

PROJECT COMPLETION SUMMARY SHEET

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6/6/02

Project Title: The production of high quality silage from adapted forage and legume crops for the maintenance of dairy cow productivity on smallholder farms through the dry season in the semi-arid region of Zimbabwe

DFID Project Reference No: R7010

Programme: Livestock Production Programme

Programme Manager (Institution): Dr J I Richards (NRIL)

Lead Institute University of Zimbabwe

Collaborating Organisations Matopos Research Station, Bulawayo, Zimbabwe

Production System: Semi Arid Crop Livestock

Programme Purpose: 1

Commodity Base: Silage – feed for cattle during the dry season

Beneficiaries: Small holder dairy farmers in the semi-arid region of Southern Africa

Target Institutions: AGRITEX and the Dairy Development Programme

Geographic Focus: Southern Africa

	Planned	Actual
Start Date:	1/4/97	1/4/97
Finish Date:	31/3/00	31/3/02
Total Cost:	£85,170	£85,170

1. Project Purpose:

The project purpose was to determine the feasibility of producing and conserving sufficient biomass of high quality forage to maintain good productivity in small holder dairy cows during the dry season.

2. Outputs:

The results showed that:

- Forage sorghum and Pennisetums can be intercropped with lablab (dolichos bean) or cow pea to produce up to 8 tons dry matter per hectare on sandy soil under formal experimental conditions and up to 4 tons dry matter per hectare under farming conditions. This is an average yield over three seasons, which included a severe drought.
- With the inclusion of legume, the protein content of the harvested forage averages 11.5% crude protein with an ME value of 9.2MJ/kg dry matter, which meets the nutrient requirements of maintenance and 5 litres of milk in a cross-bred dairy cow.
- The forage can be successfully ensiled in quantities of up to 15 kg in reject fertiliser bags or recycled garbage bags using a hand or petrol driven chopper with manual compression in the bags of the forage.
- Over two good seasons it was found that enough bags were produced on farm (ranging from 130 to 400 bags over forty farms) to feed two cows one bag a day each for the last two months of the dry season, i.e. two months before calving. This allowed the cows to calve in good condition (average body condition score 2.5) which was shown to be important for normal return to conception but had no significant effect on lactation yields in indigenous nor in cross bred cows. In the drought year, the equivalent of half a bag a day was fed over one month before calving and this allowed body condition maintenance of 1.75 BCS which kept the cows alive, while control cows on no supplement were emaciated or died.

3. Contribution of Outputs to Project Goal:

The outputs of the project have been achieved. The project showed that it is feasible for a small holder dairy farmer in the semi-arid region to produce and conserve high quality forage for dry season feeding of his dairy cows, thus making dairy production a potentially viable enterprise in this region. However, the project goal is to produce the high quality silage at low cost and this still presents challenges. Harvesting management requires further development, taking into account the need to harvest early to achieve maximum nutrient content and digestibility with wilting and locally available additives to produce the best possible silage quality against the constraint of other farming activities and labour. Feeding strategy also requires further investigation, especially in cross bred cows, to optimise both fertility and lactation yields. In the drier areas, where there is dam or borehole water, strategic flood irrigation could overcome problems with establishment of the forages and this, together with further selection of forage legume trees for inclusion of leaf material in silages, is recommended for future research. The major challenge may lie in production costs, as fertiliser prices increase rapidly with inflation. The system of producing bagged silage under central management on land provided by the community, where manure can replace fertiliser if the cattle are kept in a central dairy unit is worth investigating.

4. Publications:

Titterton, M. and Maasdorp, B.V. 1999. Polyphenolic influence on utilisation of dried fodder of *Acacia boliviana*, *Calliandra calothyrsus* and *Leucaena leucocephala* for milk production by dairy cows. Poster presented to *International Symposium on Polyphenolics in Tropical Ruminant Production*. October 11-14. Matopos, Zimbabwe.

Titterton, M., Mhere, O., Maasdorp, B., Kipnis, T., Ashbell, and G. Weinberg, Z. 1999. Conservation of forages for dry season feeding of livestock in the semi-arid areas of the tropics. In *Proceedings of the Joint ZSAP/FAO Workshop on "Strategies for dry season feeding of animals"* held by Zimbabwe Society for Animal Production. October 25-27. Harare, Zimbabwe.

Titterton, M. and Bareeba, G.B. 1999. Grass and legume silages in the tropics. Paper presented to *Electronic conference on Tropical Silage held by Food and Agriculture Organisation*. September 15-30. Website:
<http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPC/doc/pasture/pasture.h>

Titterton, M., Mhere, O., Kipnis, T., Ashbell, G., Weinberg, Z.G. and Maasdorp, B.V. 1999. Development of ensiling technology for the small holder cattle owner in Zimbabwe. Poster presented to *Electronic conference on Tropical Silage held by Food and Agriculture Organisation*. September 15-30. Website:
<http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPC/doc/pasture/pasture.ht>.

Titterton, M., Maasdorp, B.V., Mhere, O., Mugweni, B. and Nyoni, L. 1999. Forage production and conservation for dry season feeding of dairy cows in the semi-arid regions of Zimbabwe. In *Proceedings of Workshop convened by The Department for International Development (UK) Livestock Production Programme* February 21-23. Matopos, Zimbabwe.

Maasdorp, B.V. and Titterton, M. 2000. Small holder forage production and conservation for supplementation of poor-quality grazing. 1. Legume tree fodder. Poster presented to *"Rangelands for the New Millennium", 35th Congress for Grassland Society of Southern Africa and Grassland Society of Zimbabwe*. January 31 to February 3. Triangle, Zimbabwe.

Mhere, O., Maasdorp, B.V. and Titterton, M. 2000. Small holder forage production and conservation for supplementation of poor-quality silage. 2. Forage sorghum and hybrid pennisetum biomass production and silage quality. Poster presented to *"Rangelands for the New Millennium", 35th Congress for Grassland Society of Southern Africa and Grassland Society of Zimbabwe*. January 31 to February 3. Triangle, Zimbabwe.

Titterton, M., Mhere, O., Maasdorp, B.V., Kipnis, T., Ashbell, G. and Weinberg, Z. 2000. Small holder forage production and conservation for supplementation of poor-quality silage. 3. Ensilage technology. Poster presented to "*Rangelands for the New Millenium*", 35th Congress for Grassland Society of Southern Africa and Grassland Society of Zimbabwe. January 31 to February 3. Triangle, Zimbabwe.

Moyo, M.T., Maasdorp, B.V., Titterton, M. and Tererai, B. 2000. Forage yield and nutritive yield of mono- and inter-cropped cereal and legume crops grown on highveld sandy and clay soils in Zimbabwe. Paper presented to "*Rangelands for the New Millenium*", 35th Congress for Grassland Society of Southern Africa and Grassland Society of Zimbabwe. January 31 to February 3. Triangle, Zimbabwe.

Mhere, O. 1999. Intercropping forage and legume crops. In (Titterton *et al.*) Forage Production and Conservation for Dry Season Feeding of Dairy Cows in the Semi-Arid Regions of Zimbabwe. In (Ed. T. Smith) Proc. DFID Workshop on Livestock Production in the Semi-Arid Regions of Zimbabwe. Matopos, Zimbabwe. Feb.1999 pp 53-59

Mugweni, B.Z., Titterton, M., Maasdorp, B. and Gandiya, F. 2000. Effect of mixed cereal-forage tree legume silages on milk production from lactating Holstein dairy cows. In (Ed. T. Smith) Proceedings of Workshop on *Research Progress in Livestock Production in Zimbabwe*, convened by the Department of International Development. September 27-29. Matopos, Zimbabwe

Nyoni, L., Titterton, M., Hamudikuwanda, H. and Mutisi, C. 2000. The effect of prepartum supplementation on body condition score changes and post partum lactational responses in indigenous and indigenous-Jersey cross-bred dairy cows. In (Ed. T. Smith) Proceedings of Workshop on *Research Progress in Livestock Production in Zimbabwe*, convened by the Department for International Development. September 27-29, Zimbabwe.

5. Internal Reports:

Quarterly reports for
1997: June, September, December
1998 June, September, December
1999 June, September, December
2000 June, September, December
2001 June, September, December
End of year reports:
1998: March
1999 March
2000 March
2001 March

6. Other Dissemination of Results:

Forage Production and Conservation. A manual for extension workers and farming leaders, produced in English, Shona and Ndebele. The manual has been so designed that extensionists can remove sections to be arranged into brochures for farmer use.

Forage manual to be put on the internet.

Field days : at least six field days a year have been held mostly for farmers in the area but also for visiting groups from other areas, brought by the Dairy Development Programme.

Radio talks: given by Owen Mhere for an agricultural extension programme.

Discussion groups- on a weekly basis, with the farmers in the area, attended by members of Matopos Research Station, Extension field officers and officers of the Dairy Development Programme.

Invited paper to be presented at the International Silage Conference, September 2002, will include the outputs of the research carried out on the project.

7. Follow-up indicated/planned:

A demonstration centre is to be established at Datata village which is in the area of the project site. The centre has already been developed for a research and development project but funds were withdrawn on political grounds. However, there are several stakeholders who will pool resources to develop and operate the demonstration centre, including the New Zealand Volunteer Services Abroad, who will send a volunteer to manage the centre and coordinate dissemination activities with the Dairy Development Programme and AGRITEX, FAO, who already have a project on dissemination on sorghum and millet production and this incorporates a component on dry season feeding of forage sorghum, Dairy Development Programme who have been given a small grant to develop a dissemination programme on forage production and conservation and the Department of Animal Science and Matopos Research Station who will provide the expertise required for the development of the programme.

8. Name and signature of author of this report.

Dr Marion Titterton