RAISON
Research and Information Services of Namibia
PO Box 1405
Windhoek, Namibia
Tel: +264 61 254 962
Fax: +264 61 253 361

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KAVANGO BIOFUEL PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT: SPECIALIST COMPONENT REPORT ON SOCIO-ECONOMIC IMPACTS

CONTENTS

1. INTRODUCTION

In assessing the social and economic impacts of jatropha farming in the Kavango region, two major conditions need to be borne in mind. The first is the increasing demand for biofuels, which reduce dependence on the fossil fuels that are becoming increasingly expensive. The planting of biofuel crops – such as jatropha – can also help reduce atmospheric concentrations of carbon dioxide, one of several gases known to cause global warming, and they may be used to sell carbon credits. This is a mechanism to trade the production of green house gases for carbon sequestration. The credits are becoming increasingly valuable, which means that jatropha farmers in Kavango could earn substantial incomes from carbon credits.

The other major condition to be considered is the fact that rural farmers in Kavango live under trying conditions, made difficult by shortages of fertile soils, poor crop yields, and limited markets for any surplus farm production. There are also few other economic or job opportunities open to rural households. As a consequence of these features, most rural homes in Kavango are among the poorest in Namibia.[1]

Against this background and plans to plant jatropha on large areas of cleared land belonging to thousands of farmers (see Chapter 3 of the EIA report), several important social and economic impacts may be anticipated, including:

- A steady transformation of most cultivated land near the Okavango River from **food** production to **jatropha** farming
- A corresponding change in the use of labour and land for purposes of **domestic consumption** to purposes of commercial agriculture for **cash incomes**
- Perhaps a doubling or more of the amount of cash in circulation in rural Kavango
- increases to the incomes of large numbers of households
- Potentially large increases in areas cleared for cultivation.

The purpose of this specialist report is to assess the advantages and disadvantages of these and other impacts on the region as a whole and on those who will participate in the production of jatropha. Broadly, the assessment focussed on social and economic aspects concerned with rights to land (especially old clearings), household economies, and farming practices, as described in the Terms of Reference (see Appendix 1).

2 METHODS

Most of the work comprised of consultations and interviews, literature reviews and the analysis of various data sets. The majority of interviews were conducted during a field visit to Kavango between 3 and 12 October 2006, as follows:

4 October 2006:

- Mr.Reino Assindi, Chief Extension Technician, Ministry of Agriculture, Water & Forestry
- Mr. Vilho Shikukumwa, Ministry of Land & Resettlement,
- Mr. Muremi, Regional Councillor for Rundu Urban Constituency

5 October 2006,

- Senior leadership of the Shambyu tribe: Mrs Angelina Ribebe (Hompa), Mr Gende Alvis and Mr Alfons Siyere (Traditional Councillors) and Mr Mutero Edward Sikerete (Senior Headman)
- Staff of Mashare Agricultural Research Centre: Chris Smit, Eadie Haskeela and Basilia Shipepe
- Sean Nicholson, private farmer at Mashare irrigation scheme
- Mr Johan Craill, Vungu Vungu Agricultural Project

6 October 2006

- Mr John Thiguru, Governor of Kavango
- Members of the Makena Environmental Group

[1] Income and Expenditure Survey of 2004, conducted by the Central Bureau of Statistics, National Planning Commission.

7 October 2006

- Mr Mathew Haindaka, Headman of Makena village
- Five female farmers and one male farmer from Makena village

8 October 2006

- Survey forms completed by Makena Environmental Group for 29 farmers in the Makena area

9 October 2006

- Mr John Thiguru, Governor of Kavango
- Mr Piet Horn, Deputy Director, Ministry of Agriculture, Water & Forestry
- Ms Helena Negumbo, Directorate of Forestry,
- Mr Johan Breytenbach – Prime Investment (Pty) Ltd

10 October 2006

- Roundtable discussion for two hours with staff of Extension Services, Ministry of Agriculture, Water & Forestry
    - Mr Piet Horn, Deputy Director
    - Ms. B.N. Antindi, Chief Agricultural Extension Officer
    - Ms. C. Jona, Extension Officer
    - Mr. Ronald Kuella Senior Extension Technician
    - Ms. Patricia Mwazi, Senior Extension Technician
    - Mr. S. Martin, Senior Extension Technician
    - Mr. Reno Aisindi, Chief Extension Technician
    - Mr. K. Hatutale, Senior Extension Technician
    - Mr. E. Chaata, Senior Extension Technician

11 October 2006

- Ms Dorothy Wamunyima, Every River Has Its People Project
- Mr Johannes Donatus, Tondoro Village Headman and three members of Tondoro Village Development Council

17 October 2006

- Mr Christof Brock, Managing Director of Namibian Agronomic Board, Windhoek.

Two major sets of data were analysed. The first of these were of Landsat Thematic Mapper data acquired during the dry season in 1989 to assess areas of land cleared before 1990. Five scenes were obtained from the Satellite Applications Centre (SAC) of the CSIR in South Africa were acquired by the Thematic Mapper instrument on the Landsat 5 satellite between 31 August 1989 and 9 September 1989. It is most unlikely that fields areas of significant size were cleared between those dates and the beginning of 1990.[2]

[2] The spatial resolution of the data is 30 metres. All five scenes were imported into ER Mapper, and geometrically corrected to sub-pixel accuracy (RMS error < 1). After initial inspection of the radiometric values for all seven bands in the dataset, the data volume was reduced to bands 7, 4, 3, displayed as a RGB false colour composite image. This band combination provides good spectral separation between cleared/cultivated/bare land and other land cover types, and also provides the most useful visual distinction for on-screen display.

Mapping was initially done by using scattergrams to highlight/select pixels that corresponded to cleared land. Scattergrams display the spectral values of any two bands in two dimensions. Drawing a rectangular box around the spectral signatures automatically selects the corresponding pixels in the image. This method is quick and effective, but tends to be rather coarse because selection is constrained by the rectangular shape of the selection box. It was therefore discarded in favour of an algorithm that selects pixels based on thresholds between variables in the two (or three) bands. This performs the same function as the scattergram box, but allows much better control over the selection process. The algorithm was trained on a small part of a specific image, and those values were then applied to the entire scene. This process was repeated for the other four scenes and the resulting classifications were then mosaiced and converted to an ArcView shape file. This "cleared area" shape file was visually compared to the Landsat scenes that were used to extract the class. Obvious errors such as the inclusion of gravel roads were corrected. The classification algorithm described above was sensitive to bare soil such as urban areas, gravel roads and riverbanks. These areas were not included in the cleared land class. However, since roads and urban areas are in effect cleared land, an unsupervised (isodata) classification was performed on a buffer strip of about 10 km south of the Okavango River. An initial classification was performed on a small segment of the image. These classes were then used as initial clusters for a classification of the rest of the scene. Likewise, the classes that resulted from this classification were used as initial clusters for the next scene. The resulting classifications generally produced between 120 and 255 classes. Up to 54 classes per image were merged (one at a time) until the classified area corresponded with what appeared to be cleared land in the image. The results

The second major set of analyses focussed on original data collected during the Annual Agricultural censuses conducted in 1997, 1998, 1999 and 2001, the Population & Housing censuses conducted in 1991 and 2001, and the Income & Expenditure surveys of 1994 and 2004. Special emphasis was placed on the latter set of 2004 data, which were only made available to us in February 2007. The main emphasis in all these analyses was to explore variation in field sizes, sources of income, household wealth, household size, sources of food, and dependence on cash and in-kind expenditure.

A wide variety of literature and reports was consulted, much of it on jatropha and found through searches on the internet or made available by Johan Breytenbach. Many of the maps and graphs and other background pieces of information contained in this report come from our books on the Kavango Region and Okavango River Basin.

3 PUBLIC VIEWPOINTS

Most people consulted during this study fell into one of two quite different opinion groups. The first may be termed 'sceptics' which include the majority of government and parastatal officials and development experts. Many of them expressed the view that the project:

- is being implemented much too rapidly
- involves too many farmers and too much land
- requires greater government control or involvement
- requires thorough testing and experimentation
- threatens their vision for rural people to concentrate their farming on food production, and undermines the goal that rural people should be food self-sufficient[3]
- will result in Kavango being turned into a monoculture of jatropha.

In the words of one observer, "It is against all principles of Extension, Rural Development and Project implementation to rush into a project. With smaller projects the impact of failure are manageable, but the impacts of failure of such a huge project are unthinkable."

Many of the sceptics were also concerned by the idea of the private sector playing such a large role in an agricultural project that focuses on improving livelihoods in Kavango. Further concerns were due to the dependence of the project on international market forces and carbon credits, since both are concepts with which most people are unfamiliar.

The second group may be called 'desperate buffalos', a term that reflects the aspirations of rural people in Kavango to improve their economic health, especially in ways that will improve cash income security. The idea further comes from the fact that many rural farmers feel themselves wounded, often frustrated or angry at the promises made them by many development projects over the years. In addition, people in this group were mainly concerned by:

- the need to get more and better information about the project
- practical aspects of marketing and production of jatropha
- the prospect of returns only being forthcoming in a few years from now.

3 THE PEOPLE OF KAVANGO

Historically, people settled where water and soils were most suited to farming. That created a pattern of unevenly distributed settlements within the region (see Figure 6 on the EIA report). A ribbon along the

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were then mosaiced and converted to an ArcView shape file. This "cleared area" shape file was visually compared to the Landsat scenes that were used to extract the class. Obvious errors such as the inclusion of recent fire scars were corrected.

[3] The quite different concepts of food self-sufficiency and food security are often confused. Sufficiency refers to people producing enough food themselves to meet their nutritional requirements, while food security means that people have secure access to all the food they need, irrespective of whether they grow or buy their food.

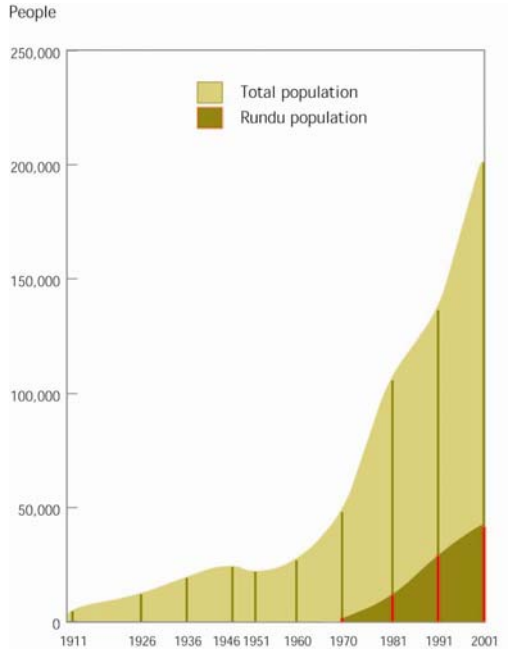
river, approximately 10 kilometres wide, is most densely populated. Settlements away from and to the south of the river developed for several reasons:

- A lack of open, arable land and grazing along the river has led people to seek areas which they could farm
- The provision of water from boreholes
- The opening of roads allowed people easier access to unsettled areas
- Wealthier farmers with large cattle herds established cattle posts which later expanded into small villages

Living conditions in small, remote villages away from the river and main roads are difficult, however. The people are far from services and they have little chance of participating in Kavango's retail and cash economy. Land available for crop cultivation is often limited. As a result, many of the villages have shrunk, often causing local public services such as schools to become redundant or uneconomical.

The expansion of settlement away from the river is one major change to have occurred to the population of Kavango over the past 40 years. Another substantial change has been the very rapid growth of the population, much of this being due to the many immigrants from Angola, especially during the 1970s and 1990s. As a result, more than half of all people in Kavango are immigrants or their children. Immigration has largely stopped as a result of the peaceful conditions in Angola.

Another major and on-going change to the population of Kavango is urbanization, which has led to the very rapid growth, expansion and development of Rundu. It is said that Rundu is the fastest growing town in Namibia. In 1971, the whole of Rundu consisted of less than 2,000 people, whereas its population in 2006 probably numbered about 53,000. More than one quarter of all people in Kavango live in Rundu and other emerging urban areas, such as Divundu, Nkurenkuru, Ncamagoro and Ndiyona. In summary, the character of the population is changing from one that was completely rural to one in which urban residence is substantial. The importance of urban areas is even greater from an economic point of view. Similarly, the urban, cash economy is becoming much more important and attractive than traditional, subsistence economies based on farming. That shift may accelerate dramatically if the planned large-scale production of jatropha materializes.



Population growth in Kavango over the past 65 years[4]

[4] Mendelsohn, J.M. & S. el Obeid. *2003. Sand and Water: a profile of the Kavango region of Namibia.* Struik, Cape Town.

The population of Kavango amounted to 201,093 during the last census in 2001. At an annual growth rate of 3%, the population in 2006 probably totals about 233,000 people. The total number of **rural** households counted in 2001 was 23,520, having grown at an annual growth of 2.3% from 18,668 rural households in 1991. Extrapolating forward at that rate of growth would indicate there to be 26,400 rural households in 2006. However, the rate of increase is certain to be lower as a result of the peace in Angola and lower number of Angolan immigrants over the past 4 years. We would estimate the rate of growth to be closer to 1.5% per year since the 2002, which would mean that there might be about 25,600 rural households in 2006. In 2001, there was an average of 6.6 people in each rural household, which would indicate a total rural population of about 169,000 people in 2006.

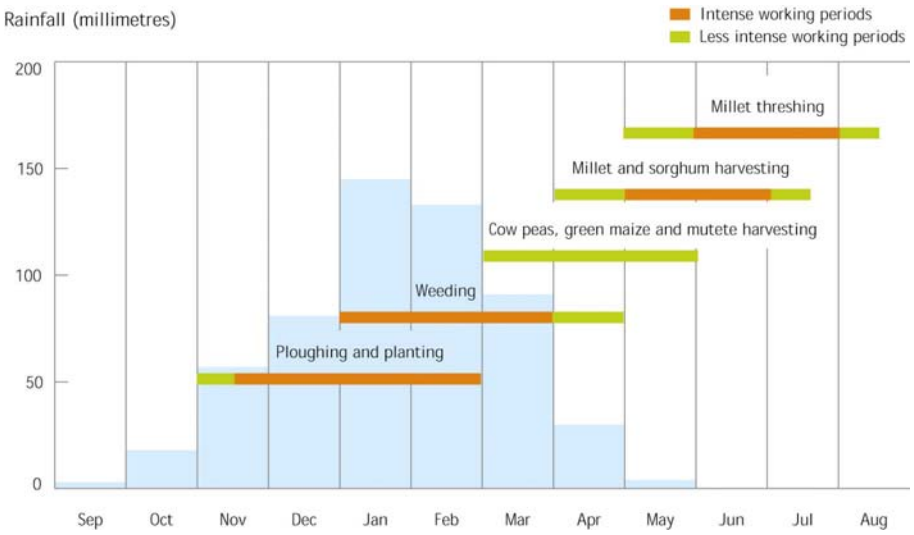
Of the total number of rural households counted in 2001, approximately 16,000 (68%) were located within 10 kilometres of the Okavango River. It is these 16,000 rural and farming households that would be the main participants in the jatropha project.

A concern raised during our assessment was that the economic opportunities offered by jatropha production may lead to a substantial influx of more people (including Angolans) to Kavango. This would lead to additional demands on natural resources and the need for more land to be occupied (and perhaps cleared – see page 12). Immigrants might also offer residents of Kavango competition, which might or might not be perceived as being fair. A related demographic point is that with more cash-based economic activity in the region, fewer Kavango residents will be attracted by jobs and other income sources elsewhere. The jatropha project should therefore lead to lower rates of urbanisation and migration away from rural Kavango.

3 FARMING

Farming in Kavango, especially along the Okavango River where jatropha is planned to be grown, consists very largely of a mix of small-scale dryland crop and livestock farming. Almost all rural households practice this kind of agriculture, the main purpose of which is to provide food for domestic consumption. Mahangu is much the dominant crop, being planted on about 95 % of all cultivated land. The remaining 5% is cultivated with maize, sorghum and vegetables such as melon, groundnuts, beans, spinach and pumpkins. Mahangu predominates because it is the only cereal that grows relatively well on sandy, nutrient-poor soils where the climate is characterised by low, erratic rainfall and long spells of dry weather.

Crop cultivation usually starts in November when fields are ploughed and prepared for crop planting, and ends in July when the mahangu is harvested and threshed. The main input to farming is labour because most farming activities are done manually. The majority of farmers plough their fields manually or using ox-drawn ploughs, while far fewer farmers plough using tractors. Weeding and harvesting are the most time consuming tasks, both of which are done manually. Each field needs to be harvested within a short period. A further factor relevant to labour demands and availability is that crop farming is concentrated over about half of the year. Due to the long dry season and relatively slow growth of crops, only one harvest of staple cereals can be obtained per year.



The main farming activities and events during the year in Kavango[5]

Yields and the areas cultivated vary greatly from one household to another, which means that there is substantial variation between households in the amount of mahangu produced each year. Crop failures occur commonly because:

- Crops are reliant on rainfall which is often low or interspersed with hot, dry spells.
- Crops are grown on nutrient poor sandy soils which retain little water.
- Farmers make very little use of compost or fertilizers.
- Weeding is often not rigorously practiced.
- Pest and diseases may damage crops.

Soils in Kavango are predominantly arenosol sands (see Figure 5 of the EIA report) which need intensive management if good yields are to be obtained.

Livestock is an important investment for many rural households, as well as for urban dwellers. There are at least 150,000 cattle and 65,000 goats in the region. However, relatively few animals are slaughtered or sold, with annual off-take amounting to less than 10%.[6] Most slaughters are for domestic consumption or to obtain cash for household use. Several reasons may be offered to explain the low off-takes, but in our view the most important reason is that livestock represent a capital investment or security investment to which farmers can turn when cash or food is needed. In addition, most households are reluctant to sell any of the very few cattle or goats that they own.

There are several important misconceptions about farming and rural households in Kavango, which often influence thinking about development prospects, options for agriculture and the livelihoods of rural people:

- **All rural Kavango households are similar**. As in any society, Kavango households differ greatly. For example, livestock ownership is extremely skewed; thus, 49% of all households own no cattle, and 59% own no goats. Just over half of all cattle in the region are owned by 10% of the farmers,[7] and field sizes vary greatly between households (see page 12). Much of this variation is due to disparities in overall wealth and access to cash incomes (see page 15). Those relatively wealthy households with the largest herds or flocks also cultivate the largest fields, and usually have the biggest and most diverse sources of other off-farm incomes. They also have more access to labour because their families are larger or because they can afford to hire casual labourers. It is these wealthier farmers that are also most likely to be able and willing to

[5] Mendelsohn, J.M. & S. el Obeid. *2003. Sand and Water: a profile of the Kavango region of Namibia.* Struik, Cape Town.
[6] Mendelsohn, J.M. & S. el Obeid. *2003. Sand and Water: a profile of the Kavango region of Namibia.* Struik, Cape Town.
[7] Based on analysis of four years of annual agricultural surveys conducted by the Central Bureau of Statistics.

plant jatropha on a substantial scale. Poorer households will, by contrast, have less land and labour available for jatropha.

- **Crops provide rural households with most of their food requirements and food security.** Many development projects are founded upon this pervasive wisdom. However, yields on most farms and in most years are far too low to provide for household needs. Average yields usually amount to between 100 and 300 kg/hectare, and most fields cover less than 2 hectares. Moreover, of all Kavango farmers, only 20% of rural households obtain all their cereal requirements from domestic production; the remaining 80% use cash to meet some or all of their cereal needs. Similarly, of cereal consumption in rural households, 42% is from domestic production and 58% is paid for with cash.[8] This trend may vary from year to year according to the rainy season, but it is generally true that most rural Kavango households are not food self-sufficient. There is also no need for them to be self-sufficient, since their *food security comes largely from off-farm cash incomes*.

  Mahangu typically has a market value of between N$3.00 and N$4.00 per kilogram, which means that one hectare might produce food to the value of between N$300 and N$1,200 per year. This would also be the total value of cereal production by a family planting just one hectare (note that about half of all rural households plant one or less hectares – see page 12). These figures are several times less than the value of one social pension. It has also been estimated that the maximum daily rate of return on labour devoted to mahangu amounts to only about N$13.60.[9]

- **The potential for food production is high.** Kavango is often held as being the breadbasket of Namibia. Huge efforts by the government, donors and NGOs have been put into improving mahangu production, for example by providing improved seed, fertilizers, ploughing services and marketing. As a broad and general conclusion, all these efforts have had little or no success. Indeed, many people conclude that mahangu yields are now lower than say 20 or 30 years ago. As for large commercial farmers along the Okavango, their irrigation schemes are, or have been heavily subsidised by the government. As a result, food produced on the irrigation schemes usually costs more than cheaper imports from elsewhere, and consumers (who are often amongst the poorest members of society) are forced to pay inflated prices to protect these uneconomic enterprises. For example, 75% of all cash expenditure on cereals by rural and urban households is on maize, compared to only 15% on mahangu and 10% on bread.[10]

- **The introduction of cash crops will jeopardise the production of staple foods.** As was made clear above, the majority of people depend on cash incomes to provide most of their nutritional needs, and their production of staples is not a requirement for food self security. Cash is therefore already the important contributor to food security, and **cash security** is much more important than food security. Almost everyone we consulted – and certainly all farmers – expressed the view that jatropha offers an opportunity to earn **additional** (not alternative) cash incomes. As such, most farmers are enthusiastic to try jatropha. The main attraction offered by jatropha is the hard cash (not food) that most people need.

In summary, traditional farming is a low input - low output activity. Production is too low to provide for all household food requirements, and people depend largely on cash incomes to feed themselves. Efforts to improve traditional farm production have had little success. Indeed, no prospects of changing this situation are known, and yields are probably now lower than obtained years ago. Opportunities of improving household wealth must thus rely on new or greater cash incomes.

[8] Results of 2004 Income and Expenditure survey.
[9] Mendelsohn, J.M. 2006. *Farming systems in Namibia*. RAISON, Windhoek.
[10] From 2004 Income and Expenditure Survey data.

How will jatropha fit into current farming practices?
It is clear that jatropha farming represents **no threat** to established farming practices in Kavango. Rather, most Kavango farmers are eager to grow jatropha as a potential source of cash. In response to concerns that the jatropha may lead to a reduction in food production if mahangu fields are given over to jatropha, our observations indicate that the majority of farmers will probably adopt a cautious 'wait-and-see approach' to jatropha, and thus continue to grow mahangu and other produce. This will hold true over the next few years, at least until the profitability of jatropha is clear to them. This may seem peculiar in the light of the low production levels of mahangu, but mahangu farming is a long established and highly valued tradition. Furthermore, mahangu farming is an aspect of household economies that is largely controlled by women who are unlikely to readily abandon either their control or responsibilities in providing mahangu as a traditional source of food for their families. By contrast, jatropha production as a source of cash incomes may be controlled to a greater extent by men. Finally, a cautious approach also stems from the many dashed expectations of failed agricultural development initiatives in Kavango.

The most important and difficult questions for farmers to answer will be in deciding how much land and labour to allocate to jatropha, especially for land and labour now used for traditional farming. The decisions and allocations will also change as the comparative costs and benefits of traditional versus jatropha farming change over the years. It is probable that some farmers will be forced to make compromises in allocating adequate labour to jatropha and traditional farming. These compromises will be felt most acutely in the early stages of the project when the young trees need to be weeded and perhaps watered, and then later on during harvest periods. For purposes of making labour available to harvest jatropha, we would again expect farmers to make appropriate decisions and allocations once the relative profitability of the trees is clearer. The timing of jatropha harvesting may also be relatively flexible, thus allowing farmers to attend to more urgent needs, for example reaping mahangu.

In due course and once jatropha production and its economic benefits are established, we expect that increasing numbers of farmers will gradually reduce and abandon mahangu farming altogether. We do not anticipate any serious impacts of that happening. As implied above, levels of food security should increase as result of jatropha. And as Kavango's economy evolves into one based on cash crops, business and trade, we expect the relevance of food self-sufficiency to decline. The value of jatropha incomes should also more than compensate for the loss of some other products of mahangu farming. The most important of these are the plant residues (stubble) which livestock graze once mahangu has been harvested. Mahangu stalks are also sometimes used for thatching and fencing, even though the structures are not particularly durable.

An additional consequence of planting jatropha on a large scale will be the loss of pastures, both on fallow or abandoned fields and perhaps as a result of clearing of virgin woodland (see below). However, it is our view that these losses too will be offset by the benefits of jatropha incomes. Most people having livestock are relatively wealthy farmers who will, in any case, be the biggest jatropha growers since they will have the largest areas available for jatropha.

These assessments have been made on the basis of what we could establish and assume about jatropha farming.[11] However, it needs to be stressed that some assumptions (and thus our assessments) could prove wrong because so little solid information is available on such critical aspects as yields, profitability, growth rates, labour and irrigation requirements to grow young trees, harvesting methods, etc. To our knowledge, there is also no comparative information available on large-scale jatropha production from areas elsewhere with similar climatic conditions and traditional farming systems.

Finally, concerns were raised by some people that Kavango will be turned into a monoculture of jatropha. However, the same concerns are seldom, if ever, raised about the fact that a monoculture of mahangu already exists.

[11] Based on the worldwide distribution of jatropha and its adaptability to different conditions, we accept the assumption that rainfall, soils and other environmental conditions in Kavango are suited for its production. A few jatropha plants now grow in the region, but little information is apparently available on their vitality and yields.

4 LAND

With the exception of state-protected areas and the Rundu townlands, all land in Kavango is generally known as communal, which means that the land is formally owned by the state but local residents have permanent rights to its use. The nature of those rights differs between exclusive plots used for crop cultivation and places on which houses are built, and commonages where livestock are grazed and plant and animal products are harvested. Residential and crop lands have traditionally been allocated by village headmen, while all local residents are regarded as having rights to the use of commonages.[12]

It is the majority of small-scale farmers in rural areas that have residential, cropping and grazing rights. In addition, a growing number of farmers are acquiring obtaining exclusive rights to large farm units in the southern and western parts of Kavango. There are now over 500 of these private farms, which should develop into commercial units with 99-year leaseholds. Most of the farms range in size between 2,500 and 5,000 hectares. Cumulatively, the large farms comprise over 30% of the area in Kavango.

Areas and the percentage of the whole of Kavango used for different purposes. These figures represent conditions in 2006 although some of the private farms have yet to be allocated.

Land use ownership	*Square kilometres*	*Percentage of Kavango*
Communal grazing	22,477	46.4%
Private large farms	14,529	30.0%
National parks and game reserves	7,534	15.5%
Namibia Development Corporation farm	1,689	3.5%
Small-scale fields	750	1.5%
Namibia Defence Force	537	1.1%
Quarantine farms	280	0.6%
Resettlement farms	200	0.4%
Urban area	162	0.3%
Government farms	112	0.2%
Forestry area	101	0.2%
Rehabilitation farms	62	0.1%
Leased farms	23	0.0%
Total area of Kavango	**48,456**	**100%**

In 1996, a total of 194,550 hectares had been cleared for cultivation over the years, and it is estimated that areas of cleared land had increased by about 3.9% each year between 1972 and 1996. Extrapolating the 1996 total at this rate of increase to 2006 suggests that there might now be about 285,000 hectares of cleared land in Kavango. Of this, approximately 75,000 hectares is cultivated each year, the remainder lying fallow or abandoned.

The LandSat images taken in August and September 1989 indicated that about 65,500 hectares had then been in the zone lying 10 kilometres south of the Okavango River. Relatively small areas of land had been cleared further south of this zone, and it was agreed in discussion with Johan Breytenbach of Prime Investment (Pty) Ltd that the project would focus on the 10 kilometre zone south of the River.

The 65,500 hectares cleared in the 10 kilometre riverine zone includes fields close to, indeed abutting the floodplain. In response to requests to consider the impact on limiting jatropha production to areas away from the floodplain, we estimated the areas of pre-1990 cleared land within buffer areas of 50, 100 and 200 metres of the floodplain. The results are given in the following table:

[12] Note that there are three levels of local or traditional authority: village headmen, senior headmen, and the tribal chief (called the Hompa by in Kwangali, Mbunza, Shambyu and Gciriku, and the Fumu in Mbukushu). The Hompa or Fumu is supported by a group of traditional councilors.

	Hectares
Total area cleared before 1990	65,500
Area cleared within 50 metre buffer	530
Area cleared within 100 metre buffer	1,250
Area cleared within 200 metre buffer	3,400

If the maximum buffer area of 200 metres was chosen, a total of 62,100 hectares would remain as potentially available for jatropha cultivation.

Previously, we had estimated that there are now about 16,000 rural households within this focal area. Some of these households would now still (or again) be planting mahangu on land that had been cleared by 1989, which means that not all the pre-1990 cleared land might be available for jatropha. How much this amounts to would require further work by the jatropha project. In addition, most of these households and their farmyards would be sited within these old clearings, again indicating that not all the pre-1990 clearings could be planted with jatropha.

Prime Investment (Pty) Ltd proposes using maps of pre-1990 cleared land to verify claims by farmers that the land they offer for jatropha was indeed cleared before 1990. The project would further assist farmers in having the boundaries of their farm areas mapped and registered with the traditional authority and communal land board of Kavango. Once registered, the owners would probably have long-term leasehold or permanent rights to their farms. The critical issues discussed here with regard to the jatropha project are:

1. How access to old fallow or abandoned fields will be determined, and how can the process be managed in everyone's best interests?
2. Whether farmers will start to clear more land for mahangu production because they make their existing fields available for jatropha?
3. Whether increased incomes from jatropha will result in farmers to plant greater areas of mahangu and increase their livestock holdings?
4. Whether the wealthiest, most influential households will gain preferential access to abandoned fields, arguably at the expense of poorer households that are more deserving of the additional incomes that jatropha might bring. This might generate considerable local competition and tension.
5. To what degree women that now manage and effectively own land might be excluded from the land registration process?

Discussions with farmers, traditional leaders, regional councillors and other people in Kavango all led to the over-riding conclusion that rights to land are locally well known and established. This is true both for fields now used for cropping and those that are fallow or abandoned. It is also valid for abandoned land formerly used by family members that are now dead or that moved elsewhere. We were informed that any uncertainties would or could be resolved to mutual agreement through discussion between neighbours and/or the village headmen. Based on this, we believe that there will be little scope for wealthy individuals usurping the land of other local residents. We further note that the process of registering land rights is, in its own right, a welcome move in helping provide residents with secure rights and the eventual possibility of using their land as collateral.

However, one disturbing scenario was described. This was the possibility that an influential person could persuade several smaller farmers to join him or her in registering their land collectively with the further promise that profits from jatropha would be shared. In due course, though, the influential person would keep the profits for him or herself.

It is clear from the table below that the great majority of farmers plant very small areas of crops each year. Thus, for example, about half the farmers plant less than 1 hectare and 86% of farmers plant less than 3 hectares. Overall, there are approximately 3 hectares of fallow or abandoned land for every hectare planted with crops in Kavango, but no information is available on how consistently this 3:1 ratio holds for each household. In other words, we do not know if an average farmer planting 1 hectare would

have an average of less, or more, than another 3 hectares of empty cleared land. However, since field areas are closely related to wealth (which probably remains fairly constant over the years), it would be safe to assume that households having small crop areas also have small areas of fallow or abandoned land. Similarly, those farmers with large planted areas are also likely to have access to large areas of abandoned land.

Percentages of farmers planting different field areas each year

Hectares planted	*Percent of farmers*
Less than 1	49%
1-2	24%
2-3	13%
3-4	5%
4-5	3%
5-6	2%
6-7	1%
7-8	1%
8-9	1%
9-10	1%
More than 10	1%
Total	100%

Source: analysis of data from 1,305 farmers during four years of annual agricultural surveys

If jatropha production is as successful and lucrative (for rural residents) as the Prime Investment (Pty) Ltd project suggests, we predict that there will be strong incentives for the clearing of new fields by farmers. This will probably happen in three ways:

1. Fields now used for mahangu will be given over to jatropha, and farmers will then clear new land to provide for their mahangu production needs. Even though jatropha may have greater economic benefits than mahangu, it will take several years of profitable sales of jatropha before individual farmers are sufficiently convinced that jatropha is lucrative to the extent that they devote all their labour and farming activities to jatropha. Moreover, mahangu has great traditional value and many farmers will continue to plant it for that reason (for example, many very wealthy households that have absolutely no need whatsoever to grow their own food for nutritional purposes continue to plant large fields of mahangu). In addition, women may express a stronger need than men to continue planting because they would have greater control over the benefits of mahangu than jatropha harvests.
2. As farmers become wealthier as a result of jatropha, they will plough some of their new incomes into expanded farming operations, resulting in bigger fields and more livestock. The trend for wealthier households to have larger agricultural holdings (as crop areas and livestock) than poorer farmers has been well-established in Kavango and elsewhere in northern Namibia. For example, households having at least one wage income have an average of 14 head of cattle compared to seven cattle where there is no cash income, while farmers owning more than 20 cattle are likely to have fields five times larger than poorer farmers who own less than five cattle.[13]
3. Farmers will simply clear new fields to plant jatropha as a profitable source of income. This will probably also happen in adjoining areas of Angola from where harvests could be transported across the Okavango for processing in Namibia.

On environmental grounds, the predicted additional clearing of more natural woodland and forest is cause for alarm because it will (a) lead to further losses of natural woodland or forest and (b) reduce the availability of commonage resources for the poorest households that **really need** those resources. We would argue, however, that different measures to control or mitigate against the clearing of new fields be considered. For example, the clearing of fields for additional mahangu *once jatropha has been proved to be a better source of income than mahangu* should be limited or stopped. The same controls should be considered for very wealthy households that *have no need for mahangu as a source of nutrition*. In these

[13] Mendelsohn, J.M. & S. el Obeid. *2003. Sand and Water: a profile of the Kavango region of Namibia.* Struik, Cape Town.

two instances, we would argue that additional clearing is *unnecessary*. By contrast, it will be hard to prevent needy households from clearing land for jatropha as a *necessary* source of income. After all, no measures are now taken to limit farmers from clearing land to plant mahangu or any other crop, and it would be hard to justify limits in the case of a jatropha crop.

5 ECONOMIC ASPECTS

Kavango's rural landscape and its many small farms provide the overall impression that subsistence agriculture is the predominant economic activity in the region. The idea of subsistence furthermore implies conditions that: (a) incomes consist largely of home or farm produce, (b) the availability and use of cash is limited, (c) the food requirements of rural homes are met largely by domestic production, and (d) farmers would not be accustomed to farming on a commercial basis. Against that background, questions may be raised about whether greater cash incomes as a result of jatropha farming might be disruptive in some way to household economies, and how people might spend new cash incomes.

These might be valid questions if subsistence farming was indeed so predominant. However, as made clear above, farms yields are far too low to provide most income or the nutritional needs for the majority families. In addition, various studies and sets of data indicate a high degree of reliance on off-farm cash incomes. For example the following table shows that high percentages of **rural** households obtain their main incomes from other sources of income.

Proportions of rural households in Kavango reporting different main sources of income

Main source of income	*2001 Population & Housing census*	*2004 Income & Expenditure Survey*
Farming	63%	42%
Business	11%	10%
Wages and salaries	13%	21%
Pension	5%	13%
Remittances	4%	
Other	3%	14%
Total	**100%**	**100%**

Source: 2001 Population & Housing census and 2004 Income & Expenditure Survey. Note that "Remittances" were not reported in the 2004 data.

These figures usually reflect the main source of income of the head of the household, rather than the major source of **all income** for a home. Indeed, the figures over-emphasize farming because the heads of most household are elderly, less educated and unemployed people, with the result that the more lucrative incomes of younger and more economically active family members are not reported. This bias is evident from the following table, which shows the proportions of people over 14 years employed in different sectors in rural areas of Kavango:

Employment sector	*Percentage of people*
Public and private services	48%
Agriculture and other natural resources	44%
Manufacture, mining, building	6%
Trade	1%
Not stated	1%
Total	**100%**

Source: 2001 Population & Housing census

And the bias is even more evident from a study in 1992 which found that 82% of the income of rural households was not related to farming.[14] Finally, cash incomes are used increasingly to buy food, a point made clear in the following table.

Proportions of total annual expenditure of in 1994 and 2004 among rural and urban households

	Urban		*Rural*	
	1994	**2004**	**1994**	**2004**
Cash cereals	16%	6%	13%	9%
Cash meat	10%	4%	5%	3%
Cash fish	2%	1%	2%	2%
Other cash food	15%	10%	11%	6%
Total cash food	**43%**	**21%**	**31%**	**19%**
In-kind cereals	2%	1%	17%	6%
In-kind meat	1%	0%	2%	2%
In-kind fish	0%	0%	1%	1%
Other in-kind food	2%	1%	12%	9%
Total in-kind food	**5%**	**2%**	**32%**	**18%**
Total food consumption	**49%**	**23%**	**63%**	**37%**
Consumption on other goods and services	**51%**	**77%**	**37%**	**63%**

Source: 1994 and 2004 Income and Expenditure Survey data

Several other aspects to household incomes are to be seen in these and other data:

- Most households have at least two or more sources of income
- Households with the largest family sizes have the greatest and most diverse incomes
- Households with the largest incomes also have the biggest fields and livestock holdings
- The largest total household incomes are in families which have one or more people formally employed, for example as teachers or nurses.[15]
- Few households have no cash incomes.
- Reliance on domestic, or in-kind production has declined

Perhaps the most significant figures in the table above are those showing how expenditure on items other than food has increased dramatically between 1994 and 2004: from 37 to 63% of all expenditure in rural households. Much of that change was due to substantial increases in wealth, people being having more money available to spend more on non-food commodities.

Overall household wealth roughly doubled between 1994 and 2004 in urban homes, and increased by about 40% in rural ones, as shown by the following figures.

Measures of total annual household expenditure in 1994 and 2004 in Kavango

Area	*Median*		*Average*	
	1994	**2004**	**1994**	**2004**
Urban	N$13,876	N$26,712	N$20,999	N$39,947
Rural	N$9,688	N$12,667	N$13,734	N$18,900

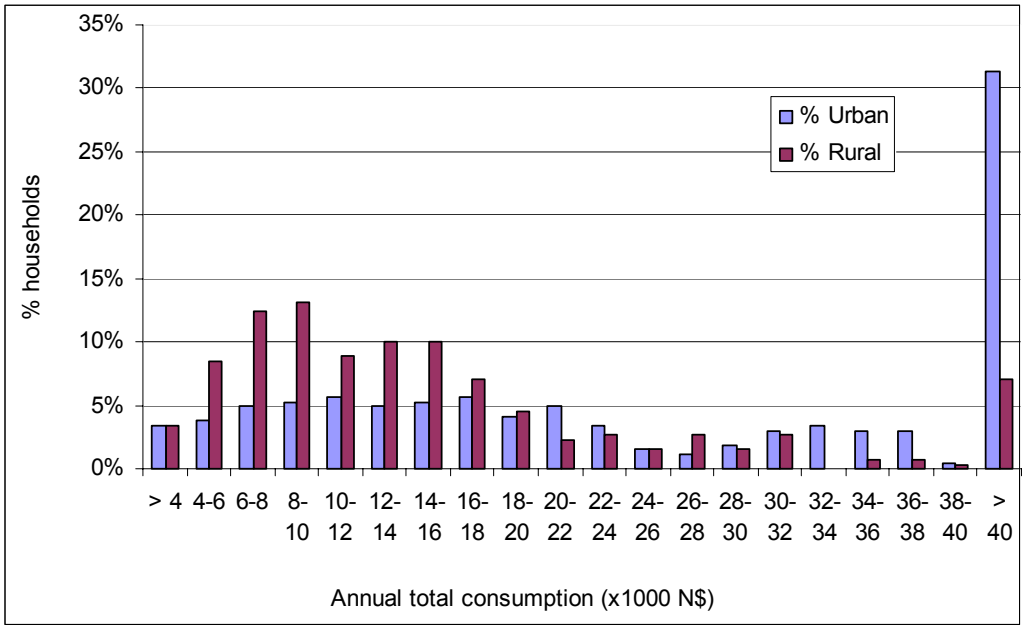
Calculated from the 1994 and 2004 Income and Expenditure Surveys.

1. The figures for 1994 have been inflated at 7% per year to provide a more realistic comparison with N$ values in 2004. The original figures in 1994 were: medians N$7,054 (urban) and N$4,925 (rural); averages N$10,675 (urban) and N$6,982 (rural).
2. Household expenditure is both a measure of overall wealth and annual income.

[14] Keyler, S. 1995. Economics of the pearl millet subsector in northern Namibia: a summary of baseline data. *International Crops Research Institute for the Semi-Arid Tropics.* Working Paper 95/03.

[15] For example, the starting salary of a qualified teacher is N$58,461, while unqualified teachers with some experience generally earn between N$35,000 and N$45,000 per year.

The medians and averages in this table mask the considerable variation between households, some of which is portrayed in the following graph.



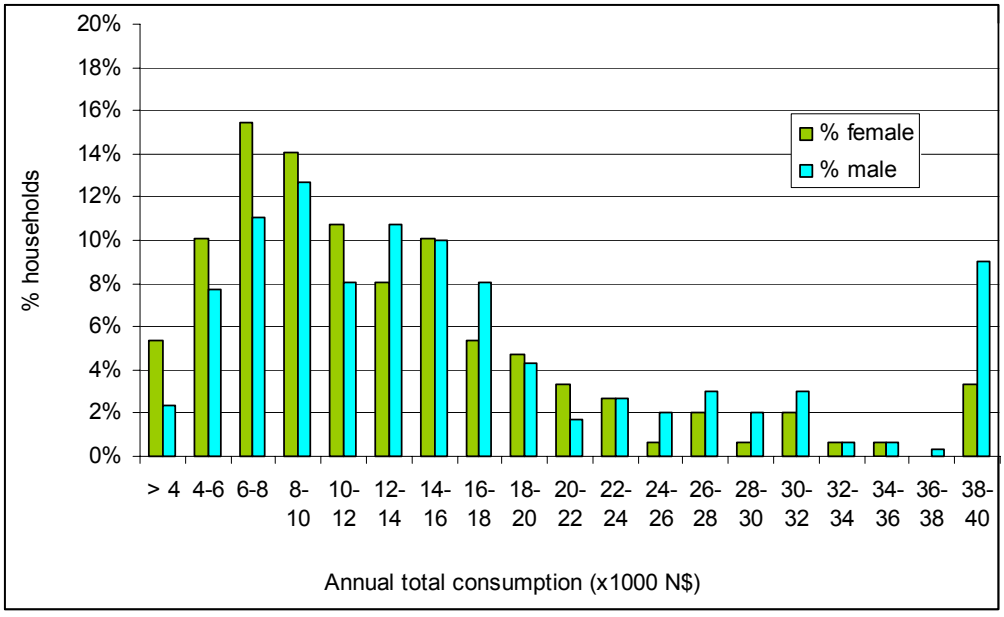
Comparison of total annual expenditure in rural and urban households in Kavango in 2004

Over and above rural households having less wealth than urban ones, female-headed homes are considerably poorer than those where men are reported as the household head. This is shown in the following table for urban and rural homes and in the graph for rural households.

Average total consumption in households headed by women and men in 2004

Area	Female	Male
Urban	29,838	45,139
Rural	13,670	21,524

Comparison of total annual expenditure in female and male-headed households in rural areas of Kavango in 2004.



In short, rural people in Kavango are spending more and more on commodities unrelated to food and food security, and they can do this because of a substantial part of their income is in the form of cash. Subsistence agriculture is **not** the mainstay of Kavango's rural economy.

Earnings from jatropha would therefore be additional, not completely new cash incomes. But how much would jatropha earnings add to the rural economy of Kavango? And what impact would jatropha income have on different households: those headed by women, or those with little wealth compared to much richer homes with large fields to be planted with jatropha?

Based on yields given in the following table, an annual income of N$1,470 per hectare could be achieved in the 7th years of the project. At that kind of income, about N$90 million could be earned on the approximately 60,000 hectares that were cleared before 1990 (see page 11). It is our understanding that other, longer term incomes are expected from jatropha since participating farmers will be shareholders of the farming and industrial companies, as stated in the project document. What these incomes are likely to amount to remains unclear.

Estimated seed production of jatropha in Kavango

Year	Kilograms per hectare	Income per hectare
Year 2	70	N$25
Year 3	100	N$35
Year 4	370	N$130
Year 5	1,730	N$606
Year 6	3,900	N$1,365
Year 7	4,200	N$1,470

Source: Prime Investment (Pty) Ltd project. document

If the 25,600 rural households in Kavango have a median annual expenditure of N$12,667, we can say that the total expenditure in rural Kavango ion 2004 amounted to about N$324 million. Of this total, about 18% was expenditure on goods received in-kind, leaving 82% as cash expenditures or a total of about N$265 million. Given annual inflation of about 7%, that total will have grown to approximately N$325 million per year by 2007. This would be a minimum estimate of the value of cash in circulation in rural areas of Kavango in 2007. The figure could be somewhat higher as a result of real economic growth.

As estimated above, at least N$90 million might be paid to farmers each year for jatropha seeds. This is about 27% of the roughly N$325 million now in circulation. The percentage increase to the rural economy is likely to be quite a bit higher if other sources of income are added, for example those generated by labour and other inputs to the jatropha nurseries and tractor company, and dividends from the sale of carbon credits. Most of this additional money will be spent on recurrent expenditure on consumables, and a surge in new business enterprises can be expected in the region. Some of the spending may be undesirable, for example on increased alcohol consumption. HIV/AIDS infection rates may also increase in association with greater economic activity. In this light, it would be useful for Prime Investment (Pty) Ltd to find and encourage more useful patterns of spending.

A key consequence of the project will be transformation of farming from domestic to commercial production. Our overall assessment is that this is desirable. The transition should also be effective and fairly rapid, since a half-hearted, patronizing approach may mean that jatropha simply adds another income to the suite of incomes that small-scale farmers already have. Little would change, and the farmers would probably use the new incomes to expand their mahangu fields and livestock holdings. By contrast, a more aggressive and committed approach would ensure that jatropha:

- is seen as a commercial activity from the beginning,
- that individual (as opposed to community or group) accountability and performance is fostered,
- that incentives for a commercial approach to the use of land be as great as possible, and

- that the project not be confused with food security or self-sufficiency, or, for that matter, with a community upliftment project.

It has been suggested by Prime Investment (Pty) Ltd that food be provided as part of an initial subsidy to participating farmers over the first few years. However, in the light of the last bulleted point, we recommend that food **not** be provided since this would undermine the project's business-like wealth-creation aim. Food handouts would also suggest a "food for work" approach, which has not had useful consequences in Namibia. The provision of food would furthermore be logistically complicated. Finally, it suggests a patronising attitude, given that it has been partially justified by some people that the provision of too much cash will lead recipients to spend too much on alcohol, perhaps at the expense of providing food.

Finally, some comments on the question of who will benefit most from the jatropha project? This is not to detract from wealth-creation goals, but it is desirable that the benefits be spread widely and that households that are really poor, with little land and no other economic opportunities earn incomes from jatropha. The latter aspect is of greatest concern since the farmers who will probably now earn most from jatropha are those that are already comparatively wealthy in having large areas available for planting jatropha. Poorer households, by contrast, will have less land and labour available for jatropha.

6 RECOMMENDATIONS AND CONCLUSION

In bringing this description and assessment of Kavango's social and economic environment to a conclusion, perhaps the most important points are:

- While subsistence farming has been a widespread traditional activity, it is particularly unproductive and does not provide food self-sufficiency or security to rural households.
- Other than labour, very little is invested in agriculture because of low yields
- Over 60,000 hectares of land cleared along the Okavango River before 1990 was identified and would be available for jatropha production.
- Much of this land now lies abandoned or fallow, but the rights to the land are apparently well-know to local residents.
- Rural people have increasingly sought and obtained cash incomes from business and wages.
- Rural homes now use these incomes to buy most of the food, in addition to the other commodities they require as members of modern society.
- Despite accepted dogma or conventional wisdom, rural Kavango no longer has a subsistence economy; rather it is an emerging cash-based society in which off-farm incomes are growing rapidly.
- As a consequence, rates of urbanisation have increased as people seek and demand wealth and the benefits it can provide.
- As a potentially lucrative cash crop, jatropha is well-placed as a more productive crop than traditional cereals because it offers an additional source of cash.
- Jatropha is also attractive because farmers will provide few inputs or investments. All that is required is cleared land, which is free, and labour.
- No other options are now known that could bring major economic benefits to a large proportion of the population.
- A major concern is that if jatropha production becomes really profitable, large areas of natural woodland will potentially be destroyed through clearing.

Our assessment therefore suggests that jatropha farming offers opportunities that are congruent with normal aspirations for greater cash wealth. The crop also offers a more productive way of using farm land and labour than traditional low output farming. Much of this thinking is also based on our view that (a) small-scale, traditional agriculture in Namibia's harsh farming environment is a recipe for sustainable poverty, and (b) the aspirations of most rural Namibians are the same as those of people in any modern society. Residents of rural communal areas also want transport, modern clothes, electronic appliances and medical care, and they can not be held to having lower standards of living than Windhoek residents.

We also inherently agree with the caution that this project is "too big, rushed, unconventional and untested". However, what other options are there for to improve the livelihoods of so many rural people? Indeed, if these economic impacts are indeed as good as they appear, there is then also good reason to encourage implementation as soon as possible. Considerable expectations have been raised, and lucrative incomes are only to be expected several years after the trees are planted. The effective implementation of the project will further:

- move farming away from low input-low output traditional production
- make labour available for jatropha more rapidly and readily
- help shift Kavango into a cash-based modern economy, and
- help make the jatropha project a success (note, the more rapidly profits are delivered, the more quickly people will join as jatropha farmers, and the less time detractors will have to criticise the project).

What will be the impact if the project fails, or if yields and production prove too low to bring anticipated economic benefits? This will prove a great disappointment, furthering the 'wounded buffalo' syndrome and suspicions of enterprises initiated from outside Kavango. Note that, the Namibia Development Corporation (NDC) farms were started 40 years ago in Kavango, and the lack of benefits to local people have left a deep distrust of big projects and their associated promises and managers. Although some jatropha might be used for domestic and limited commercial uses (for example, oil, soap, fertilizer or compost, and the protection of fields from livestock), the consequences of failure will be serious.

There is a special need for all aspects of the project to be run with complete transparency. This is particularly important given the large sums of money that should arise from the project, the many separate transactions and great number of people involved. All of these aspects provide increased opportunities for the project to be derailed by dishonest interests. One important step would be for earnings at every level to be published for everyone to see, including the publication of earnings by each farmer in every village. This would allow all the neighbours of each farmer to know what is being earned and it would also allow women to know what their husbands are earning. A measure of local, healthy competition could also be generated in this way. Prices paid for seeds must also be transparent at all levels.

Likewise, all land claims and registrations need to be done in a transparent fashion. This might be achieved by printing the proposed boundaries on maps which are displayed at the home of each village headmen and then holding meetings where any objections might be voiced.

Efforts should be made now, and in the future, to provide clear and adequate information on the project to all concerned. We encountered many questions and concerns although, understandably, not all of these could be addressed at this early stage. There are particular needs for more information on plant growth, production, yields, prices, profitability, markets and marketing methods; indeed, all aspects of being commercial farmers. Many people also asked why South Africa has not planted jatropha on a large scale, and whether livestock would be poisoned. In short, the better people (especially farmers) are informed, the smaller the chances of misunderstandings, derailment and failure.

The lack of information is also a particular concern of some sceptics who have not seen research on growth in Kavango (or any similar environment) and have not seen any large jatropha trees in Kavango or Caprivi (despite some being more than 20 years old). All of this contributes to an atmosphere of extreme caution (at best) or scorn (at worst).

Finally, we recommend that measures now be put in place to mitigate against anticipated problems, and some that cannot be foreseen. Prime Investment (Pty) Ltd should perhaps establish a unit of specialists to be clearly charged with monitoring conditions in Kavango and recommending solutions, both of a policy and practical nature. The following are problems or aspects that will require mitigation and/or monitoring:

1. Limits or controls on the clearing of virgin woodland due to processes described on page 12.

2. Expansions of low input-low output agriculture. It is likely that as farmers become wealthier they will invest significant parts of their wealth in additional fields (both of jatropha and mahangu) and livestock. This needs to be monitored and measures introduced to both limit additional farming activity that may lead to further land degradation, a loss of commonage resources to poorer farmers or result in low production (for example, a farmer may simply clear 10 or 20 hectares of woodland far to the south of the Okavango River, but then make little use of the fields or produce very little – clearly, this kind of land degradation should be controlled or stopped). Additionally, farmers should be encouraged to invest their surplus earnings in ways that do not contribute to land degradation.
3. As discussed above (see page 15), greater levels of spending may lead to several social problems, such as increased alcohol abuse. Again, this should be monitored and measures to limit such social ills should be investigated and implemented. As one commentator noted: 'If you plan to introduce radical changes to 50% of households in a few years, you have to take responsibility for any kind of negative social issues. We do not know what these might be, and they need to be investigated. And more importantly, there should be a declared willingness by the Company to take up this responsibility.

The Prime Investment (Pty) Ltd project may also care to help encourage more judicious land use planning and implementation in Kavango. For example, with the emergence of over 500 large commercial farms in the south and west, consideration needs to be given to shifting the veterinary cordon fence (red line) north of the farms so that beef from the farms can be exported to foreign markets. Since areas north of the veterinary fence would remain exposed to the possible spread of lung sickness and foot-and-mouth disease from the north, further thought should be given to creating a livestock free zone between the river and veterinary fence if it was moved north. The creation of a livestock free zone would help reduce degradation of the river zone and thus add value to its attractiveness for tourism. The clearing of new land for mahangu or jatropha south of this new red line could be carefully controlled or prohibited. It might further be useful to proclaim all areas south of the new red line as community forests or conservancies so that management committees of these community-based areas could control and limit injudicious degradation. Although most areas along the river are densely settled, there are pockets of forest and unspoilt areas that should be preserved and developed for tourism.

In summary, the commercial production of jatropha in Kavango could bring substantial economic benefits to a great number of rural households in Kavango. This will depend on effective, transparent implementation. For those who consider jatropha farming to be a bad idea, there is the challenge to find equal measures that can improve livelihoods to the same or greater degree.