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STATUS REPORT ON STOVE WORK
LESOTHO RET PROJECT

Prepared by:

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Date: March, 1982

PREFACE

This report presents the work of Ianto Evans, an ARD consultant from Aprovecho Institute who provided technical assistance to AID's Renewable Energy Technology (RET) project in Lesotho. The project is being implemented by Associates in Rural Development, Inc. (ARD). Mr. Evans was in Lesotho from January 7 to March 3, 1982. The report also includes descriptions of preliminary stove work prior to the Evans consultancy and other efforts that followed the Evans consultancy. These activities were managed by Judith Gay, sociologist, and Gary Klein, energy technician, who are ARD staff members in Lesotho. The overall RET project is being managed by Jay Stryker, ARD's team leader.

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I. INTRODUCTION

Since the March, 1981 beginning of the Lesotho Renewable Energy Technology (RET) project, a concerted effort has been made to address cooking-related problems in Lesotho. The initial stages of this work involved: 1) site visits to rural and urban areas in order to observe currently used stove technologies, 2) the design of a village energy survey, and 3) research into the design and performance of cooking stoves. This work has been carried out primarily by ARD field staff Judith Gay and Gary Klein and their Basotho counterparts. The extensive Lesotho field experience of Gay and Klein prior to and during the first months of the RET project, and their contacts with other energy and rural development specialists in Lesotho served to emphasize the fact that cooking practices and stove design were priority energy problems that the RET project would have to address.

The emphasis on stove work led to a visit in January and February 1982 by stove consultant Ianto Evans for a two-month consultancy. His scope of work (fully described in Chapter III) included an analysis of preliminary survey and stove design/testing work, suggestions for stove designs and dissemination strategies, and the training of Basotho and expatriate staff.

A preliminary village energy survey, managed by Judith Gay and Mamello Khobako, her Lesotho counterpart, was carried out prior to March 1982. Thus, the work of Mr. Evans capitalized on survey experience gained prior to the consultancy.

The Evans consultancy also clarified the need for more long-term assistance in stove design, instruction, and dissemination. Starting in July of 1982, Margaret Thomas will begin an eight-month consultancy to continue the work that Ianto Evans began.

Organization of the Report

This report reviews the cookstove design and development activities that have taken place from the project's inception until April of 1982--with a primary focus on the visit of Ianto Evans. In Chapter II the preliminary survey and cookstove design/testing activities are discussed. Chapter III focuses on the Evans consultancy, particularly his stove design ideas. Chapter IV briefly discusses spinoff activities of the Evans consultancy, including the scope of work for Margaret Thomas in Lesotho. Appendix I includes a list of contacts made during Mr. Evans' visit to Lesotho.

II. PRELIMINARY SURVEY AND COOKSTOVE DESIGN/TESTING ACTIVITIES PRIOR TO THE EVANS CONSULTANCY

Prior to the arrival of Ianto Evans in Lesotho, the RET field staff had been involved in a wide range of stove related activities which have served as a basis for further activities. This experience includes:

1. Preliminary design work. While working with the Thaba-Tseka Rural Technology Unit (RTU), staff member Gary Klein had designed some prototype metal stoves (paola-brazier) and solar cookers. Thus, these were already available for testing.

2. Preliminary design work which had been done by the Ministry of Rural Development's ATS (Appropriate Technology Section). Several types of mud stoves and metal brazier stoves or ceramic stoves had been made by Mr. Khabisi together with a Swiss advisor to the ministry. 1978-1979.

3. Other mud stove designs had been developed by a Food Preservation Unit in the Ministry of Agriculture (Home Economics) under UNICEF funding. Training workshops had been held by the Food Preservation Project teaching village women to make mud stoves. Although design problems limited the effectiveness of this early dissemination program, an interest in mud stoves was created among nutrition workers and women's groups.*

*The importance of this linkage with the UNICEF project is that:
1) From the earliest days of the project the RET staff were invited out to see existing stoves and observe workshops in which mud stove making was being taught. They were invited to contribute their knowledge where they could, though they were primarily learners and observers of indigenous developments at this stage. The RET team was able to obtain feedback crucial to its own work in avoiding early problems and designing more workable models once Ianto Evans arrived.
2) Ianto Evans was taken to visit some of these early stoves and was able to talk with users and makers. In fact, the principal mason/artisan of the UNICEF project was invited to participate in the first training and design workshop which Ianto held; he contributed and learned much, and subsequently has become a member of the RET project staff after funding for the UNICEF Project came to an end.

4. Demonstrations in the early months of RET Project. Many invitations were extended to the RET staff, and they used those occasions with schools, women's groups, nutrition clubs, etc. as occasions to a) discuss attitudes about fuel, cooking, and other energy problems; b) introduce new energy saving ideas and technologies; and c) solicit opinions to assist in evaluating prototype stove designs and suggest design modifications.

5. Preliminary data collection relevant to fuel use and stove design.

   Pre-Project: a) an early fuel use paper by RET staffer Gary Klein; b) a 1978 fuel use paper by Judith Gay of the RET staff; and c) a study of fuel and cooking in Malefiloane by Mr. Marc Best in 1978-9.

   Within Project: a) a picture book by Judith Gay specifically prepared to help Ianto Evans; b) observations and residential periods by staff members in rural villages to collect preliminary information on energy use patterns and types of fuels and stoves currently in use; and c) a preliminary cooking and fuel use study, in November 1981, to collect a small sample of interviews concerning types and amounts of fuel used, stoves, utensils, cooking practices, etc. in the Malefiloane/ Mokhotlong area in order to lay foundation for the Evans consultancy.

III. IANTO EVANS' STOVE WORK

The two-month consultancy by Ianto Evans in January and February of 1982 focused on a number of stove design, construction, and dissemination issues. His scope of work was as follows.

1. Review relevant data collected by the RET team in Lesotho and assist in collecting any further necessary data regarding:

   a. existing cooking and heating practices

   b. different fuels in different areas and income groups

   c. types of stoves and utensils used

   d. influence of seasonal and climatic changes on cooking needs and fuel supplies

   e. existing knowledge in clay pot making, use of mud or dung for plastering, making fired clay bricks, cement skills plus sheet metal work

   f. attitudes regarding cooking, labor value, investments, and furnishings

2. Review relevant activities in Lesotho, such as Peace Corps, Lorena stoves in Semonkong, the Ministry of Agriculture food preservation unit's mud stoves, and the Thaba-Tseka solar and mud stoves.

3. Review people's needs for heating (both radiant and convective) as a by-product of cooking and varying by season, income, and climate.

4. Based on the above information and experience, assist the RET team in designing alternative cooking devices for different ecological areas and income levels. These designs will take into account possible modifications to cooking practices and cooking utensils.

5. Participate with RET team in the design and execution of a cooking device construction workshop for the ATU-RET team. Training workshop content will be based on the results of 1-4 above and on consultant's previous knowledge.

6. Design field and laboratory testing procedures for prototypes selected for further testing.

7. With the RET team, carry out testing procedures on the prototypes and train the RET team in these procedures.

8. Based on knowledge of previous successes in other countries and on information gained during consultancy, develop an initial set of extension and marketing strategies for Lesotho.

Activities 1-3 were performed with ARD field staff and host country counterparts during the initial weeks of the consultancy. Activities 4-8 represent the technical assistance activities that Mr. Evans undertook.

Evans' Activities During the Consultancy

January 7:
Arrival

January 8 and 11:
Introduction to staff and to various officials in Maseru concerned with cooking technology and rural development, such as Food and Nutrition Coordinating Office, Ministry of Rural Development Officials, Home Economics Section of Ministry of Agriculture, etc.

January 9-10:
Visit University of Lesotho, tour villages for orientation to cooking fuel and architecture. Orientation to geography of Lesotho.

January 12 to 16:
Trip to Mokhotlong with Judith Gay and 'Mamathe Mathe of RET staff. Introduction and chance to gather data relevant to stove design, building upon prior information gathered by, and experience of, staff already in the rural areas.

January 18-22:
In Maseru, making further visits and observations. Discussions with staff to plan RET stove project. Preparations for training and design activities--getting materials, etc.

January 21:
Field trip to see UNICEF mud stoves in Leribe and Butha-Buthe.

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quite detailed as to expectations of both sides.

Step 3: Get to know the village physically. Walk all around it, then through it, with an enthusiastic member of the Development Committee. You should be able to assemble a lot of information without actually questioning anyone, by visual observation.

Step 4: Ask the chief to set up a group discussion among as many people as are interested (it could be quite a big group). Tell everyone why you are there and ask how things are in general; gradually focus the discussion down to perceived problems that the project can deal with. Ask how they deal with these problems already, how their neighbors do; whether they have seen or heard of other solutions. Talk about ideas that the project staff have seen in the village, neighboring villages, elsewhere in the country. Finally, bring out ideas you have seen in other countries, then throw out any hypothetical ideas you may have, all the while listening more than talking. It is ideas that people have for themselves that are most valuable to them; you only serve to broaden their range of options. When you have some concrete ideas to try, ask who wants to try them. Simultaneously, tell them, the staff will work on these ideas at Malefiloane workshop.

Step 5: Invite people to visit the workshop to see how the project is dealing with their ideas. When they arrive, involve them immediately; ask if they have time to help, that there are things (like cooking) that they understand better than you do, e.g., ask a woman to cook papa on the stove you are modifying.

Step 6: Spend time with individual families who seem to be average, talking about other aspects of the problem. By now, you should be able to show that you have been working on their problems, you're not just stealing information. This is the time to collect statistical information on fuels used, seasonal change, etc. Ask them to test prototypes, criticize, comment.

Step 7: When the work is advanced enough, through the chief hold a village pitso. Begin by thanking everyone for their help, explain what is developing and demonstrate whatever gadgetry you have to show. Make recommendations on what they should do next. Finally, if they have interest, offer to train someone of their choosing as a VET. The pitso could be repeated more than once, as new ideas unfold.

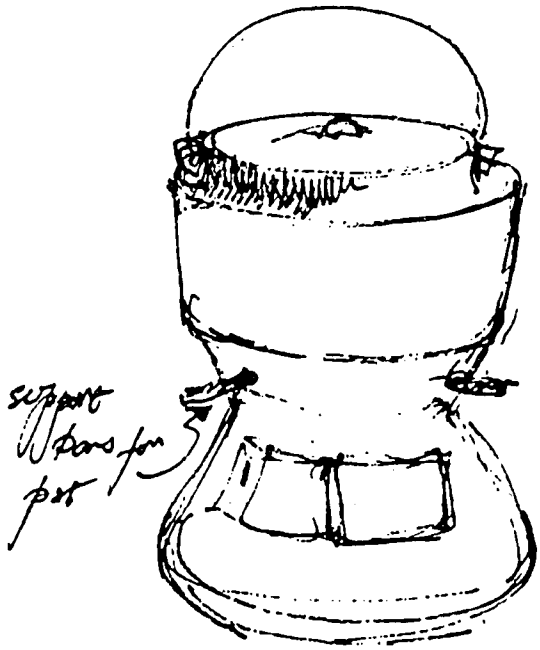
The RET project is now focusing on a few selected technologies, including stoves for heating food, water, and homes. The following pages contain a series of technical ideas, drawn up by Ianto Evans, which show promise. They are deliberately drawn schematically and loosely to encourage the imagination to work on these crude ideas. No one of them is final; all will need refinement.

As final contributions to the project, Mr. Evans concluded his visit by suggesting a plan of action for the continued development and dissemination of stove technologies, and he made final suggestions on the issues of dissemination and public relations. The plan (illustrated in Figures 1 & 2) is also applicable to other technologies being developed by the RET project. On dissemination and public relations, Mr. Evans had these concluding remarks:

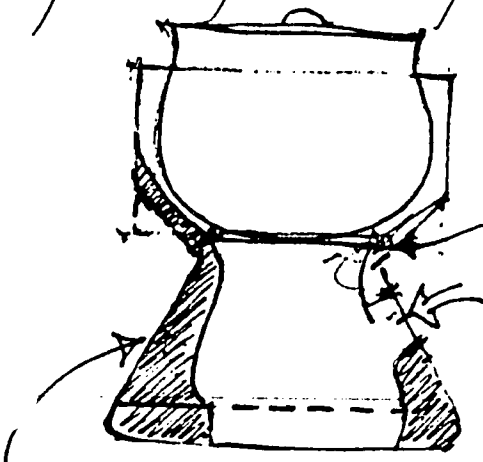
Dissemination. Initially, limited spread will occur through personal contact with villagers. Each PCV and counterpart should select up to 3 families whom he trusts, ask if they would like an experimental cooking/heating device to try. They should explain that these are not perfect, that the project needs help with making them better. They need criticism. Then they should call on these families every day (or two at most) to see how they are getting on.

Massive dissemination strategies will depend very much on the technologies that are developed, so precise details should wait until perhaps late winter of 1982. At first, a whole range of methods should be tried, selecting later those which prove

Group ① ideas: school meals stove.



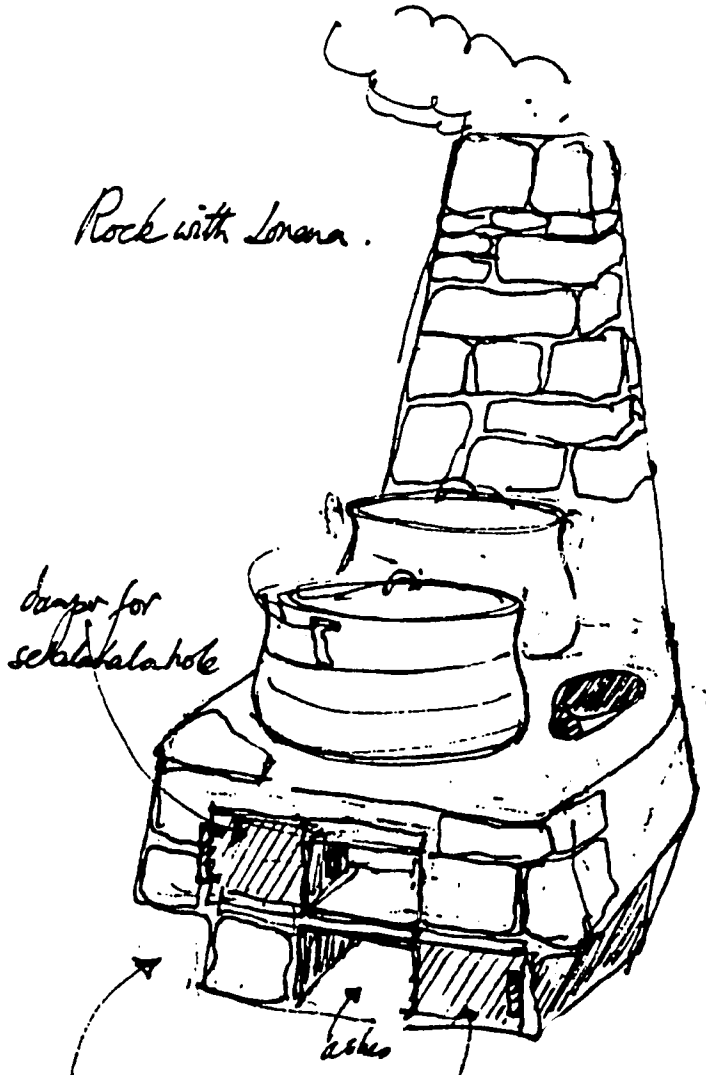
Pasta improved, lined, pot supported.



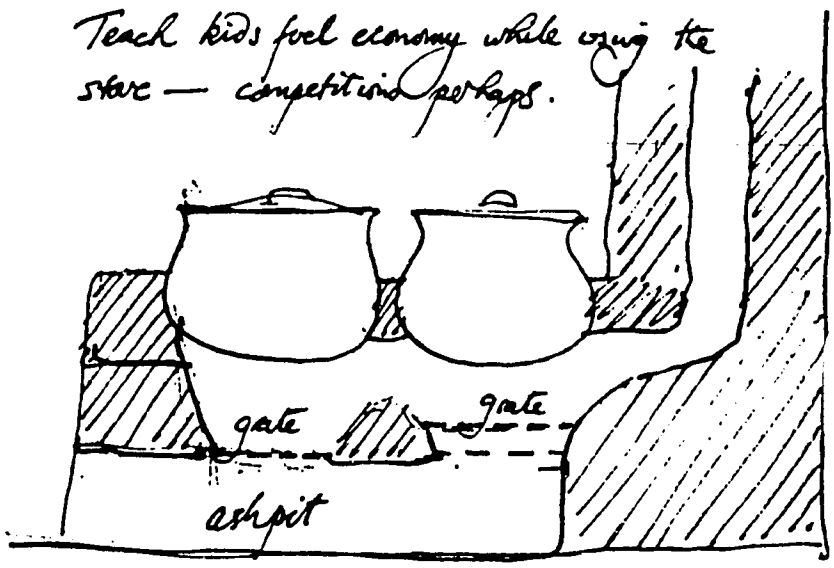
clay liner to prevent heat loss by radiation

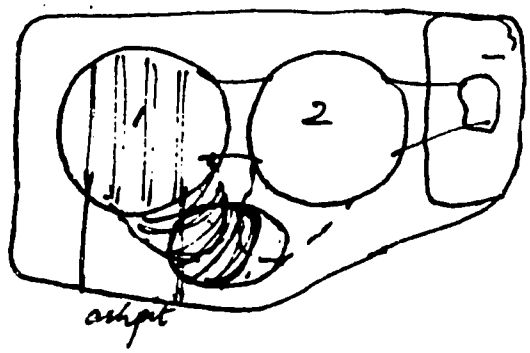
For schools, you'll need pothole covers, concrete surface, dampers that can't get lost!

Rock with Lorena.

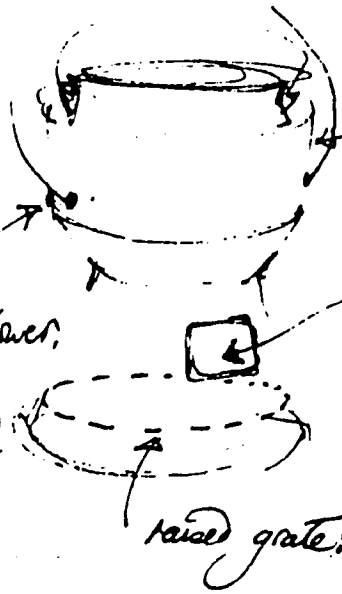


Teach kids fuel economy while using the stove — competition perhaps.

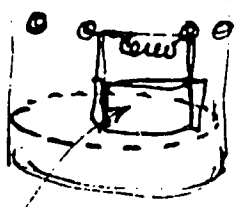




Maybe a diagonal slanted feed hole for dog, flat damper to cover it? Feed only hole #1



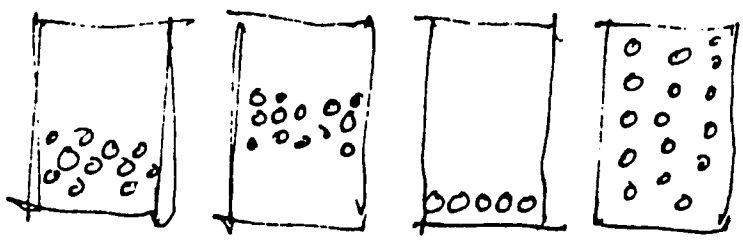
Cylindrical paola?



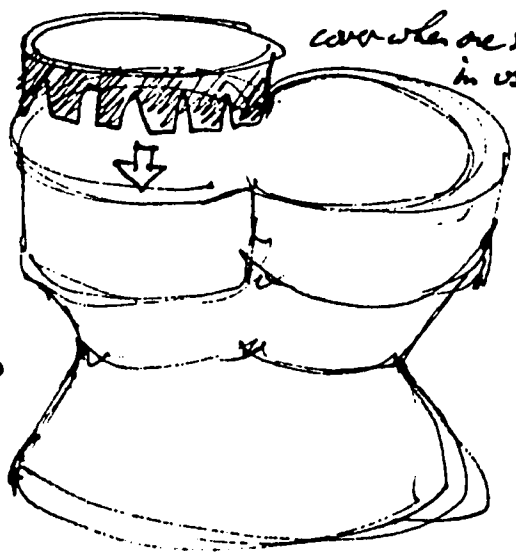
raised feed hole with damper.

Try raising floor closer to pot, more radiation from dung?

Try lighting sebalabala in separate ashpit / sebala chamber underneath.

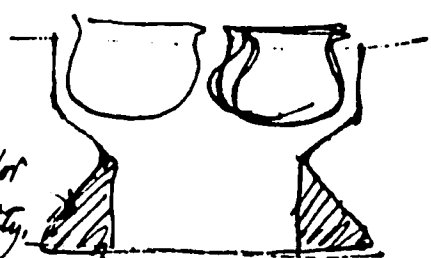


try comparative analysis holes at various locations.

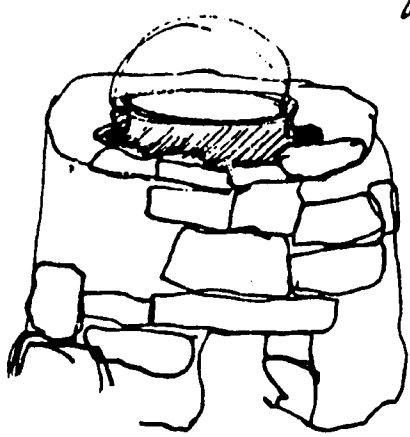


Double paola?

Test basic basket shape. with / without collar.



Clay liner for weight, stability, less radiant loss.

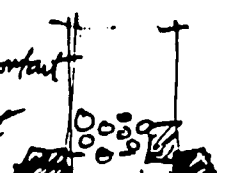


Rock paolas?

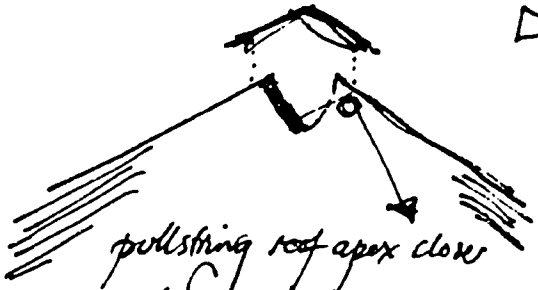
What about continuous liners? for cylindrical or basket paolas?

covered paolas with side-feed chimney, to look into Morena

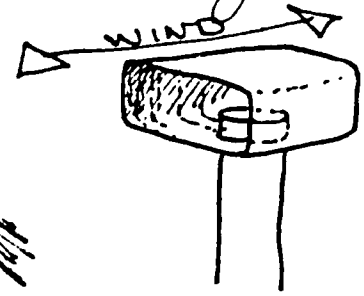
Stability may be important to safety. Try concrete coal ring, sits on floor, receives



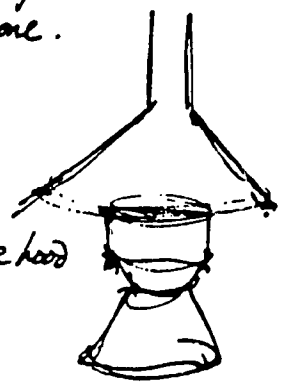
Group (3) Ideas: Airflow and Chimneys.



pullstring roof apex close in sheetmetal cone.

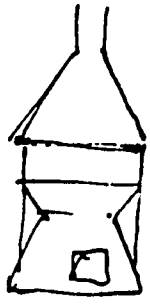


Foodaid can makes most effective chimney cap. Align with wind

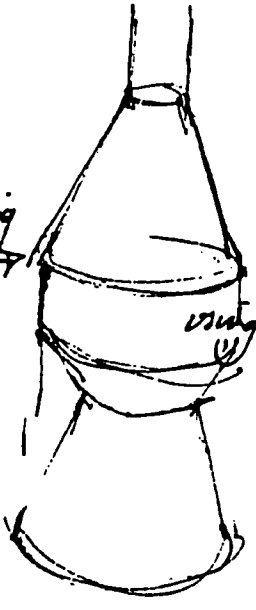


Compare very wide hood with close-fitting narrow one.

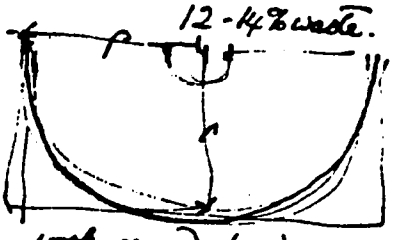
Chimney hood. Try (1) fixed hood, movable pasta/open fire etc. (2) movable hood, swinging, opening or lifting.



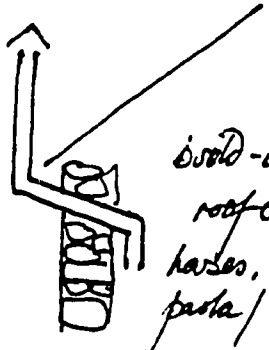
Should hood/chimney be used to increase draft in pasta?



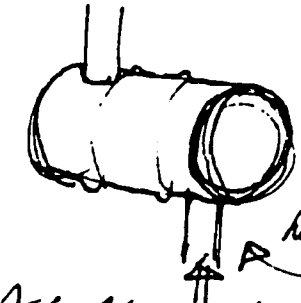
Try close-fitting pasta/hood connection



work around basic geometry of cone. Min. waste is using double square to cut cone from.

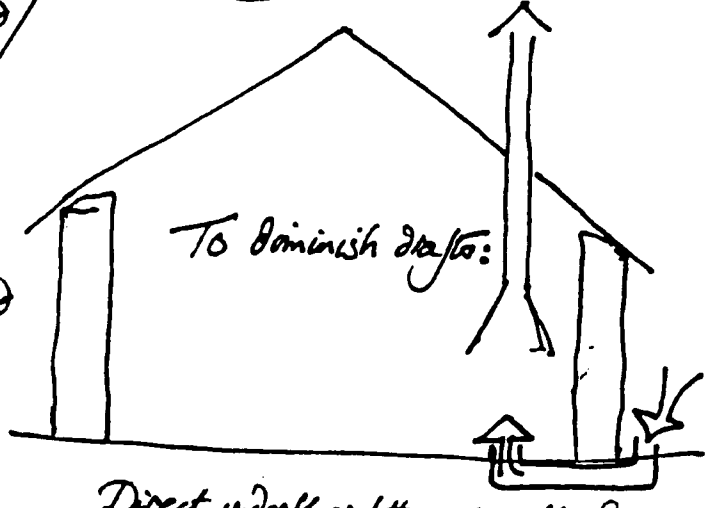


Avoid-in wall or roof chimneys in new houses, to accommodate pasta/open fire with hood/Morena stove.



Don't forget barrels make good heat exchangers

A 60 ltr barrel would heat the room a lot, mounted above stove/pasta.



Direct underfloor/through wall draft supply for stove/fire, heat-covered ends.

Group (4) ideas. Wonderboxes / insulation

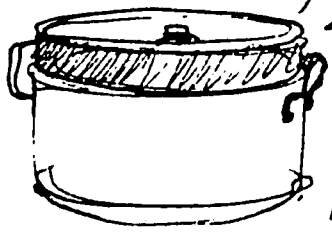
Inventory local materials available for home-made wonderboxes, eg.
- Blanket scraps
- Feathers
- Straw
- Sawdust?
- Shredded Khapani

} insulants.

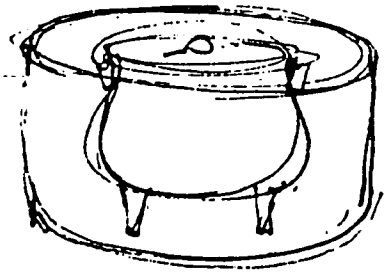
Sell Wonderboxes through Co-ops, throw in a 2-hour training session in use and maintenance.

Also: containers: cardboard boxes
cloth
tin boxes
etc.

crocheted, knitted, foam, padded



lid covers or potcosies

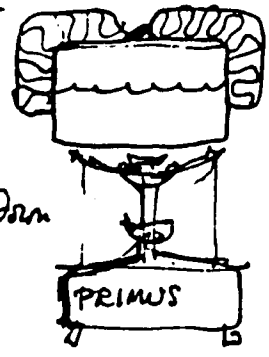


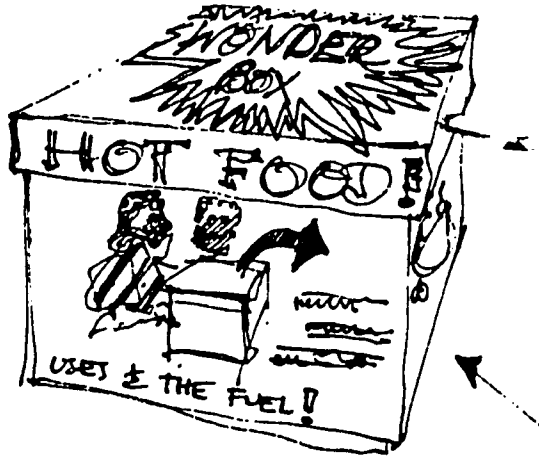
For circular pots, a circular box would be better than square.

Or no box, just big pillows.

A high proportion of pot heat is lost from the lid of the pot.

Cosies mean you turn down the flame, conserve.

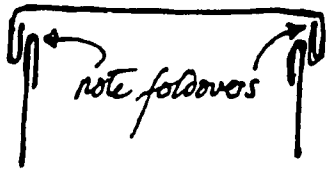




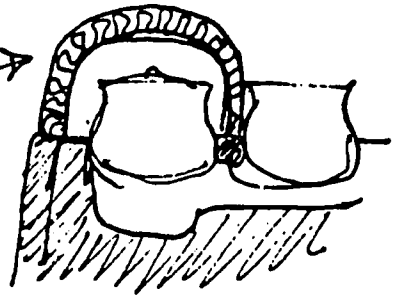
Redesign existing Wonderbox, strengthen walls of box, reinforce edges, edge of lid.

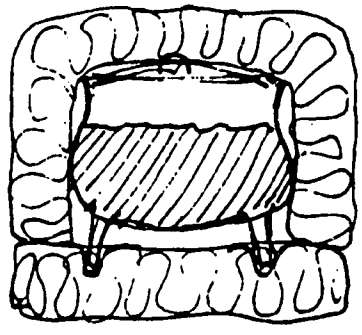
Bright colored explanatory graphics or printed paper wraparound.

Wonderboxes should be FUN!



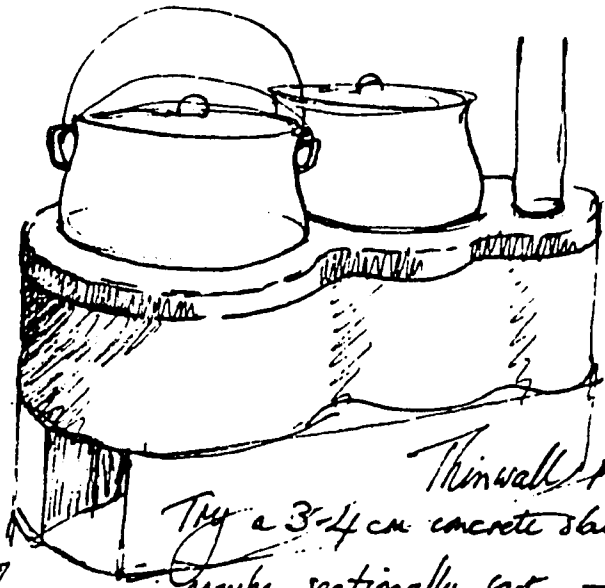
insulated potcovers to sit on top of stove. could keep water hot all night. Blanket wraparound would work too.

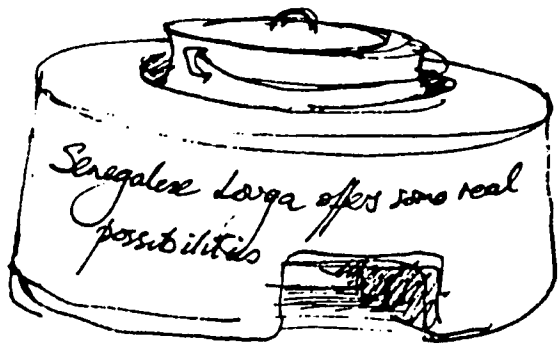




pad and cosy type wonderbox, snug fitting, loose.

Group (5) Ideas : Morena stoves.

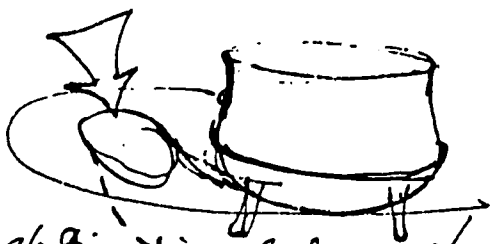




Thinwall Morenas to heat your house.

Damper

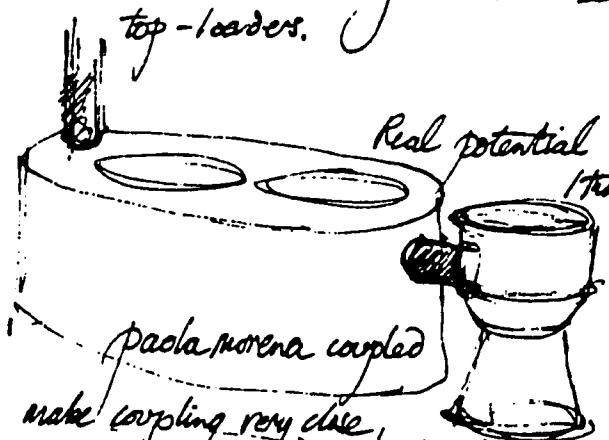
Try a 3-4 cm concrete slab to hold the top together; maybe sectionally cast in different potsize combinations e.g. 2/3 , 1½/3 1/2.



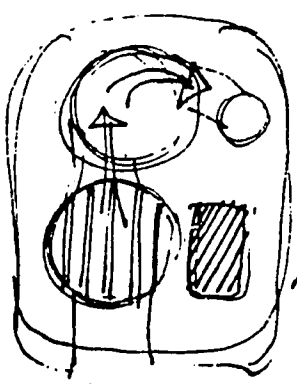
Morena dengbarnos should be mainly top-loaders.

Starting diagonal dung-feeder where pot too heavy to lift out.

Real potential here I think.



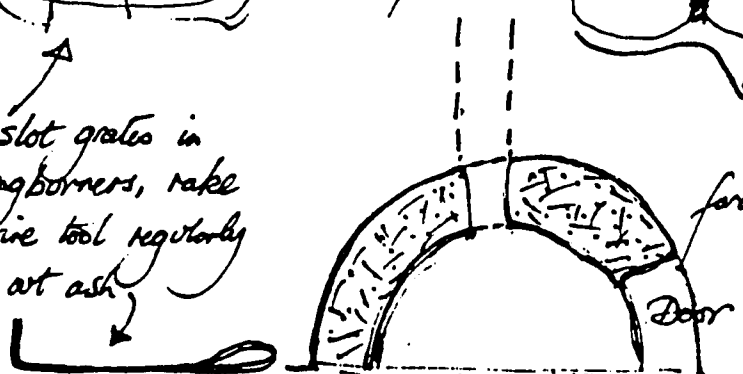
Paola morena coupled make coupling very close, as big diameter as possible.



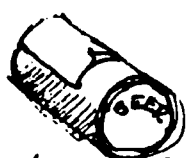
space for waterheater Foothold can beside firebox.

Use slot grates in dungburners, rake with wire tool regularly to drop out ash

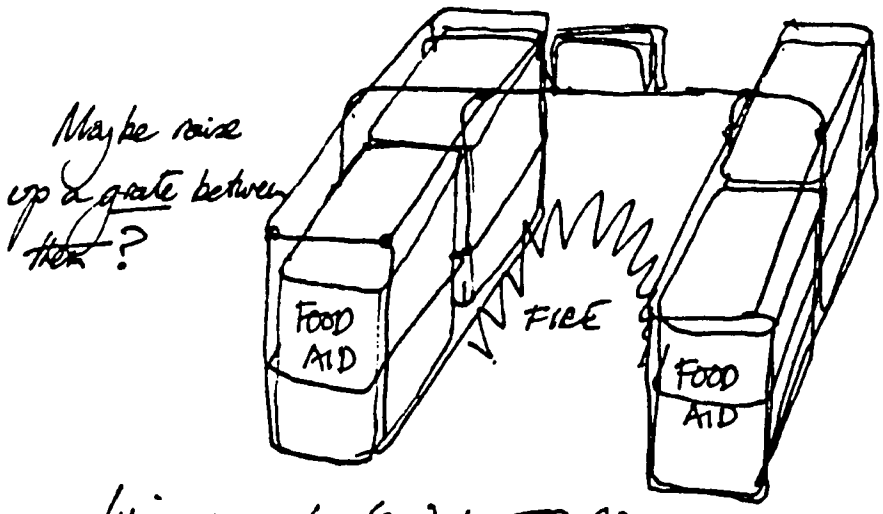
Use a removable baffle to force heat up to pot

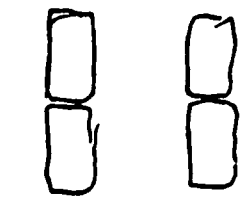


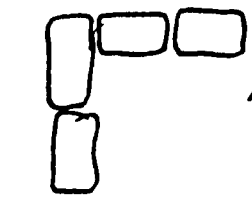
Mexican breadoven, needs fuel utilisation trials. Use plenty straw in mix to insulate.



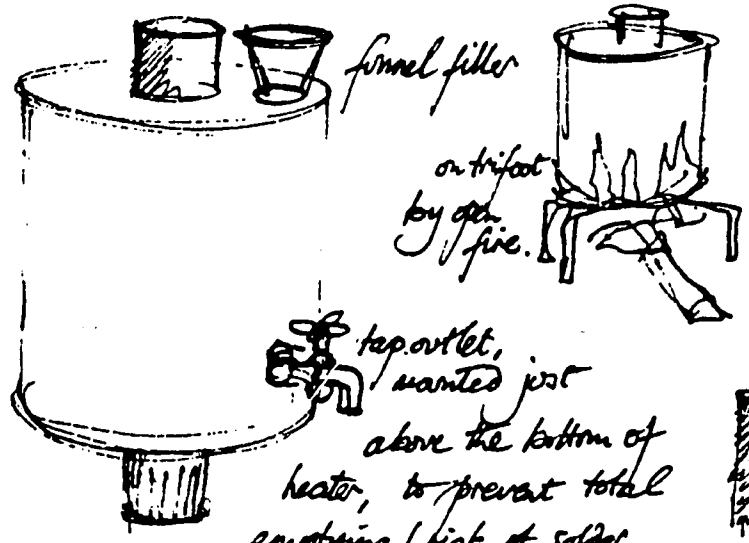
Sehai beecan damper into oblique airhole!

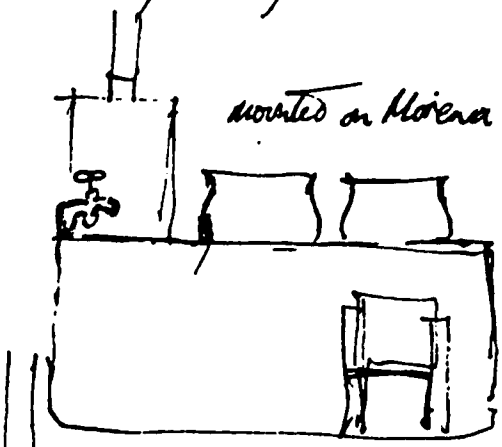


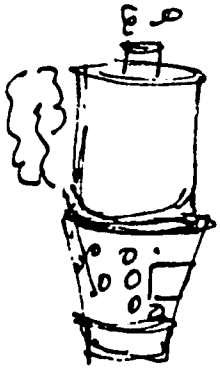


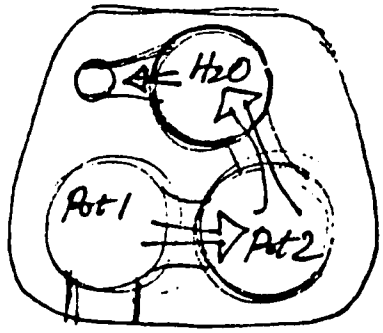


Wire cage for (2-) 4 Food Aid cans
Build fire between them. Waste heat heats water, cans protect from wind.

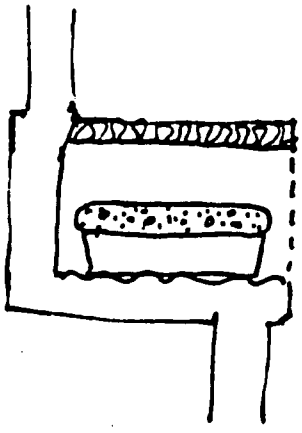








Add a third potHole in Morena especially for waterheating.
Use spare pot, cover with insulating cloth. Water will still be warm at dawn for washing.



Also, double-wall stack-heater bread oven: insulate side walls and top.

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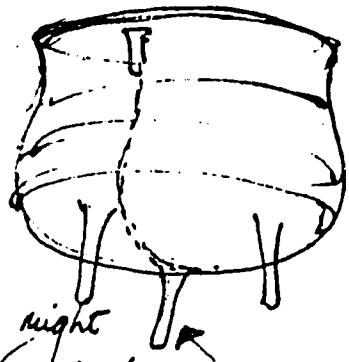
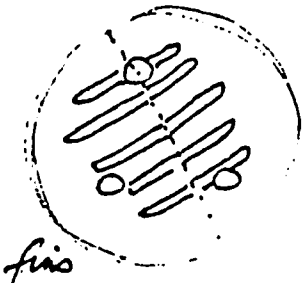


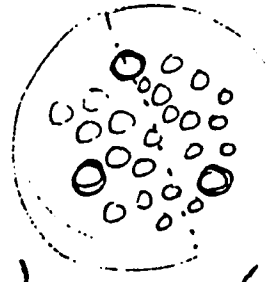
Increase surface area of pot bottom to collect more heat.

Shorter legs might be better for wonderbomes, Morena stoves, Paolas etc

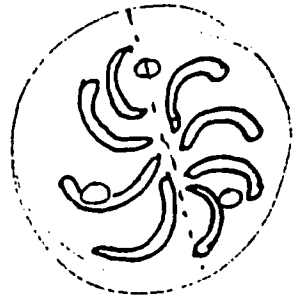


fins

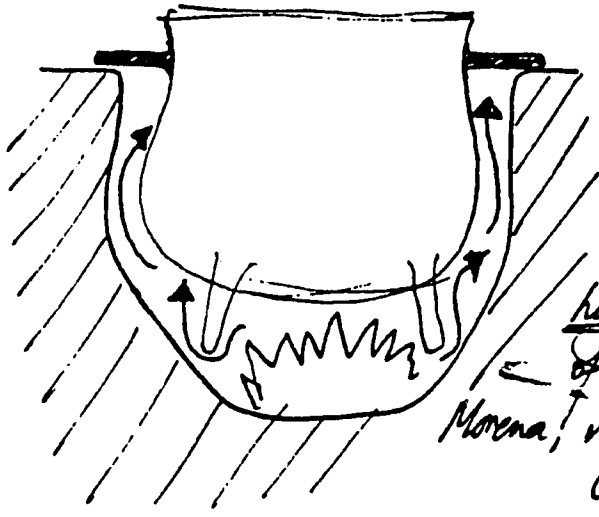
optimus



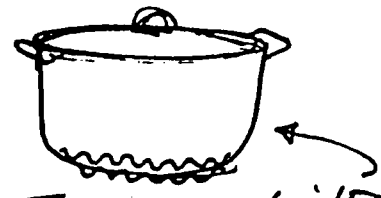
rand protrusions



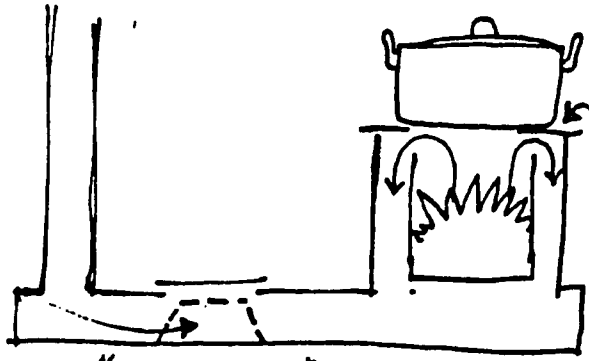
helical grides



Last flange all around pot would allow it to hang inside firechamber of any stove, Paola or Morena, very adaptable.



For stoves, a straighter-sided pot with bigger surface area at the bottom would be better.



Improve fitting of firebox lid.

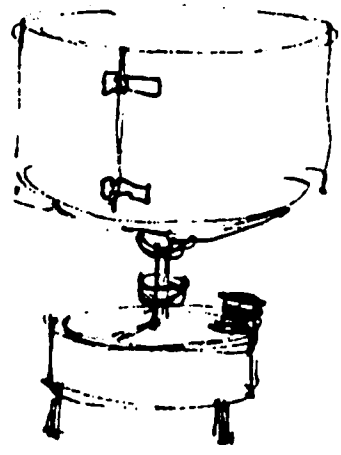
Stabilize outer ring.

Make firebox bigger (15 cm high, 20 cm wide e.g).

Incorporate baffle here to heat 2nd pot better.

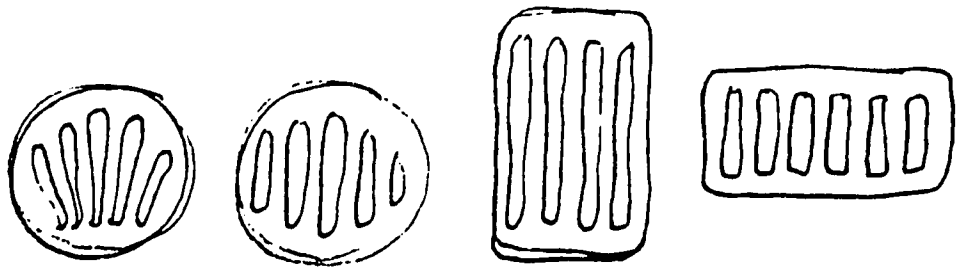
"Little Prince" Stove

Also: simple improvements to Primus — needs some research on how heat is utilized @ present. Possibly R2 million a year goes up in Primus paraffin. Even a 10% improvement would pay for all of RET in 8 years.



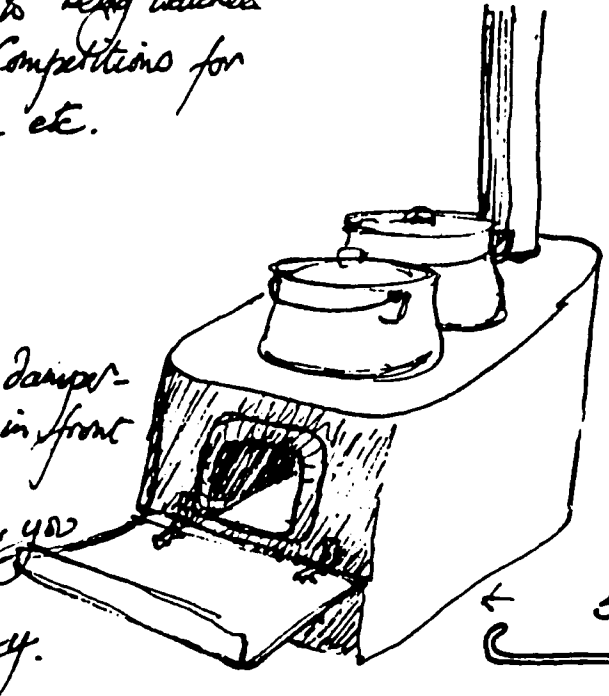
maybe a collar?

ceramic glow plate?



Earthenware tile grates for dung-burning stoves. Could be made locally by brick manufacturers. Slots, not round holes, for raking out from beneath.

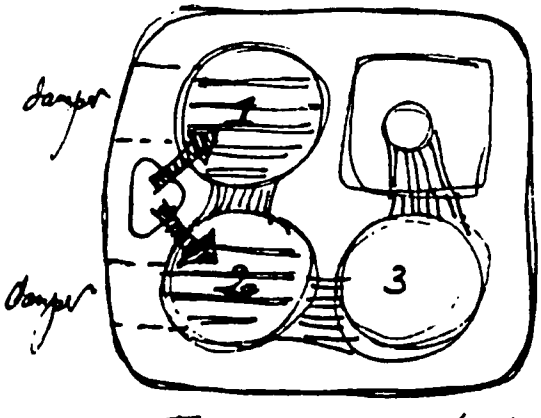
Set up village cookfests with Project people & observers; people are more open to being watched if it's a deliberate event. Competitions for least fuel used, fastest papa etc.

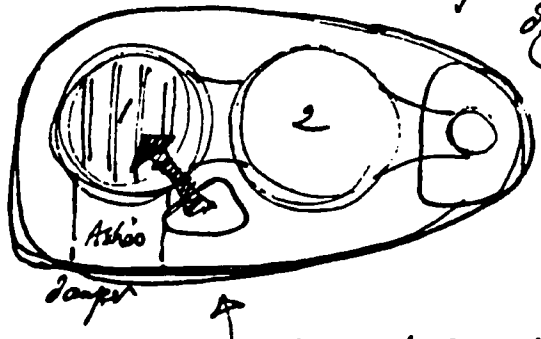


Hinge-down damper-cum-open hearth in front of Morena.
When cooking is done, you rake out the coals onto a metal tray.

← 50cms →

multipurpose 6mm wire pokka tool, raking, dragging, removing pot lid etc.





For giant-pot school stoves, if 2 pots, oblique loader for dung serves only pot #1. Pot 2 is close, preheats with waste heat beneath it. Extra pazzaz is stimulated with a little sehalahala.

For 3 pots however, feed Pots #1 and #2, both of which then need ashpit, grate and damper.

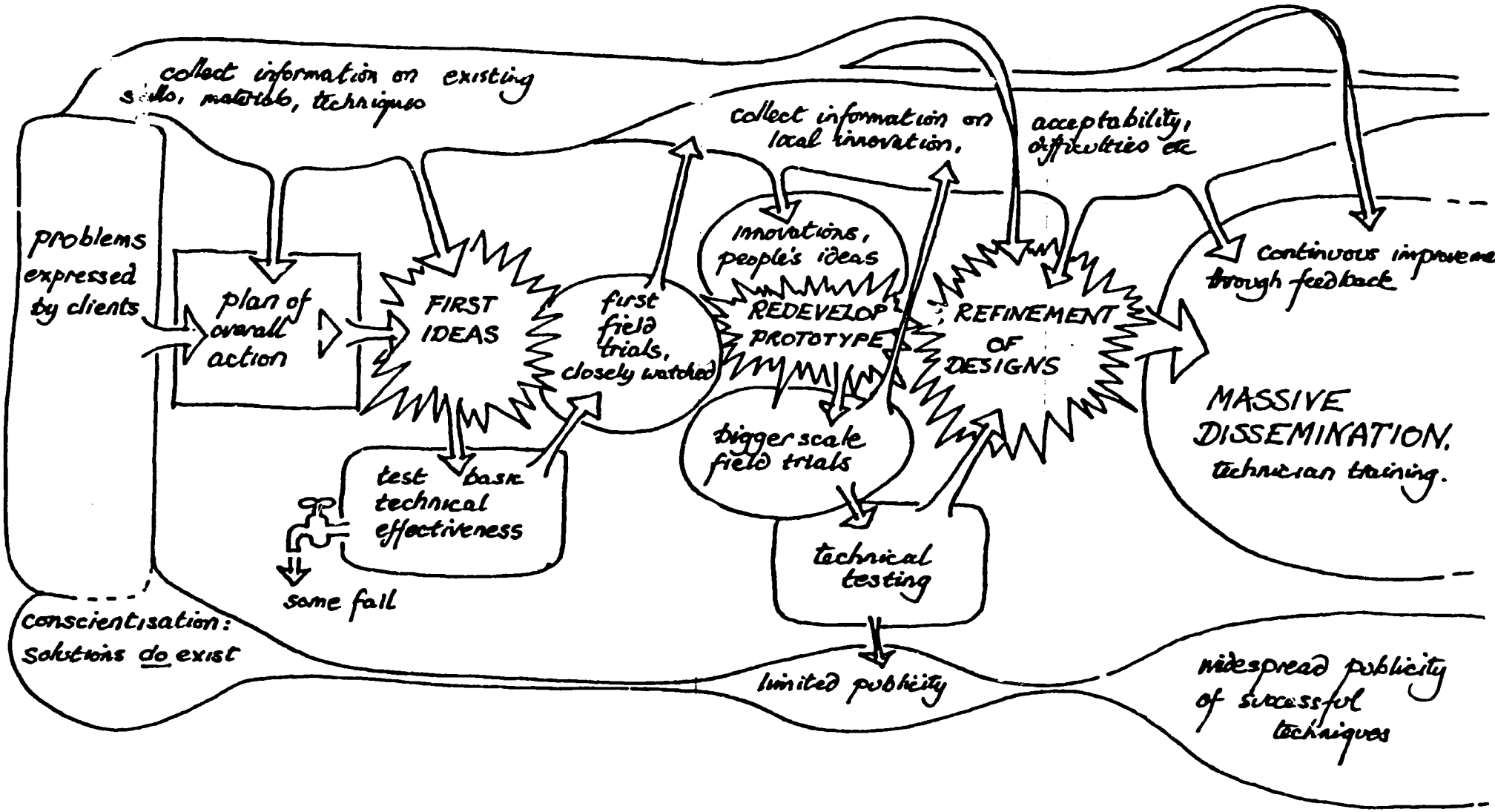


Figure 1 -- Schematic Flow Chart

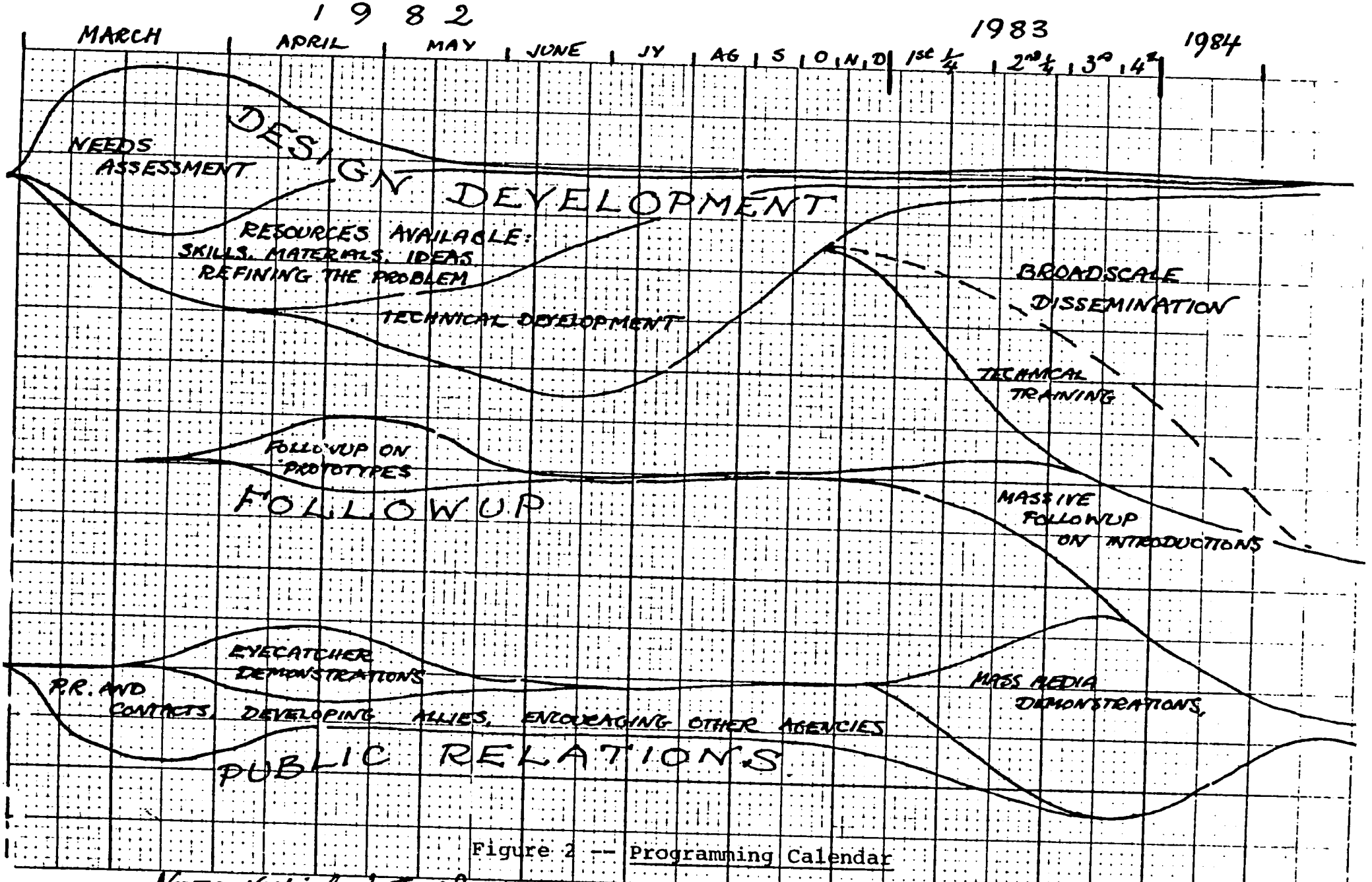


Figure 2 -- Programming Calendar

NOTE: Vertical depth indicates amount of attention paid to each component. Is theoretically cumulati

most effectual.

Public relations. On the one hand, the project should be careful not to promise the public anything not yet proven. On the other, mere mention of fuel-savings in itself saves fuel as people recognize the issue. At this stage careful broadcasting of "there are solutions to fuel shortages; you could be saving 50%" might make the public more conscientious and prepare people for new techniques as they are ready.

IV. SPINOFF ACTIVITIES FROM THE EVANS CONSULTANCY

Following the Evans consultancy, stove construction and testing activities were continued by the ARD field staff. The spinoff activities have included:

1. testing of prototypes built in Maseru and Mokhotlong;
2. the stoves made during the training workshop at Malefiloane are being used by the RET staff for demonstrations among women coming to the health clinic. Their opinions on design are then integrated into ongoing construction work.

Once the new workshop is completed in Maseru, that space will be used for continued modification of the stoves and training of Basotho staff.

A final outgrowth of the Evans consultancy has been preparation for the six-month visit of Margaret Thomas from the Aprovecho Institute. As a follow-up to Ianto Evans, both he and the RET field staff felt that continued technical assistance for stoves was necessary. Thus, Ms. Thomas will be coming to Lesotho in order to:

1. Assist the RET team in the continuation of workshops on cooking-device construction;
2. Assist the Malefiloane staff in cooking-device evaluation and aid in development and coordination of research with Maseru laboratory;
3. Oversee prototype and limited production runs of cooking devices and cooking tehcnologies (such as retained-heat cookers, improved paolas, and chimneys and cowls), and helping to establish directions for the dissemination of these technologies;
4. Help to develop, based upon the previous consultant report, the extension and market strategies suitable for Lesotho;

5. Provide brief training programs for village energy technicians (VETs) in cooperation with the RET project staff; and

6. Participate in the ongoing technology selection, design, testing, and dissemination programs.

APPENDIX I -- CONTACTS

Land Use Planning Project: Mr. O. Mukhtar, Director; Mr. Jon Castelli-Gardenari, sociologist; Mr. Boroto, counterpart to Mr. Mukhtar.

Two meetings, 23 and 26 of February, establishing common concerns such as erosion control, woodlot plantings, diminishing fuel reserves, waste of animal dung by burning it. Mr. Kanetsi will keep in touch.

U.S. Peace Corps: Brent Shafer, Director; Lee Jinks. Proposal to investigate two additional PCVs for the project late this year. PC Lesotho has monthly newsletter project could use to spread technical information. Also an interest in "simple gadgets" that PCVs could introduce as secondary projects. PC would send horticulture volunteers to short course in winter, when field work is slack. Meeting 23 of February.

World Food Program: Peter Witt, Director; Miss Malik. Two meetings 23 and 25 of February. WFP have 1100 school meals programs in Lesotho, would welcome help with stove design for school meals, at present cooked on open fire. They have limited funding. Mr. Kanetsi will follow through.

FNCO: Mrs. Phafane, Director. Two visits, 8 January and 25 of February. Mrs. Phafane is enthusiastic and helpful. Her comments are intelligent. She stresses the need to utilize Nutrition and

Home Ec Extension workers, also church newspapers to carry technical details. It is recommended that she be invited to join the project Management Committee.

CARE: Marshall French, Director. CARE has 14 groups of mohair spinners who each have a meeting/work room. Group size 40-220, a total of more than 2,000 women. They would be happy to carry news of new technologies in their monthly newsletter, provided copy is in Sesotho. Potentially demonstration stoves could be built at these 14 centers; there is potential too for meetings, technical explanations, and question sessions. 23 of February.

WOODLOTS: Donald Davidson, Director. Chiefly an explanation of the Woodlots project, its interest in generating more small fuel, and how it plans gradually to move into the Highlands, though not Mokhotlong yet. 1 meeting, 24 of June.

Catholic Relief Services. Rik Corboni. Brief meeting 23 of June. It is unclear how CRS and the project could work together.

Plenty Lesotho: Don and Marianne Edkins. Series of very informal meetings January and February. Plenty is working in 6-8 villages near Mt. Moorosi, expect to introduce stoves for cooking, possibly heating, develop new stoves better suited to local conditions and to demonstrate them in their own rondavels.

Malefiloane Clinic: Ingemaretta Hauffmann, nurse. The clinic sees 500 rural women a month, would be prepared to collect information on (e.g.) injuries to children from burns and scalds, foods

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consumed, quantities prepared.

Thaba-Tseka Project: Frank Weyer, PCV. Meetings 30 and 31 of January at Thaba-Tseka. Tested Weyer's latest model, an upright flat-top sheet steel heating stove. Verbal evaluation to Weyer, with offer of further help. The stove has some promise, but needs considerable improvement before it could be offered on trial.

EDA: Steve Morais, fieldworker, Tranokei. Mr. Morais has been building experimental stoves for the past few months. He spent a week at the Maseru workshop improving his skills and will keep in touch.

Ministry of Agriculture Food Preservation Unit: Mrs. Makosholo, Ephraim Sehai, mason. Mrs. Makosholo arranged a day of visits to Leribe district where her unit has built 66 Lorena-type stoves. They are built with sheet metal covers to the pot holes, which reduces their efficiency and overheats the house in summer. Later, both she and Mr. Sehai spent several days in the Maseru workshop taking a short training course.

Ben Vluithuis, Mafeteng: Ben has built a prototype stove of two coffee cans and a food aid tin, connected by tin cans and covered with mud. The prototype was badly cracked and obviously needed some design modification, but clearly he is interested enough to be encouraged to follow up on it.

Fuel Research Institute of S. Africa: Dr. Clark. Visit with Gary Klein, 3 of March. Dr. Clark has supervised analysis of a range of the fuels available at project's request.

ED Marketing, Johannesburg: Eddie Scott, Alan Maxwell. Makers and marketers of Little Prince Stove. Meeting all day March 2 with Gary Klein. Clear potential for collaboration with a concerned manufacturer, to sell a low-cost sheet metal stove for cooking and home heating.