Domesticating caterpillars helps the very poor in south-central Africa

RIU

Validated RNRRS Output.

In southern Africa, people with virtually nothing could now become farmers. Villagers in Botswana and Zimbabwe already domesticate and farm the Mopane Worm, an edible caterpillar. Both rural and urban folk relish these caterpillars. Harvested from woodlands throughout south-central Africa, and high in protein and fat, they are also an important food for the rural poor. Now, caterpillar farming can be a household enterprise. Children help find and collect eggs and the adults, mainly women, raise the larvae, and harvest and market the caterpillars. Proven methods of breeding, processing and storing the caterpillars ensure a steady output and maintain quality. Many other edible caterpillars popular all over sub-Saharan Africa could be domesticated and farmed like this.

Project Ref: **FRP41:**
Topic: **1. Improving Farmers Livelihoods: Better Crops, Systems & Pest Management**
Lead Organisation: **Gardiner, A. (Independent), UK**
Source: **Forestry Research Programme**

Document Contents:

Description

FRP41

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Botswana, Zimbabwe,

Target Audiences for this content:

Forest-dependent poor,

A. Description of the research output(s)

1. Working title of output or cluster of outputs.
In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Description: Mopane Worms (MW's) are an edible caterpillar in South Central Africa that is widely used both as a food and as a source of income for the rural poor. Demand-driven, cost-effective household captive breeding programmes were developed, and information made available to certain producer communities on the construction and maintenance of household breeding programmes. Innovative Mopane Worm processing and storage techniques developed, and information made available through a manual and demonstration prototypes. (The project developed the first methods for farming Mopane worms.)

Title: Mopane woodlands and the Mopane worm: enhancing Rural Livelihoods and Resource sustainability.

Working title/acronym: Mopane Worm Farming: a new mini-livestock system (MWF)

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

Project No. R7304 – Zimbabwe Micro-catchment Management and Common Property Resources (Natural Resources Systems Programme of the RNRRS: Semi-Arid Production Systems).

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

R7822

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4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? ***(max. 400 words)****. This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database*

Mopane Worms (MW's) are edible emperor moth caterpillars, which are widely used both as a **protein food** and as a **source of income** for the rural poor in **South Central Africa**. Despite the widespread utilization of naturally occurring wild populations of MW's, **farming** methods and **sustainable use** of this potential **mini-livestock** had not been developed. During the years 2001-2006 part of the Mopane Woodland project focused on developing demand-driven, cost-effective captive breeding programmes. The research concerned with farming MW's included **innovative** and **inventive** methods for breeding, harvesting, processing and storage. Breeding and harvesting strategies were developed to increase **production** and stabilize the bi-annual harvest yields as well as maintain the wild population levels. Processing and storage techniques aimed to improve the **quality** of the product and thus potentially increase the financial return from the sale of high quality MW's.

Information on the construction and maintenance of household breeding programmes was made available to certain producer communities. In addition this information and details of the innovative MW processing and storage techniques developed were made available through a manual and demonstration prototypes.

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	***Technology***	***Service***	***Process or Methodology***	***Policy***	***Other Please specify***
x	*x*		*x*		

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

The main commodity is an edible caterpillar (Mopane Worm) high in protein and fat. The caterpillar is widely eaten in South Central Africa both by rural and urban people. The outputs could be applied to many other species of edible caterpillars that are widely used throughout sub Saharan Africa.

7. What production system(s) does/could the output(s) focus upon?
Please tick one or more of the following options. Leave blank if not applicable

Semi-Arid	***High potential***	***Hillsides***	***Forest-Agriculture***	***Peri-urban***	***Land water***	***Tropical moist forest***	***Cross-cutting***
x	*x*		*x*	*x*		*x*	

8. What farming system(s) does the output(s) focus upon?
Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

Smallholder rainfed humid	***Irrigated***	***Wetland rice based***	***Smallholder rainfed highland***	***Smallholder rainfed dry/cold***	***Dualistic***	***Coastal artisanal fishing***
x			*x*	*x*		

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**). Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.*

The output “Sustainable management of Miombo woodland by local communities in Malawi (R6709)” is important when considering the utilization of edible caterpillars as the caterpillars in Miombo woodland could be used in a similar way to MW’s. The output “Medicinal tree bark in Southern Africa (R8305)” deals with an additional forest/ woodland product in the same geographical area and is also part of the management of Miombo woodlands. These and other NTFP’s should be integrated into an overall management plan. By making as many NTFP’s as possible available to the communities the value of and direct benefits from the woodlands can be increased.

Further outputs that may be useful are:
“Non-timber forest product commercialisation project (R7925)”- for decision making by the MW producers and traders.

“Analysis of stakeholder participation costs (R6914)”- economic issues and incentives to participate in MW farming methods.

“Viability and potential of ethical trade (R7285)”- for cross-border/regional trading of MW’s and other caterpillars.

“Agroforestry modelling and coordination: Phase 2 (R6348)”- to model certain aspects of MW production and possibly identify factors that need attention.

“Methodology for planning sustainable management of medicinal plants in India & Nepal (R8295)”- transfer of knowledge on NTFP’s between the interested parties.

It would be worthwhile to implement and monitor the progress of MW farming (and other edible caterpillars) over a wider range of areas and for a longer period of time than has been done to date. To maximize the benefits of the woodlands this could be done in conjunction with other NTFP's. This could be implemented in association with other organizations and stakeholders such as the Rural District Councils, the Forest Research Institute of Malawi, the Southern Alliance for Indigenous Resources (SAFIRE), the Forest Research Centre of Zimbabwe, National Research Foundation of South Africa (NRF), Donors and other NGO's.

Validation

B. Validation of the research output(s)

*10**. How** were the output(s) validated and **who** validated them?*
*Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the "who" component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation **(max. 500 words)**.*

A trial implementation was aimed at the household level and targeted various social and gender groups in three different communities. An illustrated booklet outlining MW farming was produced in English, Shona and Ndebele, the three languages most prevalent in Zimbabwe. The content of the booklet was explained to the farmers during meetings and workshops held prior to the 2005/6 MW season with the help of Government institutions (Rural District Councils, Forestry Research Centre and Institute of Environmental Studies) and NGO's (SAFIRE). At the beginning of the MW season the new and improved technologies were demonstrated to a number of households in the three study areas (Researchers from Project R7822). The communities decided which interventions they would implement. Some modifications were made depending on the household situation. Visits were made to the concerned households throughout the 2005/6 MW season to assess progress and provide advice where necessary (Gardiner 2006).

The attitudes of the three groups towards MW farming (as opposed to harvesting from the wild) differed depending on the wild harvest situation each was experiencing. This also influenced which aspects of the farming they considered useful. The households also differed in who took control of the farming. Men, women and children were involved depending on the household situation, most of the tasks being carried out by women and children. Many interventions in farming MW's have been developed and the choice of which methods and interventions to use will depend on the farmer's financial abilities and other social factors (Gardiner 2006). (Since this work a more detailed MW handbook has been produced but awaits publication). Due to time restrictions and budget constrains the user validation could only take place over one season which is to early in the farming process for financial benefits to be assessed.

Choice experiments were also carried out by Rob Hope of the Centre for Land Use and Water Resources Research, University of Newcastle-upon-Tyne (Hope et al. 2006). These results indicated that there are likely to be welfare gains from MW farming in both good and poor wild harvest years. People over 40 years of age and

people living in low and low/medium Mopane woodland zones are more likely to benefit from farming initiatives as, in addition to the willingness to accept a lower harvest price per unit of investment, this social group has a lower cost per unit of farm labour than younger people and people living in higher density woodland zones.

*11. **Where and when** have the output(s) been validated?*

*Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above **(max 300 words)**.*

Mopane Worm farming trials were carried out in three areas of Zimbabwe (Figure 1). The areas are semi-arid and the households are of the rainfed humid/dry smallholder type. The trial implementation was aimed at the household level and targeted various social and gender groups in the community. The farming of MW's is applicable to any gender and people of different social status.

The three sites in Zimbabwe chosen to implement the farming were ones where economic and biological work on MW's had already been carried out. The University of Zimbabwe, Institute of Environmental studies (IES), had carried out most of their economic work in the Matobo District (Gondo 2001, Frost 2003). For this reason the specific villages chosen were Ndiweni (part of the Madwaleni Ward in Tshatshani Communal area) 5 km south of the town Kezi and Kapeni (part of the Beula Ward in Mambali Communal Area) approximately 40 km south of the town Maphisa. Work carried out by the Zimbabwe Forestry Commission (Mushongahande 2003) on the biology of the MW had taken place at Village 27, Dombodema, 18 km NW of the town Plumtree in the Bulilimangwe District, this village was chosen as the third site.

Figure 1. Map of Zimbabwe illustrating the location of the three study sites in the south west of the country: 1-Ndiweni, 2-Kapeni and 3-Dombodema.

Current Situation

C. Current situation

12. ***How and by whom*** *are the outputs currently being used? Please give a brief description* ***(max. 250 words).***

Outputs such as bringing the mini-livestock closer to the households, harvesting, storage and marketing are being used by the households involved in the Kgetsi ya Tsie (KYT) Tswapong Hills Women's Micro-enterprise Community Trust (P.O. Box 429, Palapye, Botswana).

In the Bulilimangwe district in South Western Zimbabwe the application of improved marketing strategies has resulted in value being added to the product.

In the study area it is difficult to judge as currently the second rainy season since the households were provided with the farming methods has only just begun. As the project has ended no assessment is being made to the extent of its use. During the trial implementation phase households in Domdodema (site 3) expressed interest in further application of MW farming methods and technology together with a desire for more information and guidance.

Most of the people fall into the poverty grouping of extreme vulnerable poor *a*ssetless (or near assetless), with a few moderately poor, male & female headed households in rural areas. All members of the household may be involved in the farming. The task of locating eggs and harvesting caterpillars is mostly done by children, while women are involved in larval protection, harvesting, processing and marketing and men mainly take part in larval protection and pupa production. The extent to which men are involved in the MW farming process depends on the household situation.

13. ***Where*** *are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used* ***(max. 250 words).***

The outputs are being used in Botswana in the villages surrounding the Tswapong hills and East of the town Palapye.

They may also be in use in Zimbabwe, see answer to question 12, at three locations in the South West of the Country (Figure 1) in the Matobo District the villages Ndiweni (5 km south of the town Kezi) and Kapeni (approximately 40 km south of the town Maphisa). The third location was at Village 27, Dombodema, 18 km NW of the town Plumtree in the Bulilimamangwe District.

14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading

(max 250 words).

Not known

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

- At the community level gaining the enthusiasm of the local chief or village headman was important as he has an influence on a number of households and platforms (meetings) that may be vital for information dissemination.
- Governmental organizations were also important for instance:
  - District councils, together with the councillor, provided a platform for meetings and discussion groups.
  - Schools provided an effective means of disseminating the information as most of the information goes from the school back to the household.
- NGO's and Government Research bodies were useful especially for dissemination of information in the form of booklets and manuals.

The success of the promotion and/or adoption of outputs are largely dependent on the leadership of the programme, platform or institution. There are a number of channels available and careful selection is required. Rural District Councils and Community Trusts can play an important role. It is important that:

- they have a diverse portfolio
- the criteria for selection of natural resource products are clear (criteria should include a strong potential for value adding and/or importance to subsistence of poor rural households)
- flexible institutional structures and regulations that are designed with and for rural people are encouraged and allowed to develop over time
- micro-loans for investment in small enterprise activities and business skills training are considered.

The government agricultural extension workers and other relevant authorities need to be trained in the methods used in the MW farming system.

Current Promotion

D. Current promotion/uptake pathways

16. ***Where*** *is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion* ***(max 200 words).***

In Zimbabwe promotion is being undertaken by the Southern Alliance for Indigenous Resources (SAFIRE). This is through the HIVOS CBNRM –Information Strategy (IS) and Networking Project. Groups from different institutions meet to share information and an attempt is made to get the information to the MW producers. The promotion is

taking place in the South and South Western parts of Zimbabwe (Gwanda ward, Plumtree- Dombodema Resettlement Scheme, Mwenezi and Chiredzi Producer groups, Matobo (Ndiweni and Kapeni producer communities).

Promotion is also taking place in the Tswapong Hills of Botswana. Initial work on farming MW's was undertaken in this area. The Tswapong Hills Women's Micro-enterprise Community Trust is involved in promoting a number of natural products including MW's.

Further promotion could be planned regionally once the most recent detailed handbook on MW farming is published.

17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. ***(max 200 words)****.*

The main barrier currently is the lack of recognition of invertebrates as a mini-livestock by all levels from end user to policy makers. Information is not widely available and application of the methods and technologies developed requires the correct channels to be utilized. This would allow advice and support to get to the farmers, throughout the season over a number of years.

In some countries there is also a lack of sound property and ownership arrangements. Management of NTFP's requires sound ownership arrangements.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues ***(max 200 words).***

Promotion of the concept and technology involved in MW farming needs to be carried out at a number of levels, from the village (Chief) through to Governmental (Councillor or relevant authorities) and NGO levels. Government policies need to be analysed and adjusted were necessary (for instance individual property rights). The actual structures and institutions are in place but they need to be informed and utilized.

Institutions, people and policies that need to be considered in MW farming:

- Households (the users)
- Traditional institutions (Chiefs and Headman)
- Schools (teachers & students)
- Rural Development Councils, and their by-laws (Councillors)
- Legislation on NTFP's
- Research NGO's (e.g. SAFIRE, researchers & field officers)
- Government Research bodies (e.g. Institute of Environmental Studies & Department of Agricultural Economics, University of Zimbabwe)
- Government Ministries (for e.g. Ministry of Land and Agricultural Development, minister)

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

The emphasis of this project was the development of MW farming methods. The full scale implementation and usage by the poor of these methods was not possible until the methods had been developed. The trial implementation showed that the initial level of enthusiasm was high but required continued support in order to be maintained. The first booklet outlining MW farming methods was very well received.

For any tool (MW farming) to be taken up and utilized by a large number of poor people it has to be appropriate and cost- effective. Innovations must be matched to the resources, aspirations and constraints of current livelihood strategies of the resource users.

Harvesting and processing methods could have been better disseminated through the production of manuals and workshops. The possibility of cross- border interaction may also allow faster dissemination and use of new methods.

Research on mini-livestock methods and implementation of the work needs to be an ongoing process. Government departments also need to be targeted and the importance of MW's and other NTFP's emphasized.

Impacts On Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

No direct poverty studies were done

Indirect studies in Zimbabwe & Botswana include:

Frost, P.G.H. 2003. 1. Livelihoods and institutions: the socio-economics of Mopane Worm use. 2. Marketing of Mopane Worms in Southern Zimbabwe. Internal Annual Report 2002/2003: Mopane Woodlands and the Mopane Worm: Enhancing Rural Livelihoods and Resource Sustainability, DFID Project No. R7822. University of Zimbabwe, Institute of Environmental Studies

Hope, R.A. Frost, P.J.H. Gondo, T. Gardiner, A. Mushongahande, M. & Kozanayi, W. 2006. Social preferences to Mopane worm farming innovations in Zimbabwe's rural woodlands. Project technical report for DFID FRP R7822.

SAFIRE, 2002. Household Livelihood Analysis in Mwenezi and Chiredzi, Zimbabwe. An assessment of the role of Mopane worms in rural livelihoods. Unpublished research report.

Stack, J. Dorward, A. Gondo, T. Frost, P. Taylor F. & Kurebgaseka N. 2003. Mopane Worm Utilization and Rural livelihoods in Southern Africa. Paper presented at International Conference on Rural Livelihoods, Forests and

Biodiversity, 19-23 May, 2003, Bonn, Germany.

Taylor, F.W. 2003. Some Aspects of Innovation and Traditional Processing, Storage and Marketing of Mopane Worms in Botswana. Internal Report: Mopane Woodlands and the Mopane Worm: Enhancing Rural Livelihoods and Resource Sustainability, DFID Project No. R7822. Veld Products Research & Development, Gaborone, Botswana.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*
- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

The studies listed above were not directly related to assessing poverty alleviation due to adoption of the outputs. These studies were carried out at the same time as the farming methods were being developed. MW's constitute a resource that is taken advantage of when crops fail. The farming methods developed attempted to make it a more reliable source of income.

The findings of the studies listed in question 20 describe the current situation and indicate amongst other that:

In Zimbabwe

- MW sales can contribute anywhere between 11 and 26% of the total cash income and may be ranked second in importance after sale of large livestock (cattle/sheep/goats)
- on average women earned more from MW sales than either men or children.
- the vast majority of households rank the opportunity to earn cash income from the sale of MW's higher than food uses of MW's
- 'poor' households, while harvesting more Mopane worms than 'better off' households, earned slightly less overall. This is due largely to the 25% lower price received by 'poor' households, partly related to the timing of sales, and partly perhaps to the poor being less able to negotiate higher prices.
- not only the rural poor engage in harvesting and trading Mopane worms. Many petty traders in both rural and urban areas are involved in buying and selling Mopane worms, often with narrow profit margins
- the type of goods that MW income is spent on reflects the high level of participation of women and youths in MW collection
- income from forestry products tends to be of greater importance to poorer socio economic groups. In Mwenezi District for instance MW sales accounted for nearly forty percent of reported cash income for the bottom 25% of households, twenty percent of income for the middle 50% of households and less than 4% of cash income received by the top quartile.

In Botswana

- harvesters identified collection of MWs to be a vital source of income
- all harvesters are involved in other forms of livelihood including cropping, rearing livestock, selling traditional beer and working for the Drought Relief programme
- harvesters use the proceeds of MW sales for various household supplies including food, school uniforms and fees, buying household utensils, reinvestment in livestock, vending and property as well as paying medical expenses

Choice experiment work shows that trade-offs between labour and cash investment are critical parameters in designing interventions for different social groups. Integrated initiatives to optimize domestic harvest levels and increase harvest prices for producers are considered important to increasing social benefits and widening adoption of MW farming innovations for rural development goals (Hope et al. 2006).

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? ***(max 300 words)***
This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

Colophospermum mopane (Mopane tree) is a hardwood widely utilized as building material and firewood. This tree species is the food plant for the MW. By domesticating MW's and encouraging the utilization of this mini-livestock an additional value is placed on woodlands and forested areas. A further incentive to conserve the woodlands is created by incorporating MW farming with the development of other woodland products such as medicinal roots, rope etc.

Conservation of the woodlands will aid water retention. Erosion is also a problem in many of these areas and woodland maintenance will also aid soil conservation. These system services are difficult to measure but their importance is starting to be recognized.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? ***(max 100 words)***

The promotion of the utilization of MW's needs to be closely linked with good farming practices. Over-harvesting of wild stock without a restocking programme could lead to depletion of wild stock. This would result in the decline of MW's and possible local extinction. There is the possibility of the introduction of diseases which might be destructive to local populations; however these diseases are probably already widely distributed.

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

In many of the areas concerned increase drying is likely to occur with climate change. The MW and Mopane tree are fairly resistant to droughts and can withstand very dry conditions. This resource is likely to prove more valuable under such conditions as the ability to grow other crops decreases.

Annex

Annex A

Frost, P.G.H. 2003. 1. Livelihoods and institutions: the socio-economics of Mopane Worm use. 2. Marketing of Mopane Worms in Southern Zimbabwe. Internal Annual Report 2002/2003: Mopane Woodlands and the Mopane Worm: Enhancing Rural Livelihoods and Resource Sustainability, DFID Project No. R7822. University of Zimbabwe, Institute of Environmental Studies

Gardiner, A. 2006. Minilivestock: Rural Mopane Worm Farming at the Household Level. Internal Final Report 2006: Mopane Woodlands and the Mopane Worm: Enhancing Rural Livelihoods and Resource Sustainability, DFID Project No. R7822. Minilivestock: Rural Mopane Worm Farming at the Household Level.

Gondo, T. 2001. Mopane Worm Utilization and Rural Livelihoods: The case of Matobo District. Masters Thesis. Department of Rural and Urban Planning, University of Zimbabwe

Hope R.A., Frost P.J.H., Gondo T., Gardiner A., Mushongahande M. & Kozanayi W. 2006. Social preferences to Mopane worm farming innovations in Zimbabwe's rural woodlands. Project technical report for DFID FRP R7822.

Mushongahande, M.2003. Notes on the biology of the Mopane Worm. Mopane Worm Annual Project Report: Mopane Woodlands and the Mopane Worm: Enhancing Rural Livelihoods and Resource Sustainability, DFID Project No. R7822. Forestry Commission of Zimbabwe.

Stack, J. Dorward, A. Gondo, T. Frost, P. Taylor F. & Kurebgaseka N. 2003. Mopane Worm Utilization and Rural livelihoods in Southern Africa. Paper presented at International Conference on Rural Livelihoods, Forests and Biodiversity, 19-23 May, 2003, Bonn, Germany.

Taylor, F.W. 2003. Some Aspects of Innovation and Traditional Processing, Storage and Marketing of Mopane Worms in Botswana. Internal Report: Mopane Woodlands and the Mopane Worm: Enhancing Rural Livelihoods and Resource Sustainability, DFID Project No. R7822. Veld Products Research & Development, Gaborone, Botswana.
