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Report on a visit to Nigeria to study
the marketing of dried meat and its
shelf life in the humid zones
28 November - 8 December 1992

D Silverside

Project No F0016

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Abbreviations

ARI	-	Adaptive Research Initiative
IITA	-	International Institute for Tropical Agriculture, Ibadan
ILCA	-	International Livestock Centre for Africa, Ibadan
NRED	-	Natural Resources & Environment Dept, ODA
NRI	-	Natural Resources Institute
PCSIR	-	Pakistan Council of Scientific & Industrial Research
UNIMAID	-	University of Maiduguri

Conversion

£1 = ₦27 (December 1992)

TERMS OF REFERENCE

- 1 To make a brief, preliminary survey of the dried meat market in Nigeria.
- 2 To set up a technical project to determine the shelf life of dried meat produced in the arid tropics when stored in the humid regions.
- 3 To prepare for a socio-economic survey on the marketing of dried meat throughout Nigeria

SUMMARY

1 ARI funds have been approved to evaluate the market for dried meat in Nigeria (a socio-economic study) and to characterise the product and its storage life on transfer from the arid north to the more humid southern zones (a technical study). Before commencing field work, a short visit to Nigeria was undertaken to set up these technical and socio-economic studies.

2 Visits were made to ILCA, IITA, UNIMAID and meat markets in Ibadan and Maiduguri. Discussions were held with team leaders, scientists, professors, producers, wholesalers and retailers of dried meat. The existence of a highly structured industry of significant proportions was found. Methods of production, processing, transport and storage are described in paras 9 - 22.

3 It was concluded that the marketing and technical infrastructure exists and, with the considerable and kind support of ILCA and IITA, both the socio-economic and technical programmes may proceed as soon as formalities are complete.

BACKGROUND

4 Although consumers may prefer fresh meat, processed meats often have advantages since the bulky product is broken into small units with a relatively long shelf life. Not only is the moisture removed during drying, thereby rendering the product to 40 - 50% of its original weight, but also the small pieces may be more densely packed to reduce the costs of transportation. The protein is more concentrated and the small units makes the product suitable for isolated markets e.g. small village communities and facilitates improved nutrition of disadvantaged groups. Previous work to address these issues was conducted by NRI in collaboration with PCSIR, Pakistan and led to the successful development of dried meat products. Uptake and marketing of the products were left to the PCSIR. Subsequent work in Ghana addressed the technical difficulties of drying meat in the humid tropics through the use of solar dryers but the work raised the question of whether a market for the product actually exists.

5 Processed meats are known to fill a particular need for travellers and may be sold as a delicacy in specialised outlets. This market niche has been exploited by small producers but this is restricted mainly to the Sahel and sub-Saharan regions. Visiting Nigerians to NRI reported that dried meat was readily available in the sub-humid and humid zones of their country but the product had disappeared in recent years. The reasons for this disappearance were not known.

6 NRED/ARI funds were approved to examine the situation in Nigeria with a view to improvement of existing technologies and their adaptation to the needs of other countries in the region. The project has the following specific objectives.

To determine the market demand for processed meat products in the sub-humid/humid south.

To assess the technical problems of introducing processed meats prepared in the semi-arid north into the sub-humid/humid southern markets.

To respond to the identified market requirements for processed meat products.

7 The project is divided into three phases:

Phase 1 A 10 day visit to Nigeria by a meat technologist to determine the feasibility of continuing with the project. (ie the visit being reported here)

Phase 2 A two man team to visit Nigeria in the last quarter of FY 92/3 for 4 - 6 weeks each with the following general objectives:

- a) A socio-economist to examine the supply of and demand for the product. The Terms of Reference for the visit are attached as Appendix 3.
- b) A meat technologist who will characterise and determine the shelf life of dried meat prepared in the arid north when stored in the humid zones. The experimental plan to be undertaken during the visit is attached as Appendix 4.

Phase 3 A two man team to visit Nigeria for 3-4 months in FY 93/4 with the following general objectives:

- a) A meat technologist to prepare products which are stable in the humid southern zones.
- b) A marketing economist to test market the product if suitable markets were identified in Phase 2.

8 D Silverside undertook Phase 1 in Nigeria between 28 November and 8 December 1992. During this period, the market in Dugbe, Ibadan (Oyo State) was visited, and discussions held with staff members of ILCA, IITA in Ibadan, professors at the universities of Ibadan and Maiduguri (Borno State) and meat processors, also in Maiduguri. Prospects for completion of Phase 2 look promising but Phase 3 may need considerable revision as a consequence of the findings in Phase 2.

PROCESSING AND MARKETING OF DRIED MEAT.

Location of the dried meat industry

9 A visit to Dugbe Market in Ibadan quickly revealed a lively trade in dried meat, known locally as kundi. Market traders said that the meat originates in Maiduguri (Borno State), Abada (Borno), Nguru (Borno) and Sokoto (Sokoto State). By far the most meat comes from Maiduguri and it was in this town that two meat processors explained the processing details and marketing on the supply side of this highly structured industry.

structure of the processing industry

10 There are about 10 "masters" of the business in Maiduguri and more in other processing centres. They belong to an association with a Secretary. The association was originally set up to counter harassment from the authorities but it now regulates the market, organises transport and, presumably, influences the prices of the product. Each master has *managers* who employ *processors* and *scouts*. (Italics are authors terms).

Both of the managers interviewed explained that the masters used telephones to conduct their business. In this vast region of difficult communications, it is assumed that the masters use short-wave radio.

The *Modus Operandi* of the Processors

11 The scouts spend much of their time in the bush seeking livestock to slaughter. When appropriate, the manager sets off from town in a commercial vehicle with his processors and processing equipment to go to the stock. Slaughter and processing take place using only the facilities taken by the team. The team then moves on to the next centre and repeats the slaughter and processing operation until the vehicle is full, the money is spent or whatever; the team then returns to town. The teams have no set date to leave or return to town. They may be away for a few days or a month or so. It is difficult, therefore, for a short-term visitor to observe the method of processing. A long term visitor would need to live in Maiduguri and have constant contact with the managers. N.B It was later learned from Nigerian staff at

IITA after return to Ibadan, that established processing sites may exist at Abada, 250 km NW of Maiduguri on the Nigeria/Niger border.

12 The *modus operandi* indicates that there is probably no control over the condition of the animal slaughtered or the conditions under which the meat is processed. Nevertheless, the method of processing remains theoretically valid and it is possibly a transferable technology. The following summarises the processing details given by the two managers interviewed.

Method of Processing Livestock into Dried Meat

13 Usually only one animal is slaughtered and processed each day in the dry season, fewer during the wet. All parts of the carcase, except the fill and bones are prepared for drying. The meat is seamed out into muscles about the size of a mans arm. It is thrown into slightly salted boiling water in half an oil drum heated over a wood fire. The meat is cooked, perhaps for several hours, until it is "done", a point determined by the processor and one which requires skill. The meat is then removed and left to cool on rush mats lying on the sand in the sun. The "broth" is simply poured away. After cooling, the meat is cut into cubes and returned to the rush mat for sun drying. This usually takes one day but may take two. The processors skill is again called upon to determine sufficient desiccation of the meat. The meat may then be stacked in the vehicle which then is driven on to process the next animal. If there is no hurry, the meat may be lightly smoked before stacking.

14 Once the vehicle has returned to town, the meat is hot smoked over a wood fire for 1-2 days. The smoker observed in Maiduguri comprised a simple metal mesh tray of about 1m² suspended between the walls of two dwellings. There was evidence of a wood fire having been lit underneath. After smoking, the meat is placed on the floor in a dark shed where it is frequently raked over to allow the smokiness to disappear. After some time, the meat is then made ready for dispatch to the market.

Transport to Market

15 It is said that 160 pieces of meat are placed in crude baskets made from a broad-leaved rush. Each basket folds into a cube of about 200-250 mm and weighing about 1.0 - 2 kg. The value of each basket of meat was given as ₦160-300, a similar price to that suggested in Ibadan. The baskets of meat travel south by road. The two processors interviewed have a "slot" on the southbound vehicle of every third Friday. This ensures that all processors have a fair chance to take their product to market. The master sends his man with the vehicle to ensure safe arrival of the load and to obtain the best price in the wholesale market. The journey from Maiduguri to Ibadan takes two full days. Maiduguri sends all its meat either to Ibadan or Onitsha. N.B. There

is practically no market in Maiduguri for this product -- (kundi). The only dried products to be found in Maiduguri are Kilishi (for which demand is probably minimal) or suyer, a smoked/cooked flat spicy product, prepared in markets and at the roadside.

Activities in Dugbe Market

16 The visit to Dugbe market in Ibadan co-incided with the arrival of a lorry load of Kundi. It was said that the lorries held 6,000 baskets and the market takes delivery of 5 loads each week. Assuming a 15% fill in a 350 kg liveweight animal with 40 kg bones yielding 40% weight of dried meat, the Ibadan market represents 290 animals/week if each basket weights 1kg. Prices fluctuated greatly between ₦200 and ₦300/basket* These prices were probably artificially high due to the circumstances in which the retailers were asked and the quantity of product on the market was said to be much reduced following closure of the northern borders with Niger and Chad 2-3 years ago. Most stock originated in these countries.

17 The baskets of meat were sold in wholesale lots by what appeared to be an informal auction at the side of the vehicle. Loads of 20-50 baskets were taken into lock up shops nearby or loaded onto smaller vehicles. These vehicles are said to take the product to Lagos and many other destinations in the region. The high price/low volume of the product may explain its disappearance in some southern markets where the purchasing power of the consumer is low.

18 In the lock up shops, the baskets were opened to reveal about 50-100 pieces of meat, 30-50 mm³, very dark with an appearance of brown charcoal. There was no particular odour. The meat was sold by the basket (again between ₦200 and ₦300) or sorted into little dishes or piles of 10-15 pieces for ₦14. There are about 50 shops and each may sell about 10 dishes a day.

Meat Quality Problems

19 Traders said there were no particular problems of quality of the meat. If the vehicle met with rain en route there were signs of mould as the load was not covered. They said the product lasted about 3 months during the wet season and 5 months during the dry season before irreversible deterioration occurred.

* These prices are also affected by producer, quality and type of product eg beef, or beef with bone, intestine, stomach etc. 80 pieces of dried hide (for eating) were said to cost ₦100.

Use by the Consumer

20 According to market traders, the meat is taken home and wiped over with a damp sponge before placing directly into a pot with other vegetables and spices. It is said to be "long lasting" in the mouth.

Requirements before transfer of the technology to other countries in the region.

21 All prices given here relate to responses given to simple questions and in no way reflect the prices actually paid, since these are based on the purse of the purchaser. It is interesting to note, however, that the prices quoted in Ibadan and Maiduguri were similar. The processor clearly had little experience of selling his product in Maiduguri. Characterisation of this successful market will be required if it is to be replicated elsewhere. Terms of Reference for such a study are given in Appendix 3.

22 This product requires technical assessment and an estimation of its shelf life if it is to be used for wider distribution. An experimental design to make these assessments is given in Appendix 4. Notwithstanding the remarks made about control of the present processing operations in Northern Nigeria, some formalisation of the processing location and conditions under which it is conducted will also be necessary if the process is used in a wider context. Also, the chances of observing current practices are not high. Nevertheless, the technology appears to work and a little research may be necessary to detail the operating processes which, apart from initial meat preparation, emulate significantly the operations used previously in the PCSIR/NRI study.

DISCUSSIONS WITH OFFICIAL BODIES

Preamble

23 In order to conduct any form of research in Nigeria (and probably most other places for that matter) it is essential to have the interest and cooperation of a local organisation. Previous knowledge of the Nigerian system suggested that ILCA, Ibadan could be interested in collaboration on this project. Their cooperation and that the universities of Ibadan and Maiduguri were sought. The project falls into two parts, the socio-economic study and the technical assessment, and these will be discussed separately.

The Socio-Economic Study

23 This part of the project interested ILCA greatly and, under certain conditions, it wishes to make a contribution. It was foreseen that the TORs set out in Chapter 4 would

involve time being spent in Dugbe market and others, further afield, perhaps Onitsha, Enugu, Lagos and Port Harcourt. It was agreed that, should the NRI Socio-Economist wish, an ILCA staff member would be made available for the entire period (up to 4 weeks) during which time ILCA would meet the salary, *per diem*, and hotel expenses of the ILCA staff member. The condition on this would be that NRI would need to meet one-half of the transport costs outside of Ibadan. Current vehicle rates are ₦1.50/km (£0.05/km or 8p/mile) over short journeys and ₦1.00 over long. Dr Jabber may make an input to the project, also at ILCA expense. The NRI Socio Economist may use the IITA guest house while in Ibadan, IITA regulations permitting.

25 The NRI Socio-Economist may wish to engage the services of a counterpart from the university/private agency etc and make his own transport arrangements. The possibilities for this were not investigated as the University of Ibadan had just returned to work following a month-long strike over an outstanding pay claim and were in no condition to discuss this, and there was insufficient time to investigate private agencies. In view of the generous offer by ILCA, alternatives are not costed in the budget.

26 The NRI Socio-Economist may wish to visit Maiduguri/Abada. On first sight this seems reasonable as the supply end of the chain is to the north of the country. However, the visit will take time and contacts with processors will need to be established. These perhaps, may turn out to be the same processors who should have been interviewed in Ibadan! Nevertheless, there may be overwhelming reasons to travel north. The value of ILCA-based staff in the north must be considered before commitment. Contact was made therefore with Professor Bankole O Ogunbameru, Head of the Agricultural Economics and Extension Department of the University of Maiduguri, who will be very pleased to consider seconding staff to the NRI Socio-Economist as an extracurricular activity with full costs borne by NRI.

Technical Study

27 The technical study presents some problems. Although interested in the results, ILCA is less enthusiastic about collaboration with the technical aspects of the trials, than that of the socio-economic study. ILCA wish to make minimal inputs and then at fully costed rates. As intended anyway the work programme devised minimises the input by ILCA, yet should yield satisfactory results.

28 It has been agreed that an ILCA Diplomat will meet the NRI Technologist on the air-side of customs to ease his passage with incoming equipment through Nigerian formalities. As the flight arrives at night (there is no alternative) and travel after dark in Nigeria is considered unwise, the NRI technologist will be booked into an hotel

with the equipment before travel to Ibadan the following day. Costs to be met by NRI include transport, *per diem* and hotel costs of driver and diplomat. At Ibadan, a run of bench sufficient for his purposes will be allocated in the laboratory for the visitors' equipment, consumables etc. Local travel will be provided to the market to collect samples at cost. Suitable storage for the samples will be provided free of charge. Samples will be analysed by the visitor for Ash, Salt, Water Activity and rehydration. Samples for moisture, protein, fat and microbiological examination will be analysed at IITA on their presentation by ILCA/NRI. These will be charged through the internal account to ILCA who will present a bill for the services to NRI. IITA will provide for the use of a chemical balance for the analysis of ash, salt etc and a muffle furnace. As analysis of the samples will continue after his departure, the technologist should train an ILCA staff member to take experimental samples for presentation to IITA for analysis on the appropriate 6 occasions. NB It may be expedient to fax ILCA when sampling is needed. Full staff costs are to be met by NRI for this service. At the end of his stay, the technologist will be taken to the airport and escorted through customs with his remaining equipment by an ILCA staff member.

29 There may be a complication over accommodation at the IITA Guest House as the visit will last more than 4 weeks. ILCA must make application for the NRI technologist to stay for this period and the application is considered by an accommodation committee.

30 None of these considerations will cause difficulty in practice. There is no requirement to leave Ibadan during the period of the study and, basically, the technologist will be welcomed to stay to do his own work.

Action Points

31 The NRI Socio-Economist should send a letter to Dr Jabber at ILCA, Ibadan outlining visit details including time of arrival, length of stay etc, Terms of Reference for himself and the ILCA staff member and when this staff member will be required. The letter should also confirm that NRI will meet the appropriate NRI and travel costs. Travel details within the country will await arrival of the NRI Socio-Economist. The letter should be drafted as soon as possible as the ILCA staff member will need to reorganise his work programme to suit the visitor. If the letter is delayed unduly, the ILCA work programme will take priority and the NRI Socio-Economist will need to make alternative arrangements. A similar letter should be sent to Prof Ogunbameru at the University of Maiduguri with the appropriate proposals to consider if use is to be made of his staff.

32 The meat technologist at NRI to send the following letters to Dr Jabber of ILCA, Ibadan

a) Project document explaining in full the intended programme and what is required of whom. Attached to this document should be a contract letter of agreement to pay for staff charges, transport, *per diem*, hotel, overtime for services rendered for assistance with the technical aspects of the project and numbers of analyses of moisture, fat, protein and bacteriological samples etc in US dollars on presentation of an invoice from ILCA. The letter should also state what chemicals NRI will supply for these analyses. Upon receipt, ILCA will then draft a simple agreement with IITA requesting these analyses with permission to charge through the internal account.

b) Letter giving dates of arrival and departure and purpose of visit, with a request to stay in the IITA Guest House. This letter will be submitted by ILCA for consideration by the IITA Accommodation Committee.

c) Letter indicating the list of chemicals, equipment and instruments etc which will accompany the NRI technologist.

d) Letter to Dr Mulongoy, HO Microbiology Laboratories IITA, describing the project in some detail and explaining what is required of him by way of nature, number and frequency of samples, type of determination to be carried out, starting dates etc, so that he may include the letter with his handover notes to IITA before he leaves on 22 December 1992.

e) If it is intended to send any equipment by sea, arrangements can be made through Bindhills Ltd, Insurance House, 48a North Street, Thame, Oxon OX9 3AQ Tel: 084421 5597. A letter to Dr Jabber should be sent so that ILCA may authorise/order shipment of materials to be delivered by NRI and that NRI should be billed direct.

Acknowledgements

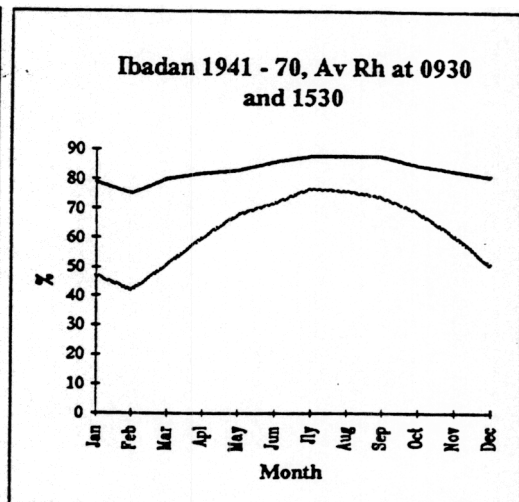
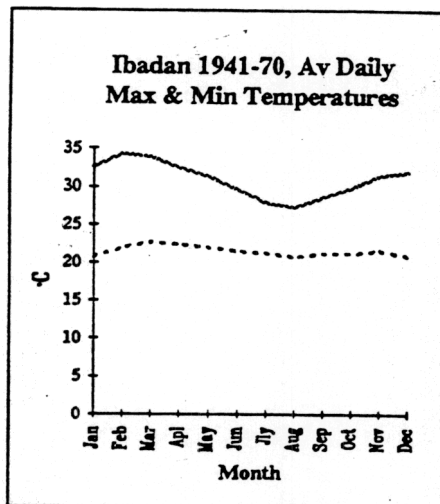
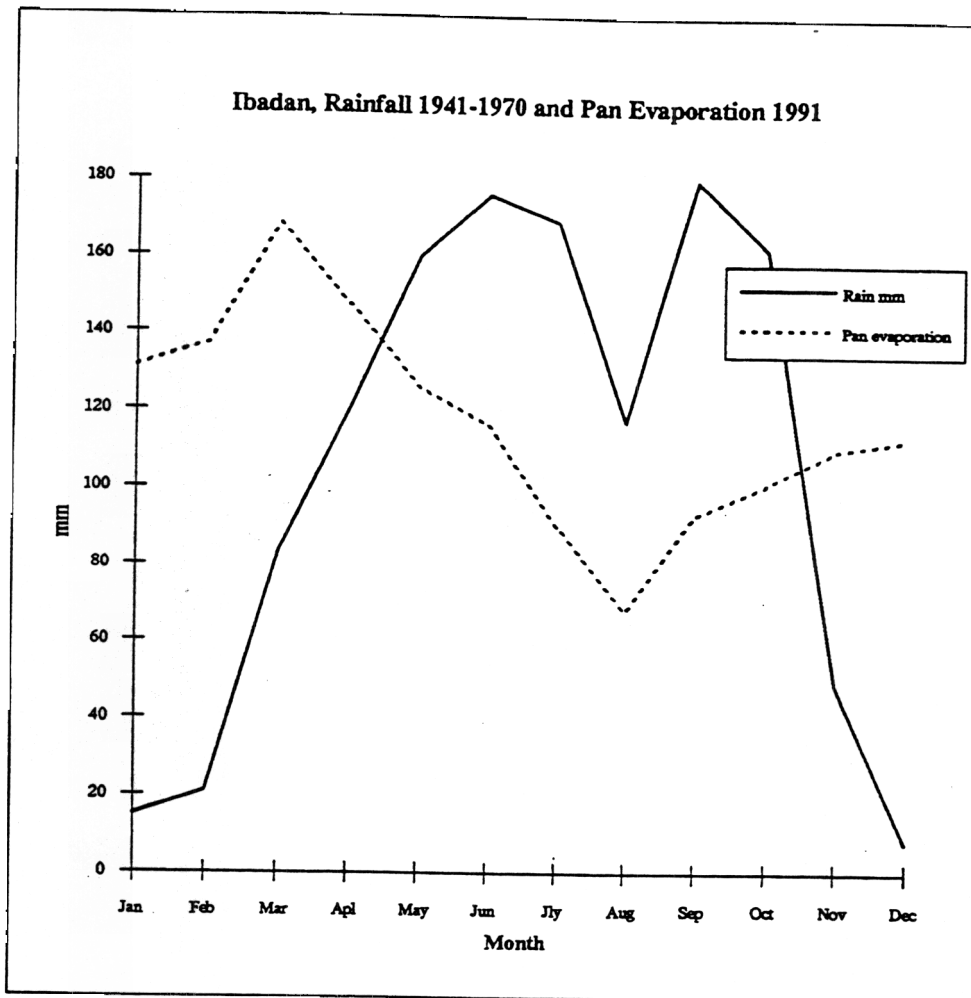
33 I express my thanks to all the persons met during my visit and also to the IITA for use of their guest house. In particular, I express thanks to Dr Jabber and Mr Sina Busari of ILCA, for their invaluable help and understanding.

Appendix 1

Persons met

Dr M A Jabber	Team Leader, ILCA, Ibadan
Mr S Busari	Research Assistant, ILCA
Prof Bankole Ogunbameru	HOD, Agricultural Economics & Extension, UNIMAID
Mr Mustafa Shettimor	Lecturer II Agricultural Economics & Extension, UNIMAID
Dr JO Igene	HOD, Food Science and Technology UNIMAID
Dr C Negbenebor	UNIMAID
Dr E Collison	Food/Industrial microbiology UNIMAID
Mr M Sale Dogon Hallam)	Meat Processors (managers),
Mr Garba Adamo Niyo)	Bulabulin, Ward, Maiduguri.
Prof Olorunda	Prof of Food Technology, University of Ibadan
Dr J L Pleysier	Head of Analytical Services Lab, IITA
Dr A Larbi	Forage Agronomist, ILCA
Mr J Smith	Animal Scientist, ILCA
Miss S M Osho	Food Techologist, Coordinator of IDRC/IITA
Mr Bola	Food Technologist, IITA, Soybean Utilisation Project
Ms Paulyne Omoaka	2 i/c Biochemistry Lab, IITA
Dr Mulongoy	Head of Microbiology, IITA

Appendix 2 Climate Charts



Appendix 3

Terms of reference for the Economic Study

1 Describe the existing market for simply processed meat in Nigeria. This should involve the provision of information on:

- Suppliers, production areas, main production seasons, technologies used, quantities (if possible).
- Market segments, eg consumer/catering by socio-economic class, geographic situation, consumer habits and preferences, quantities consumed, competing foods.

Marketing channels, systems of handling, packaging and transport, and price structure for the different products.

A complete analysis of costs of production and marketing through representative cases.

2 Analyse the potential market for simply processed meat with special emphasis on future consumption and production in sub humid/humid parts of Nigeria; and as far as possible, assess:

Potential market size, broken down by target segments

Suitable marketing mix ie product characteristics, packaging, distribution, pricing and promotional support.

- Potential suppliers and marketers.

3 Prepare preliminary feasibility analysis including costings and recommend follow-up based on the findings of the study.

4 Identify, as appropriate, suitable consultancy/market research services to be used in follow-up work; if necessary draw up consultancy briefs.

5 The time considered necessary to carry out the study is estimated at 7 weeks: 0.5 weeks mission preparation at NRI, 4 weeks field study: 2.5 weeks report writing at NRI.

Appendix 4

The Technical Study

1 Objectives

To characterise the dried meat, Kundi, produced in the arid northern zones of Nigeria.

To determine the shelf life of Kundi when kept under 2 different storage conditions and during the two main seasons of Ibadan.

2 Experimental

a) Paras 9 - 15 describe the nature of production of the dried meat and indicate the practical impossibility of observing its production. By inference the capacity to sample the meat immediately after preparation is limited. Storage of the meat in the north is part of the preparation process, whether intentional or not, before it makes the 2-day journey south. The time between preparation in the north and sales in the south is variable and unlikely to change in the foreseeable future. It is seen as sufficient therefore, simply to buy random samples in Dugbe market, Ibadan and subject these to different conditions and analyses.

b) About one month before the change of seasons in Ibadan (see climate chart Appendix 2). ie end February, six pairs of baskets of dried meat should be purchased from Dugbe market. Care should be taken to ensure that each pair of baskets has been produced by as many different processors as possible. The baskets should be labelled as they are purchased. The baskets should be returned to the ILCA laboratories where the contents should be labelled, weighed, described, sampled and stored. Description of the meat should include colour, size, odour, firmness, visible contamination and other valid comment. New, "sterile" gloves should be worn on each occasion the meat is handled and discarded immediately before the next batch is examined. Sampling presents difficulties as the cubes of meat are relatively large. Final advice will be given following experimentation in NRI. Hygiene precautions should be taken. Samples will be placed in labelled polythene bags, one for microbiological examination at IITA, another for proximate analysis at IITA and a third for chemical analyses by the NRI technologist at ILCA. These are the "week 0" samples. The remainder of the batch should be returned to its original basket. One of each pair is then stored in the agronomy laboratory (a closed room simulating the conditions in the lock-up shops in the market) and the other in the covered barn ("greenhouse") behind the agronomy laboratory at ILCA. The samples should then be distributed for analysis.

c) Batches should be sampled 1,2, 4, 8 and 16 weeks after the "week 0" samples were taken, using the method described above. Samples need not be taken for the NRI technologist after week 4.

d) Three weeks after the purchase of the six pairs of baskets, the entire procedure should be repeated. Again six pairs of baskets should be purchased, labelled, sampled etc. This second run should commence at the start of the wet, more humid season. On the second run, samples for the NRI technologist need not be taken beyond week 1.

3 Analyses to be performed:

- a) Weight)
- b) Description)
- c) Ash)
- d) Salt) All by the NRI technologist.
- e) Rehydration)
- f) Water activity)
- g) pH)
- h) Microbiology by IITA microbiology Laboratories (TVC & mould count)
- i) Moisture)
- j) Protein) by IITA Analytical Services Laboratory
- k) Fat)
- l) Environmental data at the point of storage. This should be compared with IITA meteorological data.

All the methods of analyses indicated above are described in the manual which is to be found in the Meat Group of the livestock Section at NRI

4 Timetable

The following timetable is proposed.

15 Feb 92	Arrival of NRI Technologist, set up laboratory, visits etc.			
22 Feb	Run 1: Week 0			
1 Mar	Week 1			
8 Mar	Week 2			
15 Mar		Run 2: Week 0		
22 Mar	Week 4	Week 1	Departure of NRI technologist	
29 Mar		Week 2		
12 Apr		Week 4		
19 Apr	Week 8			
10 May		Week 8		
14 Jun	Week 16			
5 Jul		Week 16	Conclusion	

NB Samples will need to be taken and analysed after departure of the NRI technologist. Hence, there is a need for the NRI technologist to train an ILCA staff member to continue with this duty.

5 Equipment to take to Nigeria

IITA and ILCA are unable to provide all the equipment necessary to perform all the analyses. The following equipment, chemicals, glassware, and consumables will be required:

Spring balance x1	£ 60.00
Mincer x1	£ 20.00
Aluminium foil roll x1	£ 5.00
Knives x3	£ 10.00
Acid washed sand x3000Kg	£ 14.00
Dessicators x2	£ 233.50
Burettes and stands x3	£ 40.00
Scalpels x3	£ 1.00
Miscellaneous plastic bags	£ 2.00
Miscellaneous meat labels	£ 1.00
Laboratory coat x2	£ 10.00
Food blender x1 (Not new)	£ 10.00
Forceps x2	£ 1.00
Heat resistant gloves x1 pair	£ 18.80
Disposable vinyl gloves x2 boxes	£ 6.00
Tongs for muffle furnace x1	£ 4.00
Whirling hygrometer x1	£ 45.00
Hygrometer x3	£ 45.00
Filter papers No.4 x1 box	£ 2.00
Filter papers No.42 x1 box	£ 6.50
Moisture dishes x25	£ 150.00
Ash dishes x12	£ 209.16
Plastic boxes x10	£ 5.00
Potassium nitrate 2x500g	£ 8.40
Magnesium acetate x500g	£ 29.40
Silver nitrate 0.1N convol x6	£ 48.40
Ammonium sulphate indicator x500g	£ 8.10
Ammonium thiocyanate convol x6	£ 14.00
Potassium chromate indicator x500ml	£ 10.90
Ethanol x2500ml	£ 52.10
Sodium hydroxide 0.1N convol x6	£ 18.40
Anhydrous sodium sulphate x500g	£ 9.10
Separating funnel 500ml x2	£ 32.00
Bromocresol green x5g	£ 13.40
Phenolphthalein indicator x250g	£ 13.00
Celite filter aid 545x1000g	£ 9.00
Methanol A.R 2x2500ml	£ 20.60
Chloroform A.R. 2x2500ml	£ 41.60
Glycerol A.R x2500ml	£ 33.20
Peptone x500g	£ 13.92
Nutrient agar x500g	£ 17.79
Dichloran-glycerol agar base x500g	£ 30.74
Chloramphenicol supplement x20 vial	£ 18.76
Dichloran-rose bengal chloramphenicol agar base x500g	£ 31.35
Silica gel self indicating 2x500g	£ 15.40
Total	£1388.52

Budget

Salary	5 days band 2 @ 385/day	1925
	2 mm @ Band 3 @ 6816/mm	13632
	2 mm @ Band 4 @ 5325/mm	10650

Travel & Subsistence

Phase 1		1800
Phase 2	2 x Economy returns	1200
	70 days @ N 1,100	2600
	Local travel: Driver + Diplomat to Lagos x 2	
	N380 x 2	740
	N1000 x	2000
	Transport	600
		<u>3340</u>
		30
		125
	Transport to market	25
	Transport to other towns (half cost)	150

Sample costs

24 baskets of meat @ N250 = 6000	30	200
288 tests at \$2 = \$576	1.5	385
Transport of freight UK - Lagos		1600

Extra labour costs

1 student in Maiduguri for 1 week @ N1500/month		20
Local travel in Maiduguri @ N50/hour, say N2000	30	65
ILCA Administration Cost		<u>500</u>
		£34877