THE USE OF OILSEED CAKE FROM SMALL-SCALE PROCESSING OPERATIONS FOR INCLUSION IN RATIONS FOR PERI-URBAN POULTRY AND SMALL RUMINANT PRODUCTION (R7524)

John F. Wood[1] and Bart Mupeta[2]

[1] *Natural Resources Institute, Central Avenue, Chatham Maritme, Chatham, Kent, ME4 4TB, Uk.*
[2] *Henderson Research Station, P. Bag 2004, Mazowe, Zimbabwe*

ABSTRACT

The development of poultry feeds in rural areas has been constrained by lack of information on the feeding value of potential protein sources such as sunflower cake produced by the ram press. The press cake is high in fibre, protein and fat, and is a valuable source of energy, lysine and methionine for poultry. Selective sieving of the press cake can reduce the fibre level by approximately 28% and increase the protein level by 15%. In –vitro digestibility studies (gas production) indicate that the ram press cake may be slowly degraded in the rumen.

INTRODUCTION

Small-scale pressing of oilseeds is well established, but information on the use of the oilcakes in small-scale livestock production is unavailable. The project will enable peri-urban and rural livestock producers to make the best utilisation of sunflower oilseed cakes in local feeds. The high level of fibre in oilcake is a constraint to its inclusion in poultry feeds. Simple technologies for separating the fibre fraction will be investigated and the performance of broiler feeds based on reduced-fibre oilcakes evaluated. Oilcakes are valuable sources of protein for small ruminants on nitrogen deficient diets. Little is known of the digestibility characteristics of ram-pressed sunflower cake and the effect which the relatively high fat levels may have on rumen function. The income generating potential of oilcake-based small-scale livestock production will be evaluated.

PROJECT PROGRESS

Developments have been made in four areas:

1. Socio-economic analysis of poultry and small ruminant production in Zimbabwe.
2. Improving the facilities for feeding trials with goats and poultry at Henderson Research Station.
3. Analytical data on feed raw materials for feeding trials.
4. Experimental studies in fibre removal from ram-pressed sunflower cake.

1. Socio-economic analysis of poultry and small ruminant production in Zimbabwe.

Studies were conducted in four poultry and small ruminant producing areas of Zimbabwe, two communal and two peri-urban (Hanyani-Mlambo, 2000). Peri-urban areas were Domboshava, which borders Harare, and Esigodini, which borders Bulawayo. Selected communal areas were Muzarabani and Chivi Districts. Surveys revealed that about 95% of peri-urban and communal families keep poultry, and the

majority of indigenous poultry producers in communal areas are women. Indigenous poultry are reared under a scavenging system where inputs for housing, breeding and feeding are minimal, and productivity is low. Hybrid birds are reared by the richer, more educated farmers. In typical communal areas, only 10% of farmers are involved in hybrid poultry production. Approximately 70% of hybrid producers reside in peri-urban areas and 30% in communal areas. Hybrid poultry production systems are run strictly on business lines, and may be broilers, layers or mixed systems. Flock sizes ranged from 25-1800 birds, with a mean of 159 birds. In contrast the mean indigenous flock was 21 birds with a range of 2-110. Occasionally indigenous birds are fed spoiled grain, oilseeds or household scraps. There was no evidence of the provision of compounded feed to indigenous birds to enhance their growth or egg laying performance. Most eggs are retained for regeneration of the flock.

Small ruminant production is based on a scavenging / browsing system, with minimal supplementary feed.

Chicken meat is preferred to goat meat, but some consumers prefer the tender meat from hybrid birds, rather than the more mature and tougher texture of indigenous birds. Indigenous birds may be more than five months of age before slaughter compared with a hybrid slaughtered at 7-10 weeks, at a live weight of approximately 2 kg.

Many producers considered that the rearing of both poultry and small ruminants was an insurance mechanism to provide food in times of drought, vagaries in the weather or other adverse factors within the local farming system.

2. Improving the facilities for feeding trials with goats and poultry at Henderson Research Station

Henderson Research Station has a good infrastructure for conducting controlled animal feeding trials. However, although the buildings are sound they required upgrading to enable measurements of the individual feeding characteristics of goats and the group feeding of poultry to be conducted. Project funds were dispersed for this upgrading, and revisions to pens are near completion. Since poultry studies will include the comparative performance of commercial broilers and indigenous birds a small egg hatcher has been purchased to enable eggs collected from rural areas to be hatched under controlled conditions.

Six hundred kg of sunflower seed of a local variety, 'Pannar', (a high oil hybrid) have been ram-pressed at Henderson in readiness for the preparation of feeds.

Efficiency of oil extraction from sunflower seed:

The efficiency of oil extraction from the ram press is a function of human effort, appropriate setting up of the press, the temperature of the seed and its varietal characteristics. For the experimental material: 100 kg seed of 43.2% oil content yielded 85 kg cake of 33% oil content and 15 kg of sunflower oil.

3. Analytical data on feed raw materials for feeding trials.

Samples of ram-pressed cake and prospective feed materials for poultry and goat feeding trials have been analysed for chemical composition, and where appropriate for *in–vitro* digestibility by the gas production method. (Tables 1,2 and 3)

Raw materials for use in poultry diets will include sunflower cake, soyabean meal, maize, minerals and vitamins. It is expected that 75-80% of the raw materials for poultry production can be sourced from a peri-urban or rural farm. For goat trials, all raw materials can be sourced from rural or peri-urban areas. These are sunflower cake, sunflower heads, maize stover and groundnut tops, together with access to vegetation for browsing.

The amino acid analyses of ram-pressed cake obtained from village sources is similar to that of seed pressed at Henderson, and confirms the relatively low levels of lysine and methionine in this raw material (0.7% and 0.4% respectively). Supplementation of sunflower with additional sources of protein, such as soya bean meal, which are high in lysine, methionine and cystine, will be necessary to obtain reasonable growth performance of poultry.

In vitro digestibility studies imply that, relative to sunflower heads, groundnut tops and maize stover, sunflower ram-pressed cake will not be rapidly degraded in the rumen. This may be a function of the high fat content in the cake giving a degree of protection against microbial degradation. Feeding trials will indicate the levels of fat in the sunflower cake which may depress rumen function.

4. Experimental studies in fibre removal from ram-pressed sunflower cake

Fibre levels of 20% in sunflower cake are potentially limiting the inclusion of this material in poultry diets where the target fibre level in the final feed is approximately 6%. Any reduction in fibre will cause a corresponding increase in protein and oil, which may assist in increasing the inclusion level of sunflower cake in the diet. Trials have been conducted at NRI and Henderson to determine whether sieving can remove fibre from sunflower cake to any significant level.

The results of the trials are presented in Table 1 and may be sumarised as follows: screening through a 1mm screen can reduce the fibre level in sunflower cake by 40%, but the yield of this material is low when compared to the amount of energy and time used to produce it. Sieving through a 1.4 mm screen produces a fine product with a 28% fibre reduction and 15% increase in protein. The fraction passing through the sieve represents 30% of the original material and is a feasible product to produce. While the fraction passing through a 2 mm screen appears to give a similar product to that obtained by a 1.4 mm screen, there was a greater sensitivity needed on the part of the operator not to force as much as possible through the screen. A 1.4 mm screen will more likely be a promising compromise. The fine, lower fibre and higher protein material passing through the sieve can be used for poultry feed. The coarser retained fraction can be used for goats.

PROPOSED FEEDING TRIALS

Poultry:

Phase 1

- Hybrids vs Indigenous stock using commercial starter and finisher feeds
  Start date: December 2000

Phase 2

- Increasing levels of sunflower ram-pressed sunflower cake (RPSFC) in balanced feed for finishers, but using a commercial starter

- Increasing levels of RPSFC in balanced feeds for starter and finisher

Goats:

- Stall-fed complete diets based on RPSFC, maize stover, sunflower heads, groundnut tops, minerals.
- Stall-fed + browse + RPSFC
- Browse +RPSFC
- Browse only

REFERENCE

Hanyani-Mlambo, B.T. 2000. Demand for livestock fed and benefits for the poor: A Zimbabwean case study . *Project Report March 2000.* NRI, pp 17.

Table 1: Nutritional value of feed raw materials

a) For poultry feeding trials:

Raw material	Oil (%)	Crude Protein (%)	Crude Fibre (%)	Lysine (%)	Meth. + cys. (%)	Ca (%)	P (%)	ME (MJ/kg)
RPSFC[12]	32.6	20.3	20.2	0.72	0.81	0.2	1.0	12.3
Maize	4.0	9.0	3.0	0.27	0.36	0.02	0.25	14.2
Soya bean meal	1.0	44.5	5.5	3.0	1.4	0.3	0.6	9.4
Fishmeal	4.0	65.0	-	5.0	2.5	6.2	3.0	11.5

b) For goat feeding trials:

Raw material	Oil (%)	Crude Protein (%)	Crude Fibre (%)	Ash (%)	ME (MJ/kg)
RPSFC[1]	32.6	20.3	20.2	4.3	11.1[3]
Sunflower heads	14.7	13.4	31.6	6.1	7.4
Groundnut tops	2.1	12.6	34.3	15.2	7.6
Maize stover	1.2	4.0	39.9	6.2	7.1

[1]RPSFC = ram-pressed sunflower cake
[2]Potential limitations in RPSFC: high fibre and high fat
[3] estimated at 90% of poultry ME

Table 2: *In-vitro digestibility* of feed raw materials for goat feeding trial (Rate of gas production with time)

Feed material	Peak gas production rate (ml/hour)	Time at peak gas production (hours)
Maize stover	6	14
Groundnut tops	8.5	12
Sunflower heads	12.5	14
RPSFC[1]	4.5	5

[1] RPSFC = ram-pressed sunflower cake

Table 3 Amino acid composition of ram-pressed sunflower cake (RPSFC) (% by weight of raw material)

	Village produced RPSFC	Henderson produced RPSFC
Taurine	0.03	0.03
Hydroxyproline	0.07	0.07
Aspartic acid	1.74	1.68
Threonine	0.74	0.69
Serine	0.78	0.71
Glutamic acid	3.52	3.44
Proline	0.84	0.79
Glycine	1.31	1.06
Alanine	0.87	0.82
Cysteine	0.41	0.34
Valine	1.03	0.97
Methionine	0.45	0.41
Isoleucine	0.84	0.78
Leucine	1.29	1.19
Tyrosine	0.47	0.40
Phenylalanine	0.90	0.86
Hydroxylysine	0.01	0.02
Histidine	0.53	0.46
Ornithine	0.02	0.02
Lysine	0.77	0.67
Arginine	1.62	1.57
Tryptophan	0.26	0.23

Table 4 Removing limitations for ram-pressed sunflower cake (RPSFC): **effectiveness of fibre separation from RPSFC by sieving**

Screen size		Fibre	Oil	Protein	%
RPSFC		20.2	32.6	20.3	100
1.0 mm	Retained	22.8	29.4	15.7	88
	Through	11.7	35.0	26.9	12
1.4 mm[1]	Retained	22.9	29.6	18.6	70
	Through	14.5	32.2	23.1	30
2.0 mm	Retained	25.4	29.8	14.1	76
	Through	15.0	33.4	23.1	24

[1]**At 1.4 mm: 28% reduction in fibre,**
15% increase in protein