings of the various interested stakeholders (importers, sellers, repairers, users, local government, etc). Bringing such people together to plan the bicycle days and to debate the promotion of bicycles will be an achievement in itself, and should be the start of local collaboration.

The various bicycle days should result in many useful ideas and will have identified many partners who will be able to work together with the network to plan and implement further bicycle initiatives. One possible result could be a collaborative programme to improve the quality and/or decrease the price of cycles and spare parts in Papua New Guinea. One component of this programme might be a project to purchase/import a range of bicycles from different suppliers and work with local stakeholders to evaluate their quality and comparative advantages. Any importation should be done with and through private sector importation and distribution channels. Whatever the results, there would be lessons for all concerned (including the private importers) about the durability of bicycles and desirable specifications. It should then be possible to define and encourage bicycle specifications that improve the quality and/or decrease the cost. A rigid 'standard' need not be developed, but the importers and key stakeholders should agree on desirable specifications for different users.

**Potential for motorcycles**

A thematic work group should be established within the network to link people concerned with the promotion of motorcycles. This should include importers that have motorcycle franchises. The group should consider ways of increasing motorcycles, to generate a critical mass of users supported by several importers, distributors and repairers working with fair competition. Because of the profitable nature of motorcycle importation and use, public sector involvement may concentrate on general promotion, support to the training of mechanics and regulation for safe use. Tax incentives, duty waivers and credit provision (at all levels) might be considered in order to stimulate the market and help 'prime the pump'.

**Additional topics to be investigated**

As the network develops, with local, provincial and national exchanges of information, many more topics will emerge. Plans should be drawn up for appropriate appraisals, investigations and/or promotion of various technologies and management systems. Among possible subject for further consideration are:

- Development of micro-credit suitable for local transport solutions
- Construction, testing and promotion of simple hand carts
- Potential for tricycles to improve urban transport
- Appraisal of small-scale water transport and the potential for long-tail propulsion
- Using animal power for road maintenance and construction of feeder tracks
- The development of transport, service and communication hubs
- Integrated transport systems for health service access and provision
- Potential for 'rope ways' for transport and pedestrian bridges
- Improving access to transport for rural women
- Improving safety for pedestrians and users of local transport solutions.

## 'Baseline' estimates and surveys

Some 'baseline' data should be obtained soon, so that there are some means of measuring and monitoring progress. Simple estimates of the numbers of intermediate means of transport (bicycles, motorcycles, carts, animals etc) in each province in 2006 would be useful. Similarly, it would be helpful if some gender-disaggregated estimates could be made of the rural journeys and loads involving walking and carrying, intermediate means of transport and PMVs. If possible this should be carried out in several representative provinces, and at three different levels of 'transport hub' and spoke. There should be different estimates (perhaps based on gender-disaggregated traffic counts, including pedestrians) for movements on provincial roads going to and from a market town hub, on district roads or tracks going to and from a large village hub, and on local paths and tracks going to and from a small village hub. The 'traffic' characteristics on these three levels of infrastructure would be very different.

From the stratified data collected in the provinces, it should be possible to roughly estimate the total number of rural journeys by different people and for different purposes and the amount and proportion of produce carried by people, by intermediate means of transport and by PMVs. This would not only provide estimates of the transport problems in Papua New Guinea, it would also provide a valuable baseline from which to measure the impact of the proposed programmes to develop local transport solutions. A methodology giving more details of this approach to estimating rural transport is available (Starkey, 2006).

# 9. Conclusions

It is clear from field visits, discussions and the national workshop that there are serious existing rural transport problems, partly due to the 'missing middle' in rural transport in Papua New Guinea. Many people live several hours walk from the nearest road, and they have no means of transport other than walking and carrying. This restricts their access to markets and income as well as their access to health, education and communication facilities.

All stakeholders contacted, including national and devolved government, universities, institutions, NGOs, the private sector and rural women and men recognised the problem and the potential for local transport solutions. All concerned people were supportive of the principle of promoting animal power and intermediate means of transport in appropriate circumstances.

Several aid agencies have expressed their support, in principle, for promoting local transport solutions. They will give sympathetic consideration to appropriate proposals that are in line with their normal conditions for funding.

It has been recommended that the Government of Papua New Guinea make a policy decision to address the lack of local transport solutions in rural areas. All relevant Government Ministries, Departments and associated institutions should also adopt policies and formulate strategies that will address the rural transport problems and promote the appropriate use of local transport solutions. The initial (informal) government reaction to these recommendations has been positive.

Suggestions have been made for appropriate strategies that could lead to the wider adoption of animal power and intermediate means of transport. These involve a participatory, inclusive and networking approach, and many separately-managed but coordinated local initiatives. There will be an initial concentration of resources on technologies that are more likely to succeed and geographical areas where a sustainable 'critical mass' of users, suppliers and support services can most easily develop. The experiences gained by the initial promotion, as well as the successful 'critical mass' will make subsequent promotion and adoption easier in more difficult situations.

The strategy also envisages the creation of a national network of independent organisations and individuals that will ensure liaison, coordination and information exchange. Representatives of relevant government departments and local government should be among the active members of the network. Other members will include universities, institutes, NGOs, community based organisations and local experts. The network will encourage its member organisations to plan and implement initiatives designed to increase and diversify the use of animal power and intermediate means of transport. It will be linked to international networks, including the International Forum for Rural Transport and Development (IFRTD). At a national workshop held in June, it was agreed to establish such a network, with initial coordination supplied by the Office of Rural Development. The consultant has provided some additional suggestions for participative workshops, the planning and implementation of promotional and appraisal initiatives and the implementation of some baseline surveys from which to measure existing problems and future progress.

The scene is therefore set for the appropriate promotion of animal traction and local transport solutions to assist rural women, men and children and the economy of Papua New Guinea.

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# 11. Annexes

## Annex 1: Terms of Reference

### Papua New Guinea, Office of Rural Development

**Paul Starkey**

***Consultancy visit provisionally scheduled for 12 May – 7 June***

**TERMS OF REFERENCE**

The Consultant shall undertake the following activities:

1. Participate in initial exploratory and orienting discussions with relevant people and institutions in Port Moresby, (eg; Ministry Agriculture & Livestock, Ministry of Transport, Multilateral and Bilateral aid agencies, British High Commission and other suggested stakeholders).

2. With the initial itinerary derived from exploratory discussions, visit the Highlands and other suggested rural areas in PNG (which could include coastal and island areas if considered appropriate).

3. Discuss with a range of different stakeholders in the rural areas visited the potential for introducing, expanding and/or diversifying the use of animal power for agriculture and for transport.

4. Discuss with rural stakeholders the current situation relating to rural transport services and intermediate means of transport.

- The rural stakeholders interviewed may include (where appropriate) local officials, farmers, agricultural extension agents, operators of different types of transport, owners and users (or potential users) of draft animals, local workshops, rural men and women in villages living off the main roads, teachers, traders and managers of local health services.

5. Discuss with relevant institutional stakeholders (officials, ministries, projects, aid agencies) options for interventions that could improve the existing situation.

6. Prepare an illustrated “Power Point” presentation based on world-wide experience and local factors on the potential for animal power and intermediate means of transport in Papua New Guinea.

7. Participate in seminars in Mt. Hagen and Port Moresby to discuss the existing situation, policy implications and practical options.

8. Undertake other relevant activities appropriate to the experience and qualifications of the consultant, the current development challenges in PNG and the time and resources available on this visit.

9. Prepare a brief report summarising the visit, findings and recommendations, with some outline suggestions for possible follow-up actions.

## Annex 2: Outline of itinerary

12 May, Friday
Arrive Port Morseby. Discussions with Hon Jamie Maxtone-Graham and ORD
13 May, Saturday
Port Morseby, Literature review and discussions with Hon Jamie Maxtone-Graham
14 May, Sunday
Travel to Kanosia. Discussions with rural stakeholders
Travel to Port Morseby
15 May, Monday
Travel to Woitape, Ononge, Tapini and Fane. Discussions with rural stakeholders
Travel to Port Morseby
16 May, Tuesday
Port Morseby; Department of Transport, French Embassy.
Bereina Catholic Diocese Office
17 May, Wednesday
Port Morseby, European Union, ORD, National Parliament
18 May, Thursday
Port Morseby. Prime Minister, World Bank, Asia Development Bank, AusAid
19 May, Friday
Port Morseby. Department of Agriculture & Livestock
National Research Institute, AusAid
20 May, Saturday
Port Morseby. Travel to Porebada village. Discussions with rural stakeholders
21 May, Sunday
Travel to Port Morseby. Travel to Lae
22 May, Monday
Travel to Lae, Kabwum, Wasu, Kaintiba, Kanabea, Kerema, Menyamya, Lae
Discussions with rural stakeholders
Lae: National Agricultural Research Institute (NARI), seminar and discussions
23 May, Tuesday
Lae. Lutheran Development Service, Forestry Research Institute
Travel to Port Morseby
24 May, Wednesday
Port Morseby. British High Commission. ORD
25 May, Thursday
Port Morseby. ORD, Radio Interview, Minister for Community Affairs
26 May, Friday
Port Morseby. ORD, Radio FM100
Secretary of National Planning and Rural Development
27 May, Saturday
Port Morseby: document review and preparation of seminar
28 May, Sunday
Port Morseby: document review and preparation of seminar
29 May, Monday
Presentation and seminar at Ministry of Planning
Flight to Lae. Drive to Kainantu
30 May, Tuesday
Travel to Markham Valley

Interviews with stakeholders including Ramu Beef Ranch and market sellers
Travel to Aiura. Presentation and stakeholder seminar at NARI with CIC
Travel to Goroka

31 May, Wednesday

Goroka, Visit and discussions ATProjects
Presentation and stakeholder seminar at CIC

1 June, Thursday

Christian Radio Missionary Fellowship
Interviews with stakeholders, including cattle owners
Travel to Kundiawa

2 June, Friday

Kundiawa. Presentation and stakeholder seminar.
Discussion with horse-using school inspector.
Travel to Mount Hagen

3 June, Saturday

Travel to Minj. Animal power demonstrations.
Presentation and stakeholder seminar.
Travel to Domil Village. Presentation and stakeholder seminar.
Travel to Mount Hagen

4 June, Sunday

Mount Hagen: Discussions with stakeholders
Travel to Banz. Visit to agricultural college.
Presentation and stakeholder seminar. Travel to Mount Hagen:

5 June, Monday

Travel to river crossings. Travel to Mount Hagen
Presentation and stakeholder seminar. Travel to Port Morseby

6 June, Tuesday

Port Morseby. Preparation of presentation.

7 June, Wednesday

Port Morseby. Presentation and participation in national seminar.

8 June, Thursday

Port Morseby. Discussions with VSO, Deputy Prime Minister, ORD
Travel to Singapore, en route to London

## Annex 3: Some network contacts

### Papua New Guinea

Many organisations have expressed interest in the development of local transport solutions in Papua New Guinea including (not a comprehensive list)

- Government (Planning and Monitoring, Rural Development, Agriculture and Livestock, Transport, Health, Education, Community Development)
- NGOs (Lutheran Development Service, Catholic Church, VSO)
- Research institutions and universities (NARI, NRI, UPNG, Unitech)
- Aid Agencies and diplomatic missions (ADB, AusAid, British High Commission, European Union, French Embassy, World Bank)
- Private Sector (Ramu Sugar, Rural Industry Council)

Initial network coordination

- Office of Rural Development (Attn Paul J. Sai'i, Director)
  PO Box 1100, Waigani, NCD
  Tel 325 7525 or 300 8512; Mobile: 6889505; Fax: 323 4165
  Email: paulsai@online.net.pg, klovuru@online.net.pg

A parliamentary 'champion' of animal traction, local transport solutions, communication hubs and other relevant issues is:

- Hon Jamie Maxtone-Graham, PO National Parliament, Waigani, NCD
  Tel: 3277644, 3277210; Mobile 6904140; Fax: 3277212, 3277480
  Email: maxtoneg@online.net.pg

### International web resources

These web resources each contain useful information with links to many other valuable sites

- Animal Traction Websites: http://www.animaltraction.net and www.animaltraction.com (this is also for intermediate means of transport)
- IFRTD Website: http://www.ifrtd.org
- ATNESA website: http://www.atnesa.org
- Aid Workers Network http://www.aidworkers.net
- Relata (Latin American Animal Traction Network) http://www.relata.org.ni

### International Forum for Rural Transport and Development

- *(Marinke van Riet, Executive Secretary)*
  113 Spitfire Studios, 63-71 Collier Street, London N1 9BE, UK
  Tel: + 44 20 7713 6699 Fax + 44 20 7713 8290
  Email: ifrtd@ifrtd.org or marinke@ifrtd.org
- *(Ranjith de Silva, Asia Region Coordinator)*
  319/10, Ramanayaka Mawatha, Erawwala, Pannipitiya, Sri Lanka
  Tel: +94 11 2842972. Email: ranjith@ifrtd.org or ranjithsd@slt.lk

### Recommended forthcoming workshop

The 5th International Colloquium on Working Equines: The Future for Working Equines
To be held 30 October - 2 November 2006, Addis Ababa, Ethiopia
see: http://www.thedonkeysanctuary.org.uk/site/1/Colloquium_2006.html