

Report on a visit to Tanzania  
to review ram presses for  
Appropriate Technology  
International.

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List of abbreviations

|          |   |
|----------|---|
| ATI      | Appropriate Technology International                          |
| CAMARTEC | Centre for Agricultural Mechanisation and Rural<br>Technology |
| CAPU     | Craftsmen and Artisans Production Unit                        |
| NRI      | Natural Resources Institute                                   |
| TSh      | Tanzanian shilling  |
| VOPP     | Village Oil Press Project                                     |

Currency (official rate):

TSh 484 approximately equal to £1  
TSh 323 approximately equal to \$1

## SUMMARY AND CONCLUSIONS

1. This visit report provides details of the main findings of a study (carried out during 13 February - 5 March 1993) of ram presses in use in Tanzania. The assignment was undertaken on contract by Tony Swetman (Oilseed Technologist) of the Natural Resources Institute (NRI) on behalf of Appropriate Technology International (ATI).

2. A total of twelve ram presses being used under field conditions for sunflower seed processing were tested. These comprised four of the original large ram press introduced in 1985 (Nand Singh type); five of an intermediate size introduced in about 1989 (CAPU type); and three of a smaller version of the press introduced in 1991 (CAMARTEC type).

3. The following extrapolated throughput and yield figures were recorded using the three press types to process 50 Kg "Record" variety sunflower seed:

\* Nand Singh (two operators):  
output - between 12.9 and 17.4 litres of crude oil,  
throughput - between 10.3 and 18.8 kg seed per hour;

\* CAPU (one operator):  
output - between 11.3 and 17.5 litres of crude oil,  
throughput - between 7.1 and 25.0 kg seed per hour;

\* CAMARTEC (one operator):  
output - between 12.7 and 16.5 litres of crude oil,  
throughput - 5.3 to 14.3 kg seed per hour.

The presses are progressively more arduous to operate as they increase in size.

4. The author was accompanied for some of the time by Carl Bielenberg (ATI engineer and inventor of the original ram press) who assessed wear characteristics of the various presses. He expressed concern over the wear of certain components (including tie-bars and swivel pins) of the CAMARTEC presses which had occurred during relatively short operating periods.

5. The original Nand Singh press is no longer in production in Tanzania. Both the CAPU and CAMARTEC presses are still being made. The Village Oil Press Project (VOPP) is currently only promoting the CAMARTEC press.

6. It was concluded that, although the CAMARTEC press has potential for addressing the needs of the target market for presses (smallholder farmers and women) it would benefit from being strengthened. The author recommends that three strengthened presses be tested thoroughly and monitored regularly over a three month period during the sunflower harvesting season at three

separate sites in Tanzania. This testing is considered essential in order to assess the robustness of the CAMARTEC press.

7. A strengthened CAMARTEC press was tested for performance and was found to produce 15.5 litres of crude sunflower seed oil per 50 kg bag at a throughput of 7.1 kg seed per hour. This compares favourably with figures achieved with the earlier CAMARTEC version. CAMARTEC staff estimate that the strengthened press will increase in price from Tsh 35,000 to between Tsh 45,000 and Tsh 50,000 as a result of this strengthening. The durability, sunflower seed throughput and oil yield of the CAPU press have been proven. The durability of the existing CAMARTEC press is in doubt. The current price of a CAPU press has been estimated by CAMARTEC staff at about Tsh 120,000.

8. Based on the findings of this survey, it would be prudent to monitor more closely the performance of the CAMARTEC press and to then promote its wider application, but not to the exclusion of the CAPU press.

Other principal technical findings were:

9. Increasing the stroke rate of the ram press increased the throughput of sunflower seed at the expense of yield.

10. A CAMARTEC press was tested using groundnut kernels, and both a CAMARTEC press and a CAPU were tested using sesame seed. The following throughput and yield figures were recorded for 50 Kg amounts of seed:

\* CAMARTEC

Groundnut kernels:

output - between 14 and 16 litres of crude oil;

input - 5 kg kernels per hour.

Sesame seed:

output - between 18 and 22 litres of crude oil;

input - 4 kg seed per hour.

\* CAPU

Sesame seed:

output - 15.9 litres crude oil

input - 7 kg per hour.

11. Oil extraction efficiencies are higher when both sesame seed and groundnut kernels are heated over a boiling water bath compared with sun heating. The temperature attained by the seed in the water bath was around 20°C higher than that achieved by sun heating.

12. It is recommended that a comprehensive field trial be undertaken using the two press types to determine the performance and financial viability of processing sesame seed and groundnut kernels. The high yield of oil from

sesame seed using the CAMARTEC press is worthy of further investigation. There is potential for user uptake of the press for processing both these crops not only in Tanzania but in other African countries.

13. Simple financial feasibilities are presented for both the CAMARTEC and CAPU press based on observations of throughput and yield made during this visit.

#### **TERMS OF REFERENCE**

14. The following are the terms of reference drawn up prior to the visit:

15. To carry out field testing in Tanzania on ten selected ram presses (to include three first generation presses, three CAPU presses and four CAMARTEC presses).

16. To set up, carry out and report on press performance tests which measure the quantity of seed used, the quantity of oil produced and the elapsed time. Also to provide descriptive information about the condition of the press, the temperature, moisture content and cleanliness of the seed, the weather conditions, the clarity of the oil produced, the method of clarification used and other relevant information.

17. To compile qualitative data on each press including the ease of operation, durability, perceived profitability, and the overall owner/user satisfaction with the different press models.

18. To determine oil content of seed and cake samples retained from each press.

19. To prepare a report to include a brief quantitative and qualitative description of the tests performed at each site and a summary of the relative performance data (yield and throughput) of the various presses and seeds tested.

20. To review and make comments on the ram press operators' manual.

21. The following additional tasks were performed following consultation with Jeanne Downing (Manager, Africa Programme, ATI), Carl Bielenberg (ATI engineer), Lynn Schlueter (Director, VOPP) and Erwin Protzen (Technical Director, CAMARTEC) after arrival in Tanzania:

22. To carry out performance trials using both the CAMARTEC and CAPU presses to process sesame seed and groundnut kernels both after heating on a water bath and heating in the sun.

23. To review differences in throughput and oil yield obtained by (i) varying the handle stroke rate when processing sunflower seed in a CAPU press and (ii)

widening the cage gaps when processing both sesame seed and sunflower seed using a CAPU press.

24. To review the difference in performance when using the CAMARTEC press fitted with both a 30mm ram and a 40 mm ram to process groundnut kernels.

#### **FIELD VISITS**

25. A total of twelve ram presses being used under field conditions for sunflower seed processing were tested. These comprised four of the original large ram press introduced in 1985 (Nand Singh type); five of an intermediate size version introduced in about 1989 (CAPU type); and three of a small version of the press introduced in 1991 (CAMARTEC type).

26. The author was accompanied by the workshop manager from CAMARTEC (Livinous Manyanga) on all visits to press sites and by Carl Bielenberg on visits to CAMARTEC and CAPU presses.

27. "Record" variety sunflower seed was used to test the various ram presses enabling direct comparisons to be made both within press types and between the three press types.

28. Throughput and yield data were collected from each press and their performance are reported below. All weights were taken using a portable battery-operated balance capable of weighing 5 Kg to an accuracy of one gram. Temperature measurements were carried out using a temperature probe.

29. Where local operators were available, they were used to operate the presses. If labour was not available either Carl Bielenberg, Livinous Manyanga or the author (all experienced ram press operators) worked the presses.

30. All the pre-processing practices as normally adopted by the press owners were used prior to press testing.

31. Appendix I contains report sheets for each ram press including observations on the operation.

32. Appendix II is a summary table of the presses tested and contains the following information: press type; ambient temperature; temperature of seed into the ram press; moisture and oil contents of both seed and cake; amount processed during the test; number of strokes per minute; process time; amount processed per hour; weight of crude oil and cake; extrapolated figures for the volume of both crude and clarified oil obtained per 50 Kg bag of seed; percentage crude oil extraction efficiency based on measured yield of oil; and the total number of bags processed using the unit, based on replies from press owners.

33. Moisture content determinations (oven method) and oil content determinations (Newport Quantity Analyser; checked by reference to Soxhlet extraction) were carried out on seed and cake samples on return to UK. Appendix II contains the results.

34. Sediment trials were carried out at ambient temperature (24°C) in the VOPP offices in Arusha and were measured by volume after standing for between 3 and 7 days. These figures are contained in the individual report sheets (Appendix I).

35. The following account has included observations on the mechanical components of the presses and their performance; but it is important to note that Carl Bielenberg (ATI engineer), who was specifically employed to report on these aspects, has prepared a detailed report.

#### **Nand Singh Presses**

36. Four examples of the large ram press introduced in Tanzania in 1985 (Nand Singh type) were visited, all in the Babati area. The owners were: Mrs Mataya (farmer) Mwikantsi village; Mr Kaisa (extension worker) Mamire village; Mr Kweka (council worker) Babati town; and Mr Kilinga (medical officer) Babati town.

37. The press owned by Mr Kweka had processed 1600 bags of 50 Kg (80 tonnes) since he purchased it new in 1985. Several repairs had been carried out in local workshops over the years (outlined in visit report, Appendix I). This was the oldest press tested and the fact that it is still being used demonstrates its robust nature even after several repairs.

38. The Nand Singh presses are, however, arduous to operate, requiring two operators but owners benefit from high seed throughputs. The press owned by Mr Kaisa was only being operated by one labourer who was not employing a full handle stroke. His stroke rate was high (24 per minute) compared with the range for the other three of 8-14 per minute. This was reflected in the poor oil yield (6.8 litres) per bag compared with the range of 11.9-16.1 litres per bag recorded for the other three presses. For this reason the Kaisa press was not included when calculating the mean yields for the Nand Singh presses (Appendix II).

39. Nand Singh press owners were satisfied with their presses even though arduous to use. All those visited employed hired labourers to carry out the pressing and reported no shortage of applicants. The Nand Singh press is no longer manufactured in Tanzania having been superseded by the CAPU and CAMARTEC versions.

40. The following average figures were recorded for the Nand Singh presses visited (excluding that of Kaisa):

|  |         |
|--|---------|
| Amount of sunflower seed processed per hour: | 15.6Kg  |
| % oil content of seed                        | : 48.6% |
| % residual oil content of cake               | : 27.9% |
| Volume (litres crude oil/50 Kg bag seed)     | : 14.5  |
| % oil extraction efficiency (crude oil)      | : 58.5% |

#### **CAPU presses**

41. Five of the intermediate size version introduced in about 1989 (CAPU type) were tested. The presses belonged to the following: Mrs Machibula, Kondoa town; VOPP - not yet sold - , Kondoa town; Mr Isere, Mrijo Juu village; Jaribu women's' group, Mrijo Juu village; and CAMARTEC in Arusha.

42. The press most intensively operated in this group was that of Mrs Machibula of Kondoa who used it on the balcony of her apartment. Mrs Machibula indicated that this press had processed 300 bags of 50 Kg (15 tonnes) since 1990. Mrs Machibula had shortened the handle of the press to stop it hitting a projection over the balcony. She said she found no difficulty in operating the press herself but often used labourers. She buys seed and sells the processed oil. She was pleased with the press performance and considered it a useful source of income.

43. All owners liked the CAPU presses. Mr Isere had purchased a CAMARTEC press but had decided to replace it with a CAPU type as he found the throughput too slow.

44. The following average figures were recorded for the CAPU presses visited:

|  |         |
|--|---------|
| Amount of sunflower seed processed per hour: | 11.9Kg  |
| % oil content of seed                        | : 47.6% |
| % residual oil content of cake               | : 24.3% |
| Volume (litres crude oil/50 Kg bag seed)     | : 14.4  |
| % oil extraction efficiency (crude oil)      | : 59.0% |

#### **CAMARTEC presses**

45. Five CAMARTEC presses were visited and four tested. That belonging to Mr Ali of Mrijo Chini was observed and samples taken from a run carried out (but not observed by the author) that afternoon. The other presses belonged to the following: Mr Sule, Kondoa town; Mrs Msaya, Kondoa town; Mrs Nduka, Mrijo Juu; and CAMARTEC in Arusha. This latter press was a modified, strengthened press manufactured (during the author's visit) at the request of Carl Bielenberg by CAMARTEC staff according to a design by Erwin Protzen.

46. A common complaint among CAMARTEC press owners was that the piston tended to jam and that parts were wearing quickly. Carl Bielenberg observed that the swivel pins and tie bars were showing excessive signs of wear after

reported short operating times. Appendix III contains a photograph of this effect. None of the presses visited had processed more than 60 bags (3 tonnes - Mrs Nduka). Others were reported as having processed only 2 bags (Sule and Msaya). All these presses showed signs of wear. That of Mr Ali was in very good condition (15 bags processed) and had been recently cleaned with water when inspected. Mr Ali considered that over-zealous operation to maximise yield and not cleaning the press after use were the reasons for undue wear.

47. Mr Sule and Mrs Nduka appeared satisfied with their presses, as did Mr Ali. Mrs Msaya had found that a nearby small expeller operation (MRN APV VII expeller) would process a 50-60 kg bag of sunflower seed and return 20 litres of oil to the customer for a charge of Tsh 1,000. She preferred to do this rather than process the seed on the ram press. The existence of local expeller operations could have an influence on the uptake of ram presses in certain areas. This fact is recognised by VOPP staff who are attempting to monitor expeller placements. The impact of such expeller operations could be very wide; one sunflower grower in Mrijo was reported to take sunflower seed to the Kondoa expeller, a journey time of over two hours.

48. The following average figures were recorded for the CAMARTEC presses visited:

|  |         |
|--|---------|
| Amount of sunflower seed processed per hour: | 7.9Kg   |
| % oil content of seed                        | : 48.3% |
| % residual oil content of cake               | : 22.7% |
| Volume (litres crude oil/50 Kg bag seed)     | : 15.9  |
| % oil extraction efficiency (crude oil)      | : 64.4% |

49. The following average figures were recorded for the modified, reinforced CAMARTEC press:

|  |         |
|--|---------|
| Amount of sunflower seed processed per hour: | 7.1Kg   |
| % oil content of seed                        | : 48.2% |
| % residual oil content of cake               | : 21.5% |
| Volume (litres crude oil/50 Kg bag seed)     | : 15.5  |
| % oil extraction efficiency (crude oil)      | : 61.6% |

The figures for the strengthened press are very similar to the figures for the original CAMARTEC model.

50. The author recommends that three strengthened presses be tested thoroughly and monitored regularly over a three-month period during the sunflower harvesting season at three separate sites in Tanzania. This testing is considered essential in order to assess the robustness of the CAMARTEC press.

#### **COMPARISON OF THE THREE PRESS TYPES**

51. The throughput range for sunflower seed on the Nand Singh press is the highest of the three press types with

a range of 10.3 - 18.8 Kg/hour and a mean of 15.6 Kg/hour. The CAPU press has a throughput range for sunflower seed of 7.1 - 25.0 Kg/hour with a mean of 11.9 Kg/hour. The CAMARTEC press has a throughput range for sunflower seed of 5.3 - 14.3 Kg/hour with a mean of 7.9 Kg/hour.

52. The amount of crude sunflower seed oil extracted per bag of 50 Kg seed was found to be highest in the CAMARTEC press (range 13.7 - 17.8 litres) with a mean of 15.9 litres. The figures for both the Nand Singh presses and the CAPU presses were similar with means of 14.5 and 14.4 litres respectively. The range for the CAPU press was 11.3 - 17.5 while that of the Nand Singh was 12.9 - 17.4 litres.

53. The presses are progressively more arduous to operate as they increase in size. The Nand Singh presses require two operators, both the CAPU and the CAMARTEC require one operator although it is easier to operate the latter press. Photographs of the three press types are contained in Appendix III.

54. Both the CAPU and CAMARTEC presses allow two levels of throughput to be covered while giving a good yield of oil per 50 Kg seed. There is scope therefore for both press types to be offered for sale (although the CAMARTEC press life expectancy needs to be determined - see paragraph 50).

#### **FINANCIAL VIABILITY**

55. Appendix IV contains simple financial calculations for the two press types based on figures observed during this visit. The assumed price for a modified CAMARTEC press is assumed to be Tsh 50,000 and that of a CAPU press Tsh 120,000. Both presses have payback periods of much less than one year and the operations are comparatively insensitive to press price.

56. Seed throughput and oil yield are the two main factors affecting viability. Both presses have advantages on each of these factors (CAPU for higher throughput - and long press life - and CAMARTEC for higher yield).

57. There exists the possibility of a farmer purchasing two CAMARTEC presses at a price cheaper than that estimated for a CAPU press and thereby surpassing the throughput (and oil yield) and the net income of the CAPU press. The extra cost incurred would be for two operators instead of one. A calculation for this possibility is also included in Appendix IV. It can be seen that running two CAMARTEC presses provides a greater net income than running one CAPU press (Tsh 441,240 compared with Tsh 305,739). An added benefit would be that if one press is ever required for repair the other would still be available for pressing.

58. The possibility of increasing returns when operating two CAMARTEC presses instead of one CAPU press reinforces the case for stringent testing of the CAMARTEC press prior to promotion by VOPP.

#### **CREDIT LINES**

59. VOPP have been operating their own credit scheme for press purchase in the past. Many press owners have benefited from the scheme. The VOPP credit scheme has been beneficial to potential press owners since institutional loans are generally not available at this level in Tanzania without collateral and a firm business plan.

60. However for the long term sustainability of the project institutional alternatives for credit extension should be investigated. A possibility is the extension of credit such as a hire-purchase scheme operated through a network of press suppliers located in strategic areas in Tanzania.

#### **SUNFLOWER SEED TYPE**

61. All press operators questioned during the visit said they processed a soft-shelled, small, mostly black sunflower seed. "Record" variety was the response given when asked to identify it by most operators. Those that did not know the name of the seed identified it as similar to a sample of "Record" shown to them by the author. One owner (Mrs Nduka) said she had tried a hard-shelled variety once but it was hard work and no oil was extracted.

#### **PREPROCESSING PRIOR TO PRESSING**

62. Most press operators winnow the sunflower seed, pick out foreign matter and spread in the sun before pressing. Some operators (especially those that buy seed rather than processing their own) assume that the seed is clean and process it immediately even without sun-heating. A pair of operators (see Kilinga and Kweka in Appendix I) routinely add a small quantity of water to the seed prior to pressing without sun heating.

#### **PRESSING PRACTICES ADOPTED**

63. Generally the faster the handle stroke rate the operator uses when operating the press the faster the throughput but at the expense of yield. The position of the pressure cone also affects yield. The tighter the pressure cone, the more back pressure is exerted and the higher the oil yield. (Appendix V contains the results of experiments carried out at the CAMARTEC workshop to demonstrate this effect - described in paragraph 69). However it is harder to operate the press using a tight pressure cone.

64. A compromise between stroke rate and pressure cone position is therefore reached by the operator to suit his/her preference. Press operators running custom milling operations are paid according to the quantity of seed processed. Assuming the customer is satisfied with the amount of oil received in return, the operator will increase the throughput as fast as possible. On the other hand, if the operator is selling the oil (a high-value commodity) it makes sense to maximise the oil yield. Under this operating regime, the amount of oil produced per bag becomes a prime consideration.

65. Press owners practising these extremes of operation were observed during the visit but most were adopting a compromise.

66. Often owners of CAMARTEC presses were using undue pressure when operating the press. This could be a legacy of the two preceding press models which were much harder to operate. The Nand Singh press requires two operators using all their strength. The CAPU requires one operator also using all his strength. The CAMARTEC press is relatively easy to operate and does not normally require all the strength of the operator to obtain good oil yields. However, if a press owner has seen the Nand Singh or CAPU presses in operation, there may be a tendency copy the observed amount of work when using a CAMARTEC press. Such extremes of force when operating the press could be a reason for the rapid wear encountered on some CAMARTEC presses. Training procedures should be reinforced on preferred operational practice.

#### **OIL CLARIFICATION**

67. Most of the press owners visited clarify crude sunflower oil by adding water in varying quantities and boiling the mixture for varying times. After boiling the oil is strained through a sieve to remove solid particles. Only one press owner routinely allows oil and seed particles to separate by gravity (Mrs Machibula). The common reason given for adding water and boiling is that clarification is quicker.

68. This confirms the results obtained by the author when carrying out settling trials of crude oils. Most of the oils collected were still cloudy after allowing to stand for 7 days at 24°C. The author has noted that soft-shelled, high oil content sunflower seed can often produce oils which remain cloudy on standing. This can be due to phosphatides and waxes present in the seed. In commercial processing sunflower seed oil is often clarified by degumming and winterization.

69. Appendix VI describes a typical method for oil clarification and contains details of a test carried out by the author which indicates the recovery of clarified

oil from crude sunflower seed oil. This figure was found to be 92.6% and is used to calculate clarified oil yields in the financial calculations contained in Appendix IV.

## **EXPERIMENTS CARRIED OUT AT CAMARTEC**

### **Effect of handle stroke rate on throughput and oil yield**

70. A series of experiments was carried out by the author at the CAMARTEC workshop to test the effect of handle stroke rate on throughput and crude oil yield when processing sunflower seed in a CAPU press. The results are given in Appendix V. Stroke rates of 12, 20 and 28 per minute were carried out while keeping the choke gap constant (40 mm). The temperature of the seed into the press was between 42 and 46°C for each test. The amount of oil yielded per 2.5 Kg charge decreased from 716 grams (stroke rate 12), through 594 grams (stroke rate 20) to 501 grams (stroke rate 28). Sunflower seed throughputs (Kg/hr) were 7.1, 10.7 and 15.0 respectively. The choke gap was adjusted to 32mm and the stroke rate increased to 44 strokes per minute giving figures of yield and throughput of 555 grams and 18.8 Kg/hr respectively. These experiments demonstrate the effect of the balance between yield and throughput that can be achieved by varying the stroke rate and the choke gap. A stroke rate of 44 per minute would not be practicable for more than a few minutes. A stroke rate of between 12 and 20 is more realistic.

### **Effect on oil yield of widening the cage gaps**

71. Experiments were carried out to assess the effect on oil yield of widening CAPU ram press cage gaps. Two sets of experiments were carried out using both sunflower seed and sesame seed. The experiments are summarised in Appendix II. The gaps before widening varied between 0 and 0.3 mm. After cutting with a hacksaw blade the gaps were a constant 0.8 mm throughout the cage.

72. With sunflower seed, 12.7 litres of ceude oil per 50 Kg bag were extracted at a stroke rate of 8 per minute and a throughput of 9.4 Kg/hr. Equivalent figures obtained after widening the gaps were 13.8 litres of oil (stroke rate 6 per minute) at a throughput of 9.1 Kg/hr. The temperature of the seed in the former was 43°C and that of the latter 32°C. It would seem likely that widening the gage gaps is beneficial with sunflower seed although these results must be interpreted with caution since it was difficult to duplicate exactly the choke gap owing to the inherent coarse adjustment control. The order of experiments was as follows:

- 1st Sunflower seed before widening gaps;
- 2nd Sesame seed before widening gaps;
- 3rd Sesame seed after widening gaps;
- 4th Sunflower seed after widening gaps.

The choke settings needed to be changed when processing the two different seeds in order to optimise processing conditions. The cage had to be removed from the press for widening in the workshop. The sequence of experiments described above allowed the choke setting to remain constant when processing sesame seed but not for sunflower seed.

73. The experiment was repeated with sesame seed. As can be seen in Appendix II there was insignificant difference in throughput and oil yield as a result of widening the cage gaps. Yield of oil was around 17 litres of oil per 50 Kg bag at a throughput of around 7 Kg per hour using a stroke rate of 4 per minute.

#### **Ram pressing sesame seed and groundnut kernels and the effect of heating method on oil yield**

74. Appendix II contains the summary of experiments to test the throughput and yield of groundnuts and sesame using both a CAPU and a (strengthened) CAMARTEC press. Paragraph 72 details throughput and yield of oil from sesame seed in a CAPU press.

75. Sesame seed was heated using two methods: sun heating and heating over a boiling water bath for 30 minutes prior to pressing. Seed temperatures obtained were 38°C and between 47 and 60°C respectively for the two methods. 18.8 litres of oil per 50 Kg bag at a throughput of 4.0 Kg per hour (stroke rate 4/min) was obtained after sun heating compared to 22 litres at a throughput of 4.4 Kg per hour after heating on a water bath. The stroke rate during the latter was also 4/min. This experiment shows the beneficial effect of temperature on oil yield.

76. The experiment was repeated using groundnut kernels. Figures obtained after sun heating (temperature of seed 40°C) were 14.1 litres crude oil per 50 Kg bag at a throughput of 5.4 Kg per hour (stroke rate 7/min). Equivalent figures after heating over a boiling water bath to a seed temperature of 65°C were 16.3 litres of oil per 50 Kg bag at a throughput of 5.4 Kg per hour at a stroke rate of 8/min. The beneficial effect of seed heating is again demonstrated.

77. The author recommends that a comprehensive field trial be undertaken using the two press types to determine the performance and financial viability of processing sesame seed and groundnut kernels. The high yield of oil from sesame seed using the CAMARTEC press is worthy of further investigation. There is potential for the uptake of the press for processing both these crops - not only in Tanzania but in other African countries.

78. Heating seed over a water bath is cumbersome and requires much fuel. However seed can reach a high temperature (a sunflower seed temperature of 52°C was recorded during sun heating in Kondoa) especially if it

is heated on a metal surface. It is recommended that VOPP instruct press operators to spread seed onto metal surfaces (in metal pans or on galvanised roofing sheet if available) and place in direct sunlight to maximise oil yields from seeds when using the ram press.

#### **RAM PRESS OPERATORS' MANUAL**

79. A ram press operating manual prepared by Lynn Schlueter to give guidance to ram press owners and operators was reviewed. Several of the suggestions made have been included in a revised version.

#### **RECOMMENDATIONS**

80. It is recommended that three strengthened CAMARTEC presses be tested thoroughly and monitored regularly over a three month period during the sunflower harvesting season at three separate sites in Tanzania. This testing is considered essential in order to assess the robustness of the CAMARTEC press (see paragraphs 6 and 50). It would be prudent to monitor more closely the performance of the CAMARTEC press and to then promote its wider application, but not to the exclusion of the CAPU press.

81. VOPP has offered a credit scheme to press purchasers in the past but to ensure a sustainable project, it is recommended that institutionalised systems for credit extension for ram press purchase be investigated (see paragraph 60).

82. It is recommended that a comprehensive field trial be undertaken using the two press types to determine the performance and financial viability of processing sesame seed and groundnut kernels. The high yield of oil from sesame seed using the CAMARTEC press is worthy of further investigation. There is potential for user uptake of the press for processing both these crops not only in Tanzania but in other African countries (see paragraphs 12 and 77).

83. Often owners of CAMARTEC presses were using undue pressure when operating the press. This could be a legacy of the two preceding press models which were much harder to operate. The Nand Singh press requires two operators using all their strength. The CAPU requires one operator also using all his strength. The CAMARTEC press is relatively easy to operate and does not normally require all the strength of the operator to obtain good oil yields. It is recommended that training procedures are reinforced by VOPP staff on preferred operational practice (see paragraph 66).

84. It is recommended that VOPP instruct press operators to spread seed onto metal surfaces (in metal pans or on galvanised roofing sheet if available) and place in direct sunlight to maximise oil yields from seeds when using the ram press (see paragraph 78).

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

|                                 |  |                         |             |
|---------------------------------|--|-------------------------|-------------|
| Press Type: CAMARTEC            | Date of purchase: 8/8/92                 | Date: 16/2/93           | Owner: SULE |
|                                 |  | Occupation: Govt worker |             |
| Village: KONDOA                 | Condition: Excellent                     | Bought new              | YES         |
| Press payment scheme:           | CASH: 25,000/-                           | Montly payments?:       |             |
| Seed type: Sunflower Record     | Only one seed?: YES                      | Clean?: YES             |             |
| No. seasons owned:              | ONE                                      |                         |             |
| Amount processed per season:    |  |                         |             |
| Amount processed since owned:   | 2 bags                                   |                         |             |
| Any breakdowns?: NO             | Nature?:                                 | Cost:                   |             |
| Distance to repair shop:        | 1 Km                                     | Delay to repair?:       |             |
| Ambient T: 25-30C               | Weather: Sunny with slight misty cloud   |                         |             |
| Preprocessing?:                 | Winnowed and picked over. Heated in sun. |                         |             |
| Temperature of seed into press: | 33-35C                                   |                         |             |
| Seed cost:                      | TSh 3500 - 4000                          |                         |             |
| Weight of seed processed:       | 5 Kg                                     |                         |             |
| Start time: 11.15               | >  |                         |             |
|                                 | > Time for processing: 21 minutes        |                         |             |
| Finish time: 11.36              | >  |                         |             |
| No strokes per minute: 28       | No. of operators?: 1                     | Gender: M               |             |
| Who supplies labour?: Owner     | Payment for labour:                      |                         |             |
| Wt cake (g) 3692                | Wt Oil (g): 1265                         |                         |             |
| Fate of oil: Home use / sold    | Use of cake: Sold to cattle farmers      |                         |             |
| Price: 400/- per litre          | Price: 600/- per bag (40kg)              |                         |             |

**Analysis of seed and products**

|                                     |   |                           |           |
|-------------------------------------|---|---------------------------|-----------|
| Settling time and sediment:         | 8.1% by vol; still slightly cloudy after 7 days |                           |           |
| Moisture content of seed:           | 5.60%   | Moisture content of cake: | 7.70%     |
| Oil content of seed:                | 48.3% mfb                                       | Oil content of cake:      | 26.3% mfb |
| Oil extraction efficiency of press: | 55.5% based on crude oil yield.                 |                           |           |

**Comments:**

Mr Sule is satisfied with the press. Plans to plant 2 Ha sunflower seed for the press. Sometimes women use the press but only to produce about 1.5 litres; then they get tired. He estimates he made TSh 2000 processing 2 bags of seed to get 20 litres of oil. He boils the crude oil with water (2:1 oil to water) then strains. He does not allow to settle - it takes too long.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

|  |  |                         |
|--|--|-------------------------|
| Press Type: CAMARTEC                               | Date of purchase: 8/8/92                 | Date: 16/2/93           |
| 2nd experiment, tighter choke, slower stroke speed |  | Owner: SULE             |
|  |  | Occupation: Govt worker |
| Village: KONDOA                                    | Condition: Excellent                     | Bought new YES          |
| Press payment scheme:                              | CASH: 25,000/-                           | Montly payments?:       |
| Seed type: Sunflower Record                        | Only one seed?: YES                      | Clean?: YES             |
| No. seasons owned: ONE                             |  |                         |
| Amount processed per season:                       |  |                         |
| Amount processed since owned: 2 bags               |  |                         |
| Any breakdowns?: NO                                | Nature?:                                 | Cost:                   |
| Distance to repair shop: 1 Km                      | Delay to repair?:                        |                         |
| Ambient T: 25-30C                                  | Weather: Sunny with slight misty cloud   |                         |
| Preprocessing?:                                    | Winnowed and picked over. Heated in sun. |                         |
| Temperature of seed into press: 33-35C             |  |                         |
| Seed cost: TSh 3500 - 4000                         |  |                         |
| Weight of seed processed: 2.5 Kg                   |  |                         |
| Start time: >                                      |  |                         |
| Finish time: >                                     | Time for processing: 24 minutes          |                         |
| No strokes per minute: 15                          | No. of operators?: 1                     | Gender: M               |
| Who supplies labour?: Owner                        | Payment for labour:                      |                         |
| Wt cake (g) -                                      | Wt Oil (g): 1558                         |                         |
| Fate of oil: Home use / sold                       | Use of cake: Sold to cattle farmers      |                         |
| Price: 400/- per litre                             | Price: 600/- per bag (40kg)              |                         |

**Analysis of seed and products**

|                                     |   |                           |           |
|-------------------------------------|---|---------------------------|-----------|
| Settling time and sediment:         | 8.1% by vol; still slightly cloudy after 7 days |                           |           |
| Moisture content of seed:           | 5.60%   | Moisture content of cake: | 7.80%     |
| Oil content of seed:                | 48.3% mfb                                       | Oil content of cake:      | 20.8% mfb |
| Oil extraction efficiency of press: | 68.3% based on crude oil yield.                 |                           |           |

**Comments:**

Mr Sule is satisfied with the press. Plans to plant 2 Ha sunflower seed for the press. Sometimes women use the press but only to produce about 1.5 litres; then they get tired. He estimates he made TSh 2000 processing 2 bags of seed to get 20 litres of oil. He boils the crude oil with water (2:1 oil to water) then strains. He does not allow to settle - it takes too long.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC      Date of purchase: Aug-92      Date: 17/2/93  
 Owner: Ali  
 Occupation: DES

Village: MRIJO JUU      Condition: Good      Bought new YES  
 No experiment carried out but samples taken  
 Press payment scheme: CASH, 25000/-      Monthly payments?:  
 Seed type: Sunflower      Only one seed?: YES      Clean?: YES  
 Record

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned: 15 bags

Any breakdowns?:      Nature?: See below      Cost:

Distance to repair shop: 1 Km      Delay to repair?:

Ambient T: 30C      Weather: Sunny, few clouds

Preprocessing?:      Winnowed and picked over. Heated in sun.

Temperature of seed into press:

Seed cost:

Weight of seed processed:

Start time:      >  
 > Time for processing:  
 Finish time:      >

No strokes per minute:      No. of operators?:      Gender:

Who supplies labour?: Labourers      Payment for labour:

Wt cake (g)      Wt Oil (g):

Fate of oil: Own use      Use of cake:      Own livestock  
 Price:      Price:

**Analysis of seed and products**

Settling time and sediment: 9.1% by vol; clear after 7 days  
 Moisture content of seed: 6.50%      Moisture content of cake: 7.80%  
 Oil content of seed: 43.6% mfb      Oil content of cake: 25.4% mfb  
 Oil extraction efficiency of press: Not calculated (no experiment carried out)

**Comments:**

Piston jammed on this press. SIDO in Dodoma polished with emery paper.  
 Mr Ali thinks piston jamming is caused by excessive force when using the press and failure to clean it  
 it after use. The piston has not jammed since.  
 This press was in good condition and had been well maintained.  
 Samples of seed, cake and oil were taken from a run carried out that afternoon.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

|  |  |                   |
|--|--|-------------------|
| Press Type: CAMARTEC                   | Date of purchase: Jul-92                 | Date: 16/2/93     |
|  |  | Owner: Msaya      |
|  |  | Occupation: Nurse |
| Village: KONDOA                        | Condition: "about half used"             | Bought new YES    |
| Press payment scheme:                  | CASH: 25,000/-                           | Montly payments?: |
| Seed type: Sunflower Record            | Only one seed?: YES                      | Clean?: YES       |
| No. seasons owned:                     | ONE                                      |                   |
| Amount processed per season:           |  |                   |
| Amount processed since owned:          | 2 bags                                   |                   |
| Any breakdowns?: NO                    | Nature?:                                 | Cost:             |
| Distance to repair shop:               | 1 Km                                     | Delay to repair?: |
| Ambient T: 30C                         | Weather: Sunny with slight misty cloud   |                   |
| Preprocessing?:                        | Winnowed and picked over. Heated in sun. |                   |
| Temperature of seed into press:        | 40C                                      |                   |
| Seed cost: TSh 3000                    |  |                   |
| Weight of seed processed:              | 5 Kg                                     |                   |
| Start time: 2.05                       | >  |                   |
|  | > Time for processing: 57 minutes        |                   |
| Finish time: 3.02                      | >  |                   |
| No strokes per minute: 15              | No. of operators?: 1                     | Gender: 4 X M     |
| Who supplies labour?: Owner + labourer | Payment for labour:                      | 200/- per bag     |
| Wt cake (g) 3204                       | Wt Oil (g): 1648                         |                   |
| Fate of oil: Home use / sold           | Use of cake: Fed to own cattle           |                   |
| Price: 400/- per litre                 | Price: estimated: 600/- per bag (40kg)   |                   |

**Analysis of seed and products**

|                                     |  |                           |           |
|-------------------------------------|--|---------------------------|-----------|
| Settling time and sediment:         | 10.3% by vol; still slightly cloudy after 7 days |                           |           |
| Moisture content of seed:           | 4.90%  | Moisture content of cake: | 7.40%     |
| Oil content of seed:                | 48.4% mfb  | Oil content of cake:      | 18.9% mfb |
| Oil extraction efficiency of press: | 71.6% based on crude oil yield.                  |                           |           |

**Comments:**

There is a MRN APV VII expeller nearby. They charge 1000/- to process a bag of seed. Yield is 20 litres crude oil. Msaya only gets 2000/- per bag profit after paying labourer on the ram press. Mixes cake 1:1 with maize bran. She boils the 5 litres crude oil with 2.5 litres water and salt (1 dessertspoon) then strains. Settling produces a bad smell after about 3 days.



APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 16/2/93  
 Press Type: CAPU Date of purchase: 1990 Owner: Machibula  
 Occupation: Housewife

Village: KONDOA Condition: "about 2/3 used" Bought new YES

Press payment scheme: CASH: 60,000/- Monthly payments?:

Seed type: Sunflower Record Only one seed?: YES Clean?: YES

No. seasons owned: THREE  
 Amount processed per season:  
 Amount processed since owned: About 300 bags

Any breakdowns?: YES: see below Nature?: Cage, handle, foot Cost: 60,000/-

Distance to repair shop: 0.5 Km Delay to repair?: 2 hours

Ambient T: 30C Weather: Sunny with slight misty cloud

Preprocessing?: Winnowed and picked over. Heated on fire.

Temperature of seed into press: 62-86C

Seed cost: TSh 3000 -4000

Weight of seed processed: 5 Kg

Start time: >  
 > Time for processing: 42 minutes  
 Finish time: >

No strokes per minute: 15 No. of operators?: 1 at a time Gender: 4 XM

Who supplies labour?: Owner + labourers Payment for labour: 200/- per bag

Wt cake (g) 3308 Wt Oil (g): 1617

Fate of oil: Sold Use of cake: Sold to cattle farmers  
 Price: 400/- per litre Price: 600/- per bag (40kg)  
 8000/- per 18 kg tin

**Analysis of seed and products**

Settling time and sediment: 11.8% by vol; clear after 7 days  
 Moisture content of seed: 4.80% Moisture content of cake: 6.60%  
 Oil content of seed: 47.0% mfb Oil content of cake: 18.1% mfb  
 Oil extraction efficiency of press: 72.3% based on crude oil yield.

**Comments:**

Cage bulged: hammered back. Cracked foot welded. Handle reduced to 1.4 metres. Press on balcony in apartment block. Estimates 16-21 litres per 60 Kg bag seed. One week processed 30 bags working in shifts day and night. Oil left to settle 2 days. Mrs Machibula uses this press herself sometimes. She loves the press "as much as my husband".









APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 18/2/93  
 Press Type: CAPU Date of purchase: Not yet sold Owner: VOPP  
 Second experiment at faster stroke rate. Occupation:

Village: KONDOA Condition: Brand new Bought new?:  
 Press payment scheme: Monthly payments?:  
 Seed type: Sunflower Only one seed?: YES Clean?: YES  
 Record

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?: Nature?: Cost:  
 Distance to repair shop: Delay to repair?:  
 Ambient T: 27-36C Weather: Sunny with few clouds  
 Preprocessing?: Winnowed and picked over. Heated in sun.  
 Temperature of seed into press: 52C  
 Seed cost:  
 Weight of seed processed: 2 Kg  
 Start time: 12.36 >  
 > Time for processing: 11 minutes  
 Finish time: 12.47 >  
 No strokes per minute: 10 No. of operators?: 1 Gender: M  
 Who supplies labour?: Payment for labour:  
 Wt cake (g) 1415 Wt Oil (g): 582  
 Fate of oil: Use of cake:  
 Price: Price:

**Analysis of seed and products**

Settling time and sediment: 9.0% by vol; still cloudy after 7 days  
 Moisture content of seed: 3.90% Moisture content of cake: 5.60%  
 Oil content of seed: 47.2% mfb Oil content of cake: 24.6% mfb  
 Oil extraction efficiency of press: 64.2% based on crude oil yield.

**Comments:**

The reinforcing ring on this press cage was poorly constructed. It was rewelded in a local workshop by Carl Bielenberg prior to the experiment.  
 This press was made by MUSUYE engineering in Dodoma.  
 Although the stroke rate was higher, the extraction efficiency was higher. The choke may have been tighter during this run

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 24/2/93  
 Press Type: NAND SINGH Date of purchase: 1988 Owner: Kaisa  
 Occupation: Bwana shamba  
 Village: MAMIRE Condition: 40% wear Bought new YES  
 Press payment scheme: VOPP credit scheme Montly payments?:  
 150,000/-  
 Seed type: Sunflower record Only one seed?: Clean?: NO  
 No. seasons owned: Five  
 Amount processed per season: 200 bags  
 Amount processed since owned: 1000+ bags  
 Any breakdowns?: YES Nature?: See below Cost: 18,000/-  
 Distance to repair shop: Babati: 10 Km Delay to repair?: No, immediate  
 Ambient T: 23C Weather: Cloudy  
 Preprocessing?: No, assumes winnowed when purchased. NO sun heating  
 Only sun heats if seed long in store.  
 Temperature of seed into press: 22C  
 Seed cost: 3000-4000/- per bag  
 Weight of seed processed: 5 Kg  
 Start time: 9.20 >  
 > Time for processing: 19 minutes  
 Finish time: 9.39 >  
 No strokes per minute: 24 No. of operators?: 1 Gender: M  
 Who supplies labour?: 1 labourer Payment for labour: 700/- per 20 litres oil  
 Wt cake (g) 3175 Wt Oil (g): 632  
 Fate of oil: Customer takes Use of cake: Animals: mix with beer grain res  
 Price: oil sold at 7000/- per 20 litres Price: 600/- per bag

**Analysis of seed and products**

Settling time and sediment: 10.0% by vol; still cloudy after 2 days  
 Moisture content of seed: 5.10% Moisture content of cake: 8.90%  
 Oil content of seed: 49.0% mfb Oil content of cake: 37.1% mfb  
 Oil extraction efficiency of press: 27.2% based on crude oil yield.

**Comments:**

Amount of cake suspect. Not all cake could be collected. This press relies on a build up of cake around the outlet to build pressure. It is difficult to remove cake to carry out a mass balance. Operator did not perform full stroke operation. Expt carried out indoors. Clarifies oil by boiling with water (preferred: quicker) or leaves to settle. Ram wore out; handle broke, cage distended; cylinder wore out. All fixed. Total cost: 18,000/- Service press operation: 200/- per tin seed pressed. Customer leaves cake.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 24/2/93  
 Press Type: NAND SINGH Date of purchase: 1990 Owner: Kilinga  
 Occupation: Medical officer

Village: BABATI Condition: 25% worn Bought new NO: s/h

Press payment scheme: CASH: 150,000/- Montly payments?:

Seed type: Sunflower record Only one seed?: YES Clean?:

No. seasons owned: 3  
 Amount processed per season:  
 Amount processed since owned: Unknown

Any breakdowns?: No Nature?: Cost:

Distance to repair shop: Babati, 0.5 Km Delay to repair?:

Ambient T: 33C Weather: Sunny with a few clouds

Preprocessing?: Yes: adds small amount of water prior to pressing. No sun heating.

Temperature of seed into press: 35C

Seed cost: 3000-4500/- per bag

Weight of seed processed: 5 Kg

Start time: 12.52 >  
 > Time for processing: 21 minutes less 5 mins down time = 16  
 Finish time: 1.13 >

No strokes per minute: 8 No. of operators?: 2 together Gender: 2 X M

Who supplies labour?: Labourers Payment for labour: 1000/- per 20 litres oil Shared

Wt cake (g) Not measured Wt Oil (g): 1191

Fate of oil: Sold locally Use of cake: Livestock  
 Price: oil sold at 7000/- per 20 litres Price: 800/- per bag

**Analysis of seed and products**

Settling time and sediment: 10.0% by vol; still cloudy after 2 days  
 Moisture content of seed: 6.70% Moisture content of cake: 7.50%  
 Oil content of seed: 48.4% mfb Oil content of cake: 34.1% mfb  
 Oil extraction efficiency of press: 52.7% based on crude oil yield.

**Comments:**

Amount of cake not measured. Not all cake could be collected. This press relies on a build up of cake around the outlet to build pressure. It is difficult to remove cake to carry out a mass balance. Clarification trial carried out: 1838g oil gave 1725g after addition of water and boiling. (=92.6% recovery)

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 24/2/93  
 Press Type: NAND SINGH Date of purchase: 1985 Owner: Kweka  
 Occupation: Council worker

Village: BABATI Condition: Good Bought new YES

Press payment scheme: VOPP credit scheme Montly payments?: 3 instalments  
 25,000/-

Seed type: Sunflower Only one seed?: YES Clean?:  
 record

No. seasons owned: Eight  
 Amount processed per season: 200 bags  
 Amount processed since owned: 1600 bags

Any breakdowns?: YES Nature?: See below Cost: 132,000/-

Distance to repair shop: Babati 0.5Km Delay to repair?: No, immediate

Ambient T: 24C Weather: Sunny with a few clouds

Preprocessing?: Yes: adds small amount of water prior to pressing. No sun heating.

Temperature of seed into press: 26C

Seed cost: 3000-4500/- per bag

Weight of seed processed: 5 Kg

Start time: 11.30 >  
 > Time for processing: 17 minutes  
 Finish time: 11.47 >

No strokes per minute: 14 No. of operators?: 2 together Gender: 2 X M

Who supplies labour?: Labourers Payment for labour: 1000/- per 20 litres oil  
 Shared

Wt cake (g) 3922 Wt Oil (g): 1216

Fate of oil: Sold locally Use of cake: Livestock  
 Price: oil sold at 7000/- per 20 litres Price: 800/- per bag

**Analysis of seed and products**

Settling time and sediment: 9.2% by vol; still cloudy after 2 days  
 Moisture content of seed: 6.70% Moisture content of cake: 9.70%  
 Oil content of seed: 48.4% mfb Oil content of cake: 26.5% mfb  
 Oil extraction efficiency of press: 53.8% based on crude oil yield.

**Comments:**

Amount of cake suspect. Not all cake could be collected. This press relies on a build up of cake around the outlet to build pressure. It is difficult to remove cake to carry out a mass balance. Piston replaced 5 times (25,000/-); Cage distended 4 times: new cage 25,000/-; handle broke 3 times (3,000/-); reinforced side plates (1000/-); cone worn twice 3,000/-) TOTAL: 132,000/- Expt carried out inside house.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 23/2/93  
 Press Type: NAND SINGH Date of purchase: 1990 Owner: Mataya  
 Occupation: Farmer

Village: MWIKANTSI Condition: 40% wear Bought new YES

Press payment scheme: CASH, 160,000/- Monthly payments?:

Seed type: Sunflower record Only one seed?: Clean?: YES

No. seasons owned: Three  
 Amount processed per season: 180 bags  
 Amount processed since owned: 540 bags

Any breakdowns?: YES Nature?: See below Cost: 7000/-

Distance to repair shop: Babati, 15 Km Delay to repair?: No, immediate

Ambient T: 33C Weather: Sunny

Preprocessing?: Winnowed and picked over. NO sun heating

Temperature of seed into press: 40C

Seed cost: 3500-4000/- per bag

Weight of seed processed: 5 Kg

Start time: 2.03 >  
 > Time for processing: 36 minutes - 7mins to undo choke= 29  
 Finish time: 2.39 >

No strokes per minute: 10 No. of operators?: 3 together Gender: 3 x M

Who supplies labour?: Labourers Payment for labour: 800/- per 20 litres oil  
 Payment shared

Wt cake (g) 2781 Wt Oil (g): 1605

Fate of oil: Home use, some sold Use of cake: Own livestock  
 Price: 750 ml= 300/- Price: Estimated @ 1000/- per bag  
 18 kg = 6,500/- Never sold

**Analysis of seed and products**

Settling time and sediment: 10.0% by vol; still cloudy after 3 days  
 Moisture content of seed: 5.10% Moisture content of cake: 8.10%  
 Oil content of seed: 49.0% mfb Oil content of cake: 23.0% mfb  
 Oil extraction efficiency of press: 69.1% based on crude oil yield.

**Comments:**

Amount of cake suspect. Not all cake could be collected. This press relies on a build up of cake around the outlet to build pressure. It is difficult to remove cake to carry out a mass balance. Lots of seed and foots expelled with oil. Mrs Mataya filters it. 15 litres oil mixed with 2.5 litres oil and boiled prior to use. Press difficult to adjust to steady state running. Side plates broke once: rewelded in Babati.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 22/2/93  
 Press Type: CAMARTEC Date of purchase: Not yet sold Owner: CAMARTEC  
 Groundnuts heated in the sun for 2 hours. Occupation:

Village: Condition: Brand new Bought new?:

Press payment scheme: Monthly payments?:

Seed type: Groundnut kernels Only one seed?: Clean?:

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?: Nature?: Cost:

Distance to repair shop: Delay to repair?:

Ambient T: 30C Weather: Sunny with light broken clouds

Preprocessing?: Winnowed and picked over. Heated in sun.

Temperature of seed into press: 40C

Seed cost:

Weight of seed processed: 5 Kg

Start time: 3.51 >  
 > Time for processing: 56 minutes  
 Finish time: 4.47 >

No strokes per minute: 7 No. of operators?: 1 Gender: M

Who supplies labour?: Payment for labour:

Wt cake (g) 3591 Wt Oil (g): 1305

Fate of oil: Use of cake:  
 Price: Price:

**Analysis of seed and products**

Settling time and sediment: 15.1% by vol; almost clear after 4 days  
 Moisture content of seed: 4.80% Moisture content of cake: 6.10%  
 Oil content of seed: 48.5% mfb Oil content of cake: 30.2% mfb  
 Oil extraction efficiency of press: 56.5% based on crude oil yield.

**Comments:**

Compare this run with groundnut kernels heated on water bath.  
 This run carried out with 30 mm ram.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC      Date of purchase: Not yet sold      Date: 22/2/93  
 Groundnuts heated in the sun for 3 hours.      Owner: CAMARTEC  
 Occupation:

Village:      Condition: Brand new      Bought new?:

Press payment scheme:      Monthly payments?:

Seed type: Groundnut kernels      Only one seed?:      Clean?:

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?:      Nature?:      Cost:

Distance to repair shop:      Delay to repair?:

Ambient T: 30C      Weather: Sunny with light broken clouds

Preprocessing?:      Winnowed and picked over. Heated in sun.

Temperature of seed into press: 32-38C

Seed cost:

Weight of seed processed: 5 Kg

Start time: 5.01      >  
 > Time for processing: 45 minutes  
 Finish time: 5.46      >

No strokes per minute: 6      No. of operators?: 1      Gender: M

Who supplies labour?:      Payment for labour:

Wt cake (g) 3808      Wt Oil (g): 1117

Fate of oil:      Use of cake:  
 Price:      Price:

**Analysis of seed and products**

Settling time and sediment: 12.5% by vol; still cloudy after 4 days  
 Moisture content of seed: 4.60%      Moisture content of cake: 5.90%  
 Oil content of seed: 48.5% mfb      Oil content of cake: 33.8% mfb  
 Oil extraction efficiency of press: 48.3% based on crude oil yield.

**Comments:**

This run carried out with 40 mm ram.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC      Date of purchase: Not yet sold      Date: 22/2/93  
 Owner: CAMARTEC  
 Groundnuts heated on water bath for 30 minutes      Occupation:

Village:      Condition: Brand new      Bought new?:

Press payment scheme:      Monthly payments?:

Seed type: Groundnut kernels      Only one seed?:      Clean?:

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?:      Nature?:      Cost:

Distance to repair shop:      Delay to repair?:

Ambient T: 28C      Weather: Sunny with light broken clouds

Preprocessing?:      Winnowed and picked over. Heated over water bath.

Temperature of seed into press: 65C

Seed cost:

Weight of seed processed: 5 Kg

Start time: 2.36 >  
 > Time for processing: 56 minutes  
 Finish time: 3.32 >

No strokes per minute: 8      No. of operators?: 1      Gender: M

Who supplies labour?:      Payment for labour:

Wt cake (g) 3036      Wt Oil (g): 1508

Fate of oil:      Use of cake:  
 Price:      Price:

**Analysis of seed and products**

Settling time and sediment: 13.1% by vol; almost clear after 4 days  
 Moisture content of seed: 4.70%      Moisture content of cake: 6.40%  
 Oil content of seed: 48.1% mfb      Oil content of cake: 24.6% mfb  
 Oil extraction efficiency of press: 65.8% based on crude oil yield.

Comments:  
 Compare this run with sun heated groundnut kernels.  
 This run carried out with 30 mm ram.



APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 19/2/93  
 Press Type: CAPU Date of purchase: Not yet sold Owner: CAMARTEC  
 Expt carried out after cutting cage bars open Occupation:  
 Village: Condition: Good Bought new?:  
 Press payment scheme: Monthly payments?:  
 Seed type: SESAME Only one seed?: Clean?:  
 No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:  
 Any breakdowns?: Nature?: Cost:  
 Distance to repair shop: Delay to repair?:  
 Ambient T: 28C Weather: Sunny with few clouds  
 Preprocessing?: Winnowed and picked over. Heated in sun.  
 Temperature of seed into press: 30C  
 Seed cost:  
 Weight of seed processed: 2.5Kg  
 Start time: 5.12 >  
 > Time for processing: 22 minutes  
 Finish time: 5.33 >  
 No strokes per minute: 4 No. of operators?: 1 Gender: M  
 Who supplies labour?: Payment for labour:  
 Wt cake (g) 1668 Wt Oil (g): 794  
 Fate of oil: Use of cake:  
 Price: Price:

**Analysis of seed and products**

Settling time and sediment: 6.5% by vol; clear after 6 days  
 Moisture content of seed: 4.80% Moisture content of cake: 6.70%  
 Oil content of seed: 53.8% mfb Oil content of cake: 33.3% mfb  
 Oil extraction efficiency of press: 62.0% based on crude oil yield.

**Comments:**

This experiment carried out after cutting cage bars open with hacksaw to increase gaps  
 Compare with experiment before cutting cage.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 19/2/93  
 Press Type: CAPU Date of purchase: Not yet sold Owner: CAMARTEC  
 Expt carried out before cutting cage bars open Occupation:  
 Village: Condition: Good Bought new?:  
 Press payment scheme: Monthly payments?:  
 Seed type: Sunflower Only one seed?: YES Clean?: YES  
 Record  
 No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:  
 Any breakdowns?: Nature?: Cost:  
 Distance to repair shop: Delay to repair?:  
 Ambient T: 30 Weather: Sunny with few clouds  
 Preprocessing?: Winnowed and picked over. Heated in sun.  
 Temperature of seed into press: 43C  
 Seed cost:  
 Weight of seed processed: 5 Kg  
 Start time: 1.37 >  
 > Time for processing: 32 minutes  
 Finish time: 2.09 >  
 No strokes per minute: 8 No. of operators?: 1 Gender: M  
 Who supplies labour?: Payment for labour:  
 Wt cake (g) 3818 Wt Oil (g): 1178  
 Fate of oil: Use of cake:  
 Price: Price:

**Analysis of seed and products**

Settling time and sediment: 13.3% by vol; still cloudy after 6 days  
 Moisture content of seed: 5.00% Moisture content of cake: 6.60%  
 Oil content of seed: 47.1% mfb Oil content of cake: 25.5% mfb  
 Oil extraction efficiency of press: 52.7% based on crude oil yield.

**Comments:**

This experiment carried out before cutting cage bars open with hacksaw to increase gaps  
 Compare with experiment after cutting cage.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Date: 19/2/93  
 Press Type: CAPU Date of purchase: Not yet sold Owner: CAMARTEC  
 Expt carried out after cutting cage bars open Occupation:

Village: Condition: Good Bought new?:

Press payment scheme: Monthly payments?:

Seed type: Sunflower Record Only one seed?: YES Clean?: YES

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?: Nature?: Cost:

Distance to repair shop: Delay to repair?:

Ambient T: 28C Weather: Sunny with few clouds

Preprocessing?: Winnowed and picked over. Heated in sun.

Temperature of seed into press: 32C

Seed cost:

Weight of seed processed: 5 Kg

Start time: 5.47 >  
 > Time for processing: 33 minutes  
 Finish time: 6.20 >

No strokes per minute: 6 No. of operators?: 1 Gender: M

Who supplies labour?: Payment for labour:

Wt cake (g) 3691 Wt Oil (g): 1280

Fate of oil: Use of cake:  
 Price: Price:

**Analysis of seed and products**

Settling time and sediment: 8.3% by vol; still cloudy after 6 days  
 Moisture content of seed: 5.50% Moisture content of cake: 7.60%  
 Oil content of seed: 47.0% mfb Oil content of cake: 24.5% mfb  
 Oil extraction efficiency of press: 57.7% based on crude oil yield.

**Comments:**

This experiment carried out after cutting cage bars open with hacksaw to increase gaps  
 Compare with experiment before cutting cage.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC      Date of purchase: Not yet sold      Date: 19/2/93  
 For comparison with heating in sun.      Owner: CAMARTEC  
 Occupation:

Village:      Condition: Good      Bought new?:

Press payment scheme:      Montly payments?:

Seed type: SESAME      Only one seed?:      Clean?:  
 Heated in water bath for 30 minutes before pressing

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?:      Nature?:      Cost:

Distance to repair shop:      Delay to repair?:

Ambient T: 29C      Weather: Sunny with few clouds

Preprocessing?:      Winnowed and picked over. Heated over water bath.

Temperature of seed into press: 47-60C

Seed cost:

Weight of seed processed: 5 Kg

Start time: 11.50 >  
 > Time for processing: 75 minutes  
 Finish time: 1.05 >

No strokes per minute: 4      No. of operators?: 3      Gender: 2M+1F

Who supplies labour?:      Payment for labour:

Wt cake (g) 2859      Wt Oil (g): 2033

Fate of oil:      Use of cake:  
 Price:      Price:

**Analysis of seed and products**

Settling time and sediment: 8.4% by vol; clear after 6 days  
 Moisture content of seed: 4.10%      Moisture content of cake: 7.70%  
 Oil content of seed: 53.9% mfb      Oil content of cake: 26.0% mfb  
 Oil extraction efficiency of press: 78.6% based on crude oil yield.

**Comments:**

SESAME DRIED OVER WATER BATH ( for comparison with sesame heated in sun)  
 NEWLY MADE REINFORCED CAMARTEC PRESS

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC      Date of purchase: Not yet sold      Date: 19/2/93  
 For comparison with heating over water bath      Owner: CAMARTEC  
 Occupation:  
 Village:      Condition: Good      Bought new?:  
 Press payment scheme:      Monthly payments?:  
 Seed type: SESAME      Only one seed?:      Clean?:

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?:      Nature?:      Cost:  
 Distance to repair shop:      Delay to repair?:  
 Ambient T: 28C      Weather: Sunny with few clouds

Preprocessing?:      Winnowed and picked over. Heated in sun.

Temperature of seed into press: 38C

Seed cost:

Weight of seed processed: 4.5Kg

Start time: 3.10 >  
 > Time for processing: 62 minutes  
 Finish time: 4.12 >

No strokes per minute: 4      No. of operators?: 1      Gender: M

Who supplies labour?:      Payment for labour:

Wt cake (g) 2821      Wt Oil (g): 1568

Fate of oil:      Use of cake:  
 Price:      Price:

**Analysis of seed and products**

Settling time and sediment: 9.0% by vol; clear after 6 days  
 Moisture content of seed: 5.00%      Moisture content of cake: 6.20%  
 Oil content of seed: 54.1% mfb      Oil content of cake: 29.8% mfb  
 Oil extraction efficiency of press: 67.8% based on crude oil yield.

Comments:  
 SUN-DRIED SESAME ( for comparison with sesame heated on water bath)  
 NEWLY MADE REINFORCED CAMARTEC PRESS

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC      Date of purchase: Not yet sold      Date: 22/2/93  
 12 strokes per min      Owner: CAMARTEC  
 Occupation:

Village:      Condition: Brand new      Bought new?:

Press payment scheme:      Monthly payments?:

Seed type: Sunflower      Only one seed?:      Clean?:  
                  Record

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?:      Nature?:      Cost:

Distance to repair shop:      Delay to repair?:

Ambient T: 30C      Weather: Sunny with light broken clouds

Preprocessing?:      Winnowed and picked over. Heated in sun.

Temperature of seed into press: 46C

Seed cost:

Weight of seed processed: 2.5 Kg

Start time: 11.29      >  
                  > Time for processing: 21 minutes  
 Finish time: 11.50      >

No strokes per minute: 12      No. of operators?: 1      Gender: M

Who supplies labour?:      Payment for labour:

Wt cake (g) 1767      Wt Oil (g): 716

Fate of oil:      Use of cake:  
 Price:      Price:

**Analysis of seed and products**  
 Settling time and sediment: 14.1% by vol; still cloudy after 4 days  
 Moisture content of seed: 3.60%      Moisture content of cake: 6.10%  
 Oil content of seed: 48.2% mfb      Oil content of cake: 21.5% mfb  
 Oil extraction efficiency of press: 61.6% based on crude oil yield.

Comments:  
 Ckoke setting 40 mm.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC      Date of purchase: Not yet sold      Date: 22/2/93  
 20 strokes per min      Owner: CAMARTEC  
 Occupation:

Village:      Condition: Brand new      Bought new?:

Press payment scheme:      Monthly payments?:

Seed type: Sunflower      Only one seed?:      Clean?:  
 Record

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?:      Nature?:      Cost:

Distance to repair shop:      Delay to repair?:

Ambient T: 30C      Weather: Sunny with light broken clouds

Preprocessing?:      Winnowed and picked over. Heated in sun.

Temperature of seed into press: 42C

Seed cost:

Weight of seed processed: 2.5 Kg

Start time: 12.04      >  
 > Time for processing: 14 minutes  
 Finish time: 12.18      >

No strokes per minute: 20      No. of operators?: 1      Gender: M

Who supplies labour?:      Payment for labour:

Wt cake (g) 1882      Wt Oil (g): 594

Fate of oil:      Use of cake:  
 Price:      Price:

**Analysis of seed and products**  
 Settling time and sediment: 18.6% by vol; still cloudy after 4 days  
 Moisture content of seed: 3.60%      Moisture content of cake: 5.90%  
 Oil content of seed: 48.2% mfb      Oil content of cake: 25.6% mfb  
 Oil extraction efficiency of press: 51.1% based on crude oil yield.

Comments:  
 Chole setting 40 mm.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC      Date of purchase: Not yet sold      Date: 22/2/93  
 28 strokes per min      Owner: CAMARTEC  
 Occupation:

Village:      Condition: Brand new      Bought new?:

Press payment scheme:      Monthly payments?:

Seed type: Sunflower      Only one seed?:      Clean?:  
 Record

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?:      Nature?:      Cost:

Distance to repair shop:      Delay to repair?:

Ambient T: 30C      Weather: Sunny with light broken clouds

Preprocessing?:      Winnowed and picked over. Heated in sun.

Temperature of seed into press: 44C

Seed cost:

Weight of seed processed: 2.5 Kg

Start time: 12.40      >  
 > Time for processing: 10 minutes  
 Finish time: 12.50      >

No strokes per minute: 28      No. of operators?: 1      Gender: M

Who supplies labour?:      Payment for labour:

Wt cake (g) 1976      Wt Oil (g): 501

Fate of oil:      Use of cake:  
 Price:      Price:

**Analysis of seed and products**  
 Settling time and sediment: 14.7% by vol; still cloudy after 4 days  
 Moisture content of seed: 3.60%      Moisture content of cake: 5.40%  
 Oil content of seed: 48.2% mfb      Oil content of cake: 28.4% mfb  
 Oil extraction efficiency of press: 43.1% based on crude oil yield.

Comments:  
 Choke setting 40 mm.

APPENDIX I

**RAM PRESS REVIEW: TANZANIA**

Press Type: CAMARTEC  
 44 strokes per min

Date of purchase: Not yet sold  
 Date: 22/2/93  
 Owner: CAMARTEC  
 Occupation:

Village: Condition: Brand new Bought new?:

Press payment scheme: Monthly payments?:

Seed type: Sunflower Record  
 Only one seed?: Clean?:

No. seasons owned:  
 Amount processed per season:  
 Amount processed since owned:

Any breakdowns?: Nature?: Cost:

Distance to repair shop: Delay to repair?:

Ambient T: 30C Weather: Sunny with light broken clouds

Preprocessing?: Winnowed and picked over. Heated in sun.

Temperature of seed into press: 44C

Seed cost:

Weight of seed processed: 2.5 Kg

Start time: 1.04 >  
 > Time for processing: 8 minutes  
 Finish time: 1.12 >

No strokes per minute: 44 No. of operators?: 1 Gender: M

Who supplies labour?: Payment for labour:

Wt cake (g) 1909 Wt Oil (g): 555

Fate of oil: Use of cake:  
 Price: Price:

**Analysis of seed and products**

Settling time and sediment: 17.1% by vol; still cloudy after 4 days  
 Moisture content of seed: 3.60% Moisture content of cake: 5.40%  
 Oil content of seed: 48.2% mfb Oil content of cake: 27.9% mfb  
 Oil extraction efficiency of press: 47.8% based on crude oil yield.

**Comments:**

This run was carried out using a faster stroke speed but a tighter choke setting than the previous runs on sunflower seed

RAM PRESS SURVEY: TANZANIA FEBRUARY 1993

| Owner/ Village  | Press type | Temp oC | Temp of seed into press, oC | Seed type | % Moisture | % oil mfb   | Amount processed (kg) | Strokes per min           | Process time (min) | Kg processed per hour | Wt crude oil (grams) | % sediment (by vol) | Weight of cake (grams) | % moisture in cake | % oil in cake mfb | Litres oil per 50 kg      | Litres refined oil/50kg | Litres crude oil per hour | % OEE (crude oil) | Bags Processed |
|---|------------|---------|-----------------------------|-----------|------------|-------------|-----------------------|---------------------------|--------------------|-----------------------|----------------------|---------------------|------------------------|--------------------|-------------------|---------------------------|-------------------------|---------------------------|-------------------|----------------|
| Sule, Kondoa  | CAM        | 25-29   | 33-35                       | SF        | 5.6        | 48.3        | 5                     | 28                        | 21                 | 14.3                  | 1265                 | 8.1                 | 3692                   | 7.7                | 26.3              | 13.7                      | 12.7                    | 3.9                       | 55.5              | 2              |
| Sule, Kondoa  | CAM        | 25-29   | 33-35                       | SF        | 5.6        | 48.3        | 2.5                   | 15                        | 24                 | 6.3                   | 779                  | 8.1                 | nm                     | 7.8                | 20.8              | 16.8                      | 15.6                    | 2.1                       | 68.3              | 2              |
| Msaya, Kondoa   | CAM        | 30      | 40                          | SF        | 4.9        | 48.4        | 5                     | 15                        | 57                 | 5.3                   | 1648                 | 10.3                | 3204                   | 7.4                | 18.9              | 17.8                      | 16.5                    | 1.9                       | 71.6              | 2              |
| Nduka, Mrijo  | CAM        | 30      | 33                          | SF        | 5.3        | 48.0        | 2.5                   | 12                        | 26                 | 5.8                   | 709                  | 8.0                 | 1763                   | 7.1                | 25.0              | 15.3                      | 14.2                    | 1.8                       | 62.3              | 60             |
| <b>AVERAGE</b>  |            |         |                             |           |            | <b>48.3</b> |                       |                           |                    | <b>7.9</b>            |                      |                     |                        |                    | <b>22.7</b>       | <b>15.9</b>               | <b>14.7</b>             |                           | <b>64.4</b>       |                |
| Ali, Mrijo  | CAM        | 30      |                             | SF        | 6.5        | 43.6        |                       | No experiment carried out |                    |                       |                      | 9.1                 |                        | 7.8                | 25.4              | No experiment carried out |                         |                           |                   | 15             |
| Protzen, Arusha   | CAM*       | 30      | 46                          | SF        | 3.6        | 48.2        | 2.5                   | 12                        | 21                 | 7.1                   | 716                  | 14.1                | 1767                   | 6.1                | 21.5              | 15.5                      | 14.3                    | 2.2                       | 61.6              | 0              |
| <b>AVERAGE</b>  |            |         |                             |           |            | <b>48.2</b> |                       |                           |                    | <b>7.1</b>            |                      |                     |                        |                    | <b>21.5</b>       | <b>15.5</b>               | <b>14.3</b>             |                           | <b>61.6</b>       |                |
| Machibula, Dongoa   | CAPU       | 30      | 62-86                       | SF        | 4.8        | 47.0        | 5                     | 15                        | 42                 | 7.1                   | 1617                 | 11.8                | 3308                   | 6.6                | 18.1              | 17.5                      | 16.2                    | 2.5                       | 72.3              | 300            |
| Isere, Mrijo  | CAPU       | 30      | 40-49                       | SF        | 5.5        | 48.3        | 5                     | 13                        | 19                 | 15.8                  | 1464                 | 8.4                 | 3464                   | 6.8                | 23.2              | 15.8                      | 14.7                    | 5.0                       | 64.1              | 5              |
| Isere, Mrijo  | CAPU       | 30      | 40                          | SF        | 5.3        | 48.5        | 5                     | 16                        | 12                 | 25.0                  | 1048                 | 7.2                 | nm                     | 6.7                | 27.4              | 11.3                      | 10.5                    | 5.7                       | 45.6              | 5              |
| Jaribu, Mrijo   | CAPU       | 30      | 35-56                       | SF        | 5.1        | 48.1        | 5                     | 14                        | 45                 | 6.7                   | 1412                 | 16.4                | 3441                   | 6.5                | 24.6              | 15.3                      | 14.1                    | 2.0                       | 61.8              | 134            |
| VOPP, Kondoa  | CAPU       | 27-36   | 46                          | SF        | 4.4        | 47.8        | 5                     | 6                         | 27                 | 11.1                  | 1223                 | 9.0                 | 3735                   | 5.8                | 26.8              | 13.2                      | 12.2                    | 2.9                       | 53.5              | 0              |
| VOPP, Kondoa  | CAPU       | 28      | 52                          | SF        | 3.9        | 47.2        | 2                     | 10                        | 11                 | 10.9                  | 582                  | 9.0                 | 1415                   | 5.6                | 24.6              | 15.7                      | 14.6                    | 3.4                       | 64.2              | 0              |
| Protzen, Arusha (1)                                       | CAPU       | 30      | 43                          | SF        | 5.0        | 47.1        | 5                     | 8                         | 32                 | 9.4                   | 1178                 | 13.3                | 3818                   | 6.6                | 25.5              | 12.7                      | 11.8                    | 2.4                       | 52.7              | 0              |
| Protzen, Arusha (2)                                       | CAPU       | 28      | 32                          | SF        | 5.5        | 47.0        | 5                     | 6                         | 33                 | 9.1                   | 1280                 | 8.3                 | 3691                   | 7.6                | 24.5              | 13.8                      | 12.8                    | 2.5                       | 57.7              | 0              |
| <b>AVERAGE</b>  |            |         |                             |           |            | <b>47.6</b> |                       |                           |                    | <b>11.9</b>           |                      |                     |                        |                    | <b>24.3</b>       | <b>14.4</b>               | <b>13.4</b>             |                           | <b>59.0</b>       |                |
| Mataya, Mwikantsi   | NS         | 33      | 40                          | SF        | 5.1        | 49.0        | 5                     | 10                        | 29                 | 10.3                  | 1605                 | 10.0                | 2781                   | 8.1                | 23.0              | 17.4                      | 16.1                    | 3.6                       | 69.1              | 540            |
| Kaisa, Mamire   | NS         | 23      | 22                          | SF        | 5.1        | 49.0        | 5                     | 24                        | 19                 | 15.8                  | 632                  | 10.0                | 3175                   | 8.9                | 37.1              | 6.8                       | 6.3                     | 2.2                       | 27.2              | 1000           |
| Kweka, Babati   | NS         | 24      | 26                          | SF        | 6.7        | 48.4        | 5                     | 14                        | 17                 | 17.6                  | 1216                 | 9.2                 | 3922                   | 9.7                | 26.5              | 13.1                      | 12.2                    | 4.6                       | 53.8              | 1600           |
| Kilinga, Babati   | NS         | 35      | 33                          | SF        | 6.7        | 48.4        | 5                     | 8                         | 16                 | 18.8                  | 1191                 | 10.0                | nm                     | 7.5                | 34.1              | 12.9                      | 11.9                    | 4.8                       | 52.7              | NK             |
| <b>AVERAGE (figures in this row do not include Kaisa)</b> |            |         |                             |           |            | <b>48.6</b> |                       |                           |                    | <b>15.6</b>           |                      |                     |                        |                    | <b>27.9</b>       | <b>14.5</b>               | <b>13.4</b>             |                           | <b>58.5</b>       |                |
| Protzen, Arusha   | CAM*       | 30      | 42                          | SF        | 3.6        | 48.2        | 2.5                   | 20                        | 14                 | 10.7                  | 594                  | 18.6                | 1882                   | 5.9                | 25.6              | 12.8                      | 11.9                    | 2.8                       | 51.1              | 0              |
| Protzen, Arusha   | CAM*       | 30      | 44                          | SF        | 3.6        | 48.2        | 2.5                   | 28                        | 10                 | 15.0                  | 501                  | 14.7                | 1976                   | 5.4                | 28.4              | 10.8                      | 10.0                    | 3.2                       | 43.1              | 0              |
| Protzen, Arusha   | CAM*       | 30      | 44                          | SF        | 3.6        | 48.2        | 2.5                   | 44                        | 8                  | 18.8                  | 555                  | 17.1                | 1909                   | 5.4                | 27.9              | 12.0                      | 11.1                    | 4.5                       | 47.8              | 0              |
| Protzen, Arusha (1)                                       | CAPU       | 28      | 40                          | SES       | 4.2        | 53.8        | 2.5                   | 4                         | 22                 | 6.8                   | 792                  | 4.5                 | 1671                   | 6.2                | 35.0              | 17.1                      | 15.9                    | 2.3                       | 61.4              | 0              |
| Protzen, Arusha (2)                                       | CAPU       | 28      | 30                          | SES       | 4.8        | 53.8        | 2.5                   | 4                         | 21                 | 7.1                   | 794                  | 6.5                 | 1668                   | 6.7                | 33.3              | 17.2                      | 15.9                    | 2.5                       | 62.0              | 0              |
| Protzen, Arusha (3)                                       | CAM*       | 28      | 38                          | SES       | 5.0        | 54.1        | 4.5                   | 4                         | 62                 | 4.4                   | 1568                 | 9.0                 | 2821                   | 6.2                | 29.8              | 18.8                      | 17.4                    | 1.6                       | 67.8              | 0              |
| Protzen, Arusha (4)                                       | CAM*       | 28      | 47-60                       | SES       | 4.1        | 53.9        | 5                     | 4                         | 75                 | 4.0                   | 2033                 | 8.4                 | 2859                   | 7.7                | 26.0              | 22.0                      | 20.4                    | 1.8                       | 78.6              | 0              |
| Protzen, Arusha (3)                                       | CAM*       | 30      | 40                          | GN        | 4.8        | 48.5        | 5                     | 7                         | 56                 | 5.4                   | 1305                 | 15.1                | 3591                   | 6.1                | 30.2              | 14.1                      | 13.1                    | 1.5                       | 56.5              | 0              |
| Protzen, Arusha (4)                                       | CAM*       | 28      | 65                          | GN        | 4.7        | 48.1        | 5                     | 8                         | 56                 | 5.4                   | 1508                 | 13.1                | 3036                   | 6.4                | 24.6              | 16.3                      | 15.1                    | 1.7                       | 65.8              | 0              |
| Protzen, Arusha   | CAM*       | 30      | 32-38                       | GN        | 4.6        | 48.5        | 5                     | 6                         | 45                 | 6.7                   | 1117                 | 12.5                | 3808                   | 5.9                | 33.8              | 12.1                      | 11.2                    | 1.6                       | 48.3              | 0              |
| <b>AVERAGE</b>  |            |         |                             |           |            | <b>48.4</b> |                       |                           |                    | <b>5.8</b>            |                      |                     |                        |                    | <b>29.6</b>       | <b>14.2</b>               | <b>13.1</b>             |                           | <b>56.9</b>       |                |

Press type= CAM: CAMARTEC CAP: CAPU NS: NAND SINGH  
Seed type= SF: Sunflower SES: Sesame GN: Groundnut

nm= not measured NK= not known  
\* modified, strengthened press

(1): Before cutting cage bars  
(2): After cutting cage bars

(3): Heated in the sun  
(4): Heated over water bath

APPENDIX III



Nand Singh press in operation



Nand Singh press showing barrel

APPENDIX III



CAPU press being used for processing sunflower seed  
Another CAPU press is shown in the foreground

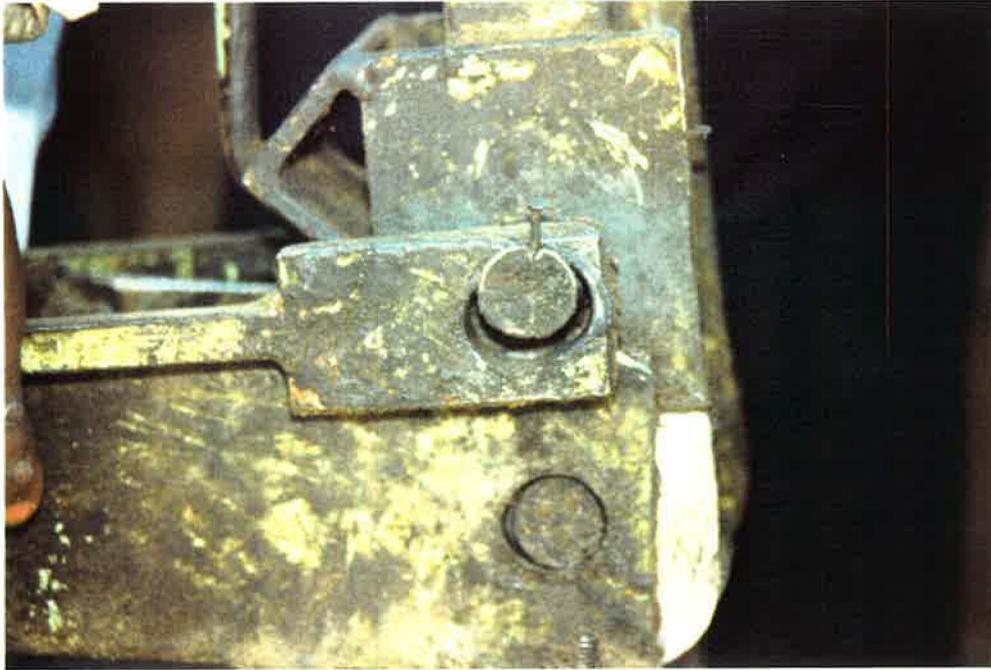


CAMARTEC press in operation showing seed agitator



Sesame seed being processed using a modified CAMARTEC press

APPENDIX III



Example of worn tie bars



CAMARTEC press showing strengthened bearing parts

## APPENDIX IV

Ram press operation in Tanzania: financial analysis

Cost of press: 120,000 TSh

### **CAPU PRESS**

FIRST YEAR OF OPERATION: SEASON = 3 MONTHS

|                                    |                    |
|------------------------------------|--------------------|
| 1. Fixed costs                     | 120,000 TSh        |
| 2. Operating costs                 |                    |
| a. Seed* 170 bags @ 3500           | 595,000 TSh        |
| b. Labour 170 bags @ 200           | 34,000 TSh         |
| Total operating costs              | 629,000 TSh        |
| 3. Income                          |                    |
| a. Oil: 2448litres x 0.926** @ 400 | 906,739 TSh        |
| b. Cake: 56 bags @ 500             | 28,000 TSh         |
| <b>Gross revenue</b>               | <b>934,739 TSh</b> |
| Net revenue                        | 305,739 TSh        |

Conclusion: payback period less than one year

NOTE: Maintenance and replacement part costs have not been included

\* Press operating for 3 months of the year only: see below

\*\* 7.4% refining loss

Assumes the following:

- a. 12 Kg sunflower seed processed/hour
- b. 10 hour working day
- c. 6 working days/week
- d. 12 working weeks/season  
(equal to 170 bags processed /season)
- e. labour cost Tsh 200/50 kg bag seed
- f. 14.4 litres crude oil per 50 kg bag
- g. No maintenance costs
- h. All products can be sold

## APPENDIX IV

Ram press operation in Tanzania: financial analysis

Cost of press: 50,000 TSh

### **CAMARTEC PRESS**

FIRST YEAR OF OPERATION: SEASON = 3 MONTHS

|                                    |                    |
|------------------------------------|--------------------|
| 1. Fixed costs                     | 50,000 TSh         |
| 2. Operating costs                 |                    |
| a. Seed* 100 bags @ 3500           | 350,000 TSh        |
| b. Labour 100 bags @ 200           | 20,000 TSh         |
| Total operating costs              | 370,000 TSh        |
| 3. Income                          |                    |
| a. Oil: 1550litres x 0.926** @ 400 | 574,120 TSh        |
| b. Cake: 33 bags @ 500             | 16,500 TSh         |
| <b>Gross revenue</b>               | <b>590,620 TSh</b> |
| <b>Net revenue</b>                 | <b>220,620 TSh</b> |

Conclusion: payback period less than one year

NOTE: Maintenance and replacement part costs have not been included

\* Press operating for 3 months of the year only: see below

\*\* 7.4% refining loss

Assumes the following:

- a. 7 Kg sunflower seed processed/hour
- b. 10 hour working day
- c. 6 working days/week
- d. 12 working weeks/season  
(equal to 100 bags processed /season)
- e. labour cost Tsh 200/50 kg bag seed
- f. 15.5 litres crude oil per 50 kg bag
- g. No maintenance costs
- h. All products can be sold

## APPENDIX IV

Ram press operation in Tanzania: financial analysis

Cost of 2 presses: 100,000 TSh

### 2 CAMARTEC PRESSES

FIRST YEAR OF OPERATION: SEASON = 3 MONTHS

|                                    |                      |
|------------------------------------|----------------------|
| 1. Fixed costs                     | 100,000 TSh          |
| 2. Operating costs                 |                      |
| a. Seed* 200 bags @ 3500           | 700,000 TSh          |
| b. Labour 200 bags @ 200           | 40,000 TSh           |
| Total operating costs              | 740,000 TSh          |
| 3. Income                          |                      |
| a. Oil: 3100litres x 0.926** @ 400 | 1,148,240 TSh        |
| b. Cake: 66 bags @ 500             | 33,000 TSh           |
| <b>Gross revenue</b>               | <b>1,181,240 TSh</b> |
| <b>Net revenue</b>                 | <b>441,240 TSh</b>   |

Conclusion: payback period less than one year

NOTE: Maintenance and replacement part costs have not been included

\* Press operating for 3 months of the year only: see below

\*\* 7.4% refining loss

Assumes the following:

- a. 7 Kg sunflower seed processed/hour
- b. 10 hour working day
- c. 6 working days/week
- d. 12 working weeks/season  
(equal to 200 bags processed /season)
- e. labour cost Tsh 200/50 kg bag seed
- f. 15.5 litres crude oil per 50 kg bag
- g. 2 CAMARTEC presses being operated
- h. No maintenance costs
- i. All products can be sold

Effect of handle stroke rate on throughput and yield when using the ram press

| Owner/ Village  | Press type | Temp oC | Temp of seed into press, oC | Seed type | % Moisture | % oil mfb | Amount processed (kg) | Strokes per min | Process time (min) | Kg processed per hour | Wt crude oil (grams) | % sediment (by vol) | Weight of cake (grams) | % moisture in cake | % oil in cake mfb | Litres oil per 50 kg | Litres refined oil/50kg | Litres crude oil per hour | % OE (crude oil) | Bags Processed |
|-----------------|------------|---------|-----------------------------|-----------|------------|-----------|-----------------------|-----------------|--------------------|-----------------------|----------------------|---------------------|------------------------|--------------------|-------------------|----------------------|-------------------------|---------------------------|------------------|----------------|
| Protzen, Arusha | CAM        | 30      | 46                          | SF        | 3.6        | 48.2      | 2.5                   | 12              | 21                 | 7.1                   | 716                  | 14.1                | 1767                   | 6.1                | 21.5              | 15.5                 | 14.3                    | 2.2                       | 61.6             | 0              |
| Protzen, Arusha | CAM        | 30      | 42                          | SF        | 3.6        | 48.2      | 2.5                   | 20              | 14                 | 10.7                  | 594                  | 18.6                | 1882                   | 5.9                | 25.6              | 12.8                 | 11.9                    | 2.8                       | 51.1             | 0              |
| Protzen, Arusha | CAM        | 30      | 44                          | SF        | 3.6        | 48.2      | 2.5                   | 28              | 10                 | 15                    | 501                  | 14.7                | 1976                   | 5.4                | 28.4              | 10.8                 | 10                      | 3.2                       | 43.1             | 0              |
| Protzen, Arusha | CAM*       | 30      | 44                          | SF        | 3.6        | 48.2      | 2.5                   | 44              | 8                  | 18.8                  | 555                  | 17.1                | 1909                   | 5.4                | 27.9              | 12                   | 11.1                    | 4.5                       | 47.8             | 0              |

\* This test was carried out using a tighter choke setting than that used for the previous three tests

CAM= modified, strengthened CAMARTEC press

## APPENDIX VI

### **Household oil clarification method used in Tanzania for sunflower seed oil produced by the ram press**

Crude sunflower seed oil containing sediment is transferred to a pan and water added. The amount of water varies but is typically in the range 1:1 to 2:1 (oil:water).

The mixture is boiled for varying periods. Some operators boil the mixture until all the water is driven off and decant the oil from the residue. The residue is placed in a cloth and squeezed, the residual oil being added to that previously decanted. Other operators boil for 10-15 minutes and scoop the oil from the resulting cooled oil/water layers. Both methods produce a clear oil.

Some operators add salt and/or pieces of potato during the boiling process.

### **Experiment to determine loss on boiling crude oil to obtain clear oil**

Crude sunflower seed oil (1863g) was placed in a pan and water (1400ml) added. The mixture was boiled for 12 minutes and left to cool for 4 minutes. The oil was scooped off using a spoon.

The weight of the clarified oil was 1725g representing a recovery rate of 92.6%. The factor 0.926 has therefore been used in this report to calculate the amount of clarified oil obtained from crude sunflower seed oil.