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CULTURE AND AGRICULTURE:

SOCIAL CONTRIBUTIONS TO THE MAINTENANCE OF GENETIC DIVERSITY IN BEANS IN NORTHERN MALAWI

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Report of the Social Science Research Conducted in Northern Malawi under the Malawi/Michigan State University Project of the Bean/Cowpea Collaborative Research Support Program (CRSP)

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THIS REPORT IS DEDICATED TO THE MEMORY OF
PARTICIPANTS AND THEIR FAMILIES WHOSE LIVES ENDED
DURING THE CONDUCT OF THIS STUDY. THE NUMBER INCLUDES
THE DAUGHTER OF ONE OF THE RECORDERS.

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I. PREFACE

The Bean/Cowpea Collaborative Research Support Program (CRSP) is relatively unique among development efforts. Through a set of separate but coordinated projects, the CRSP seeks to generate research results which can contribute to increasing bean and cowpea availability for human diets. Each project focuses on at least one of the major constraints to this goal. A comprehensive base of support characterizes the CRSP, with participation by US as well as developing country institutions. Although it is primarily a research initiative, training is an integral part of its mission. The program is facilitated by a separate management office established at Michigan State University.

While these features are significant, it is the collaborative nature of the CRSP which provides its strong foundation. Initially, collaboration involved the coming together of US scientists from Land Grant universities with administrative and financial backing from the US Congress through the US Agency for International Development (A.I.D.). Additional financial support from the US universities was assured through the requirement that they match 25 percent of A.I.D. funds.

Ultimately, the planners broadened the definition of collaboration as they recognized the need for a process that gave voice to all participants whatever financial, administrative, scientific or community resources they brought to the effort. Thus, policies were established such as (1) the "50/50 split" policy that requires all projects to spend a minimum of one-half of their funds for direct costs "in or directly on behalf of" their Host Countries, (2) the representation of Host Country scientific expertise in the technical advisory functions of the CRSP, and (3) the encouragement of financial support, direct and/or in-kind, from Host Country participating institutions.

The Bean/Cowpea CRSP planners did not stop there. They also appreciated the importance of participation by the ultimate beneficiaries of the efforts--the farmers, especially the small-scale farmers in Host Countries. In recognizing that in most of these countries the bean and cowpea producers are women, their intent included efforts which would help reach this important labor force. The thirteen Articles of the CRSP Global Plan, written by founder M. Wayne Adams and confirmed by CRSP participants and the Board of Directors, highlight the significance and complexity of this vision. For example:

> We must support the evolution of more productive and more stable production systems. The evolving systems must maintain their adaptation to the variety of conditions on small farms, utilizing breeding for higher yields and through improved mixed cropping management.
>
> We must be cognizant of the interacting and sometimes contradictory results of various agronomic interventions. We must, therefore, carry out production/consumption-oriented research with socio-economic analyses to assess the acceptability and agro-economic feasibility of proposed interventions. Marketing studies should determine whether improvements, in terms of greater real gain to the farmer, can be made in the system.

> We must give substantive consideration to major components of the farming system and especially the human components. We must become sensitive to and knowledgeable about the unique and multiple roles played by women and men in developing countries as they affect production and consumption of beans and cowpeas.
>
> We must attempt to maintain an acceptable ecology by encouraging all collaborators to look specifically at the relationship of their research to agronomic, social and cultural context of the small-farm family. Researchers will have to assess the potential of their research for increasing or lessening the frequently overwhelming burden of daily living for such families, an assessment which will suggest the level of acceptance that can be anticipated.

The intent to involve farmers in development through their participation in research is critical to achieving useful research results. It is an intent widely held in international agricultural development. Carrying out this intent however characteristically faces stubborn barriers.

For example, professionals and lay persons with different orientations, even if they speak the same national language, frequently talk past each other. Further, it is not uncommon for professionals to ask the wrong questions for the information they seek. They sometimes do not conceptualize the issues in ways that will generate useful information from non-scientific sources.

Lay persons, while willing and often eager to help move the development effort, are limited in time and energy. They may not understand how to contribute information in a way familiar to scientists. Frequently the most important knowledge that lay persons have is intuitive, honed over generations of socialization from parent to child. Such knowledge is not necessarily accessible even to them in a form which they can easily verbalize.

For example, one farmer participant in this study when asked why she plants maize and pumpkins with beans admitted she does not know the reason because she only follows her forebears' way of doing things.

The Bean/Cowpea CRSP Malawi project has incorporated a major effort to address this issue of communication. The basic research problem, extremely important to agriculture in both the US and Malawi, was the identification of biological and social contributors to the extensive bean genetic diversity that exists in Malawi. It was clear from the beginning that in the Malawi project it would be essential to evolve a mechanism to support successful communication among very different people.

What follows is a chronicle of that effort which attempted to open productive communications among persons for whom such communications are not often traditional; e.g., US and Host Country nationals, scientific and lay persons, biological and social scientists, males and females concerned with common technical issues, and persons speaking many different languages among themselves, all thrown together in what by necessity had to become a functional team. It was a tremendous undertaking requiring constant care and feeding. Just as importantly, it required the good will and faith of all those who participated.

This report is the first formal social science presentation of the initial investment made by those participants. The conclusions are preliminary and are purposefully left open-ended to allow for colleagues from Malawi to contribute to the interpretation of research results. It is the intent of the author that this document circulate among these colleagues for their input. Detailed reports of the data are included for their use. The findings from this study will require integration with the rest of the biological and anthropological research being generated by the CRSP Malawi project. Subsequent reports of the implications of these integrated data will more comprehensively reflect information on bean diversity in Malawi. While political circumstances in the region have caused many changes in Malawi since the time of this study, the report can contribute to baseline information for subsequent development efforts in the country.

II. ACKNOWLEDGEMENTS

The study reported here was carried out by Bunda College of Agriculture, Lilongwe, Malawi, and Michigan State University, East Lansing, Michigan--partners in the Bean/Cowpea CRSP Malawi project. The partners are indebted to the Government and people of Malawi who made this study possible.

Specifically, gratitude is extended to (1) the Chitipa and Mzuzu Agricultural Development Division of the Extension Department of the Ministry of Agriculture, (2) the Smallholder Coffee Authority in Mzuzu and (3) eighty-five small-scale farm families who gave of their limited time and resources to participate in this research effort. The agencies, their leaders and representatives throughout the study gave critical logistical, supervisory and moral support without which the research could not have occurred. Concurrently the participating farm families opened their homes to the recorders, in many cases welcoming them as their own children. Gratitude is particularly expressed to the women who allowed the recorders to follow them around, ask endless questions, and be present at poignant moments in family life. The data generated from interactions with these women whose names are listed in Appendix 1 are the basis of the report.

Other offices of the Government of Malawi supported the effort, including the Research Department of the Ministry of Agriculture, the Ministry of Finance and the Ministry of Community Services Women's Bureau. Appreciation also is extended to USAID/Lilongwe, representative of the major donor, the US Agency for International Development in Washington, DC, USA, for their critical logistical and administrative support.

The major directors of the work were Dr. Todo Edje, formerly Head of the Malawi Bean Program at Bunda College; Dr. M. Wayne Adams, US Principal Investigator from Michigan State University; and the present author, formerly Co-Principal Investigator and leader of the project's northern Malawi social science component. The author accepts sole responsibility, however, for this document. Field supervisor for the pilot study was Dr. Julia Miller, formerly of Virginia State University and currently Dean of the College of Human Ecology at Michigan State University. Field supervisor for the major study was Dr. Ellen Bortei-Doku of Accra, Ghana. Field coordinator and technician for both phases of the study was Mr. Augustine Mwamukangama, formerly of Bunda College. The cooperation of departmental colleagues, and especially the principal administrators, from the two partner institutions were vital to the ability of these persons to successfully participate.

Recorders in the field for the pilot study were Wanangwa Banda, Kupingani Gondwe, Ellen Jenda, Filly Kamanga, Caroline Mhango, Ndindasi Mkandawire, Estere Moyo, Emmie Nyirenda, and Flora Zulu.

Principal field recorders for the major study were Jirda Kuyokwa, Astridah Mbeye, Jennifer Msongole, Yimale Msuku, Violet Musukwa, Joyce Mudolo, Christinah Mulenga, Emmie Simchimba, Agness Soko, and Iris Ziba.

Computer technicians were: Kaveh Abani, Ali Kamali and Brenda Johnson. MSU students who participated in coding and data entry were supervised by Elise Harrington. Sherry Presley contributed to the analysis of the questionnaires. Dr. James Stapleton, Professor of Statistics and Probability, Michigan State University, and his student Md. Mezbahur Rahman gave essential statistical support.

Finally, important informational and advisory support has been contributed by the Bean/Cowpea CRSP External Evaluation Panel, especially Dr. Clarence Gray and Dr. Hugh Bunting, who took a personal interest in seeing that the work of this project was completed. Ms. Sue Bengry provided invaluable administrative, organizational and technical support. The author gratefully acknowledges the contributions of all of these persons in the conduct and presentation of this research effort.

III. INTRODUCTION

The purpose of this study is to document and describe the socio-cultural complexity of small-scale farms in northern Malawi in ways which will suggest how that complexity contributes to bean genetic diversity. With over four thousand varieties of beans now documented in that country,[1] the question asked is what deliberate and/or indirect contributions do the small-scale farm families make to bean diversity? That is, is the diversity purposefully maintained, an apparent critical contributor to human survival in the limited resource system? On the other hand, is diversity a non-essential, and perhaps accidental, by-product of some other phenomenon in the farming system? This study attempts to shed light on these issues, important for agricultural improvement programs in general, but especially important for the Malawi bean improvement program.

The staple food in Malawi is maize, which has been important as a subsistence crop since the 1920s. It spread into the country from Portuguese East Africa, now Mozambique, where it was grown along the Zambezi valley as early as the 17th century. In northern Malawi the maize is commonly ground into flour and made into nsima. Nsima is a dough-like product made by stirring enough maize flour into boiling water to make a relatively firm product that will hold together when dipped into a sauce or relish. While likely more digestible than boiled whole maize, it nonetheless does require a relish to increase its palatability and to give the bulky, starchy product improved taste and texture. Beans, and sometimes their leaves, provide that relish.

> *This day (Saturday) I didn't take lunch because there was no relish (2/11/84--Rec).*[2]
>
> *The grandmother after weeding maize in dimba garden sat down and looked very serious. She said she was hungry. She was thinking of where she could go and find relish (11/14/85--PN2).*
>
> *She had gone to church meeting after that she went to harvest bean leaves for relish. The family had lunch very late due to relish problem (5/6/86--PN8).*
>
> *She is happy coz some of her beans which she planted earlier than the others are mature and the problem of relish is now over (3/13/85--P5).*

Undoubtedly the nutritional contribution of beans to the family diet is important. However, it apparently is the availability of beans, or at least bean leaves, for relish which is the most critical concern of the family. In the absence of some kind of relish, the total level of calories consumed is reduced even when the supply of maize is adequate.

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[1]Mloza-Banda, H. R. The Malawi Phaseolus vulgaris Germplasm: Collection, Conservation, Evaluation and Documentation. Paper presented at the 6th Bean Research Workshop, Sokoine University of Agriculture, Morogoro, Tanzania, October 1-13, 1987.

[2]Throughout the report, excerpts from the records are inserted to provide clarification of the information being discussed. These excerpts are indented and italicized for ease of recognition. Recorded observation date and place follow each entry. Asterisks are placed beside excerpts from the same family.

Establishing the importance of beans however, does not explain *per se* the presence of the extensive genetic diversity in Malawi beans. A major, culturally sensitive effort was considered appropriate.

The work of this report began with a pilot study to define research parameters and refine the research methodology. The report of this pilot study is found in Appendix 2. The pilot work corroborated general knowledge and the growing literature indicating that women are the major producers of beans in Malawi (Ferguson and Sprecher, 1987). The decision was made, therefore, to focus attention on them for information generation.

Consideration of the pilot study led to two other perspectives for the major research. First, while women are indeed central to bean production in Malawi, focusing on the total family context seemed to give a more realistic understanding of the information generated. Thus, a basic tenet of this work is that the women and men of Malawi, like their counterparts throughout the world, orient their lives around the utilization of existing resources for the survival of the family unit, i.e., the maintenance of supportive conjugal relationships and the procreation and nurturing of young. As shall be shown subsequently by an analysis of the study's health data, this is no light, romantic undertaking in the northern Malawi small-scale farm environment. As part of its analysis, therefore, the report (1) highlights the role of all family members, (2) addresses the predicament for the family when one such member is incapacitated or absent, (3) inquires as to how this condition affects bean production and (4) identifies related contingency plans that families have in place where the odds favor such unfortunate possibilities.

The second perspective suggested by the pilot study was the importance of seasonal cycles. It became apparent that most of the families' activities were organized around seasonal demands and constraints, heavily influenced by the vagaries of weather, especially erratic in that part of the country. Thus, where appropriate, data are presented not only by district (Chitipa and Rumphi) to get a sense of the ecological variations, but also by month to support consideration of both production and socio-cultural phenomena in the ecological/weather context.

Field work among the rural families of northern Malawi was a rich and stimulating experience. At every turn, agricultural hints of cultural ties to the social evolution of the continent suggested avenues for research which were tempting indeed. The potential for such research is highlighted through the growing literature by African and non-African historians, often making use of significant oral traditions. This literature illuminates not only the history of pre-colonial Africa but the relationship of that history to the history of Europe, the Middle East and the Americas.

For example, there are many reports of great migrations of indigenous populations searching for new homelands throughout East Africa. These include the Bantu movements in the early centuries A.D. (Davidson, 1969) up through the Ngoni Exodus from Zululand and Swaziland to Malawi, Tanzania and Zambia in the 19th century (Phiri, 1983). Some of these reports focus on the relationship between the internal movement of these groups and the invasive activities of external groups penetrating the continent for such wealth as

gold, ivory and eventually slaves (Davidson, 1969). Many of the routes were long-established traditional trade routes of African peoples as well as early Arab and Indonesian traders.

The year 1498 brought Vasco da Gama to East Africa. His arrival began the Portuguese presence on the coast, which spread rapidly to the interior through the 16th century. Moving inland up the Zambezi, the Portuguese eventually found the traditional trade routes useful in their movement of bounty to ports in Kenya, Tanzania and Mozambique.

Historical accounts suggest that the Portuguese may have included beans among the items they traded for African goods and slaves. Agricultural evidence reinforces this possibility. For example, the zebra bean has been documented as indigenous to the former Portuguese colony of Brazil by researchers from the International Research Center for Beans in Cali, Colombia, CIAT. In Malawi this bean is very popular but mostly in the north (Martin, 1987). Apparently it is seldom found even in the central region of the country (Ferguson, personal communication, 1988). The name by which this bean is known in the north, Mangulungulu, suggests its arrival to Malawi via Tanzania either directly during Portuguese trading forays or, as likely, indirectly from the Portuguese through African migrations or trade. History reports that movements within the Ukimbu region of Tanzania included the migration of clans from the Ngulu mountains there (Roberts, 1968). The Ngulube migration in turn included movement into northern Malawi in the period 1550-1650 (The National Atlas of Malawi, 1983). Members of this group eventually established such ruling houses as the Mwenemisku, the Traditional Authority of the Chitipa District families participating in this study. The Ngulu chiefdom in Tanzania was founded around the end of the 18th century, but the second ruler was killed by the Ngoni about 1839. There is ample evidence of active confiscation and/or trade among the various enclaves in the region (Roberts, 1968). The possessive prefix "ma" in the bean Mangulungulu reinforces the likelihood of its African routing.

The Balowaka Migration from 1720 to 1780, which began with a trading party crossing Lake Malawi from the eastern side, may also have played a part in the bean diaspora. They crossed in what is believed to have been a dhow, a sailing ship with a single mast and made of wood like those commonly used in Zanzibar at the time. This suggests that as traders their interaction with the Arab/Portuguese was not unlikely. The Balowaka established their most important authority, Chikulamayembe, in present day Rumphi District (Pachai, 1973). Chikulamayembe is the Traditional Authority under which most of the families in this study from Rumphi live.

Linguistic and cultural ties to these important migration periods in history exist not only in the Traditional Authorities but also in family lore.

> *They are from Mzimba but due to tribal wars among the Ngoni people the family ran to this place (7/25/85--P9).*

Indeed, the movement of people has left social ties to neighboring countries especially Zambia and Tanzania, with whom the continuing exchange of beans is likely.

Wife mulching coffee, husband visiting relatives in Zambia (6/6/85--M2).

Husband went to visit relatives in Zambia (8/1/85--M3).

Husband went to buy meat to be eaten at Malipenga feast the next morning. Wife is preparing food for visitors (sister from Zambia)(10/11/85--M12).

Husband went to Tanzania a week ago. Wife clearing land (6/10/85--M13).

**Husband visiting with Tanzanian businessmen (11/19/85--M13).*

**Wife planting beans. Husband and his friends practicing new songs for Mabenenga (traditional dances competition). He is chairman of the group and he is the one who called three teachers from Tanzania so that they can be taught new styles of dancing. He is one of the dancers (11/29/85--M13).*

The names of many other beans suggest their heritage. Aside from the obvious beans known as Tanzania, Alusha, Zambia and Lusaka, there are others such as a black bean the women say is called Fipa. While the name may refer only to its color, that is also the name by which an easily crossed, treeless plateau in Tanzania is known. The plateau which lies between the two large lakes there is thought to have been used in the great migrations of many African peoples (Roberts, 1969). Archaeologists have found evidence on the plateau of there having been human habitation going back nearly 60,000 years. The white Mbozi bean's possible relationship to trade in the Mbozi District of Tanzania and the Nyika people there (and the Nyika in Malawi) is yet another possible piece of the ethnographic puzzle.

The ancient existence of indigenous peoples in the area suggests an alternative hypothesis to the Brazil/Portuguese connection in the origin of beans in Malawi. In discussions held with the director of research for Weyerhauser Corporation during a recent Task Force trip to the rainforests of Zaire, the author learned of an ancient rare tree species common in the world only in Zaire and the rainforests of Brazil. It was thought that this tree's existence in the two areas dated back to when the two land masses were joined before the break up of the continents. One wonders if a similar Brazil/African connection could have existed for beans, a connection which still might have made use of ethnic migrations for the dispersal of beans eastward toward an especially receptive home. For example, the early Tumbuka/Phoka migrations between the 14th and 16th centuries are reported, through some traditions, to have come from the Luba region of Zaire (The National Atlas of Malawi, 1983).

All of this, tempting though it is, is taking us somewhat afield from the central focus of this report. It nonetheless points to the likely importance of beans in the history of the Malawi people. It suggests that the lowly bean is a small, almost unnoticed, but not at all trivial thread back through very significant periods in the evolution of a nation.

IV. RESEARCH DESIGN

A three-week site selection and rapid appraisal trip through the northern region of Malawi was carried out in 1982 by the biological and social science personnel on the team. The trip was organized to get a general picture of the research issues needing to be addressed in the major study. This assessment was followed by a six-week pilot study, also in 1982, to test the research instruments and the overall research design.

Preparation for this pilot study, and the subsequent principal study, included the training of Malawi women who would be the actual data collectors. These recorders were trained using a training program presented in the Training Report of the Initial Agro-Social Survey Methodology for the Bean/Cowpea CRSP Malawi Project found in Appendix 3. The research plan developed and taught in this program was the foundation for all the project's subsequent social science work in the north, appropriately modified as new information was received from the field.

Beans observed during the pilot study were described and given code numbers. New listings were added as the coders at Michigan State University found new beans in the recorders' data sheets or when the coders were unsure if the ones they came across in the records were the same as similar ones listed. During the analyses, these beans were compiled in 23 categories (Table 1). The Bean Catalog is included as Appendix 4. Throughout this report, beans referred to carry their category's letter designation for ease of identification.

TABLE 1: BEAN CATEGORIES

Code Letter	Description
A	Large and medium solid red, including kidney and round Saaba
B	Small solid red kidney
C	Large and medium solid white
D	Small round solid white
E	Large and medium white with black, green and/or grey zebra stripes
F	Large and medium white with red spotted or stripes
G	Large and medium yellow with black and/or green zebra stripes
H	Large and medium brown/khaki zebra
I	Large and medium pink or violet or blue muted round
J	White with minor marks (e.g., one hilum spot or stripe)
K	Large and medium solid yellow or orange
L	Small solid yellow
M	Large and medium solid khaki kidney or oval
N	Small round khaki
O	Large and medium solid brown
P	Large, medium and small solid green, dark green or blackish (gun metal)
Q	Large and medium solid black kidney
R	Small solid dark blue, blue-black or black round
S	Large and medium solid blue kidney
U	Large and medium "sugar bean" cream with red broken stripes
V	Large and medium red variegated
W	Medium miscellaneous
X	Small variegated miscellaneous

The initial recorders were trained by the author. They in turn, with help from the on-site field supervisors and occasional visits by the author, trained subsequent recorders. Integral to this process was the constant participation and oversight by the Bunda College collaborators in the project. They responded to requests from the Extension Service Development Officer in the region, who contacted them on behalf of the northern team sometimes located in areas not otherwise accessible.

The research was designed to be carried out from several different mutually reinforcing perspectives that would ultimately provide informational checks throughout the data analysis. Overall, the intent was to generate an understanding of appropriate issues in the farm system through discussion of those issues and concurrently through observation of how those issues were actually addressed in real life. While the people of the area were, for the most part, very cooperative, the researchers were aware that what one says is not always what one knows or does.

> *After a long chat she showed us only a mixture of 5 varieties which she herself said was Saaba alone (4/2/84--N4).*

In addition, the recorders who worked with the families might themselves unintentionally contribute misinformation. This was addressed by:

1. Using recorders from the north who spoke tumbuka, the major language there.

2. Using young female recorders who would likely be acceptable to the women and whom the women might feel comfortable having around.

3. Having initial training sessions reinforced periodically by the professional field supervisors who went over the recorders' work with them.

4. Having the recorders work in teams of two for safety, companionship and insurance of the continuity of the work when one had to be absent.

5. Having each recorder do her own work—forms, diary, etc.—thus having two sets of nearly every report, increasing the validity of total output.

Working through the local Development Officer, the project provided for each recorder a measuring cup, watch, clipboard, pens, pencils, erasers, a supply of forms, thermometers, notebooks to use as diaries and a small, water-proofed backpack in which to carry it all. The two-recorder team was also issued a hygrometer and a small eye dropper with which to add water to its wet bulb as needed, and a small vial so they could carry water with them. Aside from the research materials, it was also clear the recorders needed to be issued such items as raincoats, umbrellas, tennis shoes and jackets for their health and safety.

A rotating visitation schedule was developed. Each recorder team had a group of four or five families whom they visited one to three days each at a time, before going on to the next family in the group. Issues of logistics,

convenience and family health sometimes required adjustment of the initially established three-day cycle, which at one point was changed to one day rotating visits.

Essentially, the work of the recorders was to observe and document, each half-hour, the activities of all family members and the description and condition of all the families' beans. In between times, questionnaires were to be administered and discussions held about beans and their care. As the recorders became more accustomed to the research tasks, the families became more comfortable with the recorders.

> *At first she (the wife) was unable to do errands away from her household coz she said it was very unfair to leave us all alone but now she is used (to us) and has known how we are working and she doesn't matter much when she goes away (7/2/85--P5).*

In addition, there was time between the half-hour recordings when the recorders could lend a hand with a large task or help out in a crisis.

> *We were with (the) sick mother at (her) home. I prepared nsima for (the) family because she was sick (6/16/86--M4).*
>
> *Mother gave us some flour to prepare lunch for father when he returned from the fields while she went back to the garden to continue fertilizing coffee (12/12/85--M6).*
>
> *Mother brought maize from the garden and we helped the family shell (3/14/85--M3).*
>
> *Mother is sick with malaria. She went to the hospital and returned. We made nsima for the family but mother did not eat because she was suffering seriously (5/1/86--M7).*
>
> *They had been harvesting coffee all morning. At one o'clock when they were near to going to sell the coffee, (the) father became seriously sick. The mother stayed with him at home so they begged us to help them by carrying the coffee to the factory for selling. We went for a short time and then came back and continued our work (9/5/85--M1).*

To a limited extent, this kind of periodic assistance to the family was encouraged as it helped establish the recorder-family relationship and the communications flow.

> *The family is always happy and cheerful. Mostly the mother is very cooperative and she is a good farmer. She loves us very much (3/1/85--M5).*
>
> *She was very happy with us. They regarded us to be their daughters because all her daughters are married and they have only a 13 year old boy left at home (1/11/85--M9).*
>
> *It was not a nice day (recorders were doing office work awaiting supplies) as we missed chatting with our farmers (3/16/84).*

Photo No. 1

The presence of the recorders was accepted by the community who similarly used them as a resource when needed. This expanded the learning opportunities for the team.

> *This day the neighbors came with fresh maize so that we could help them shell. We were entertained by a lot of stories from the visitors and the mother herself (3/11/85--M12).*

> *The father was weeding coffee in the garden, the mother had gone to Zomba. While we were alone one woman came, she was very worried. She asked where the father was. We told her that he had gone to the garden. She told us that her son had fallen from the tree. We went to see what happened. We stopped the car of one of our bosses coming by from Makeye and asked him if he can carry the injured boy to the hospital. He agreed and picked him up (5/27/86--M6).*

Because the recorders travelled through the hills on foot, the job was very demanding, especially during the rainy season. It required them to leave their homes very early, which was not inconsequential because of their own family responsibilities.

> *The way to this family is always very slippery more especially if it rains. Then we always go barefooted. Today it was too slippery because of heavy rains. We were using walking sticks (2/19/85--Rec).*

> *Tuesday I got up at 4 a.m. and started pounding the maize I had shelled yesterday morning. By 5 a.m. I made 3 mortars and at 5:30 I made 4 mortars. I started hauling water at 5:40 a.m. but left the pounded maize for my sister to dehusk then soak. Then I went to meet my partner and go to the family we are visiting (8/29/84--Rec).*

Observations—Family Activities (Appendix 5)

Using a Family Activity Form, the recorders assessed the whereabouts of each family member every half-hour and marked the appropriate column and row. Each adult family member had a Roman numeral designation and each child had a capital letter designation. The numeral or capital letter was given a lower case letter subscript which referred to the specific activity in the category column in which the person was engaged. A legend for each subscript was printed at the top of each recording form.

The recorders arrived at the household each morning, generally around 8 a.m. and left after their 4:30 p.m. assessment. There were, of course, many relevant activities that took place in the recorders' absence. Frequently when they learned of these things, they included them in their diary reports. This type of information was not to be included on the Family Activity Form as that form was reserved only for those things taking place at the time the recorders were present and reasonably able to verify them.

Observations—Family Beans (Appendix 6)

Concurrent with the observation of family activities, the recorders were to assess the families' bean stocks. Each lot or batch of beans which the family had was described on the Bean Observation Sheet and given a number. Whether a single variety or a mixture, the name, color, shape and size of each variety

of beans in a lot were to be indicated. Each half-hour, the lots' conditions, methods and amounts were recorded in the appropriate column using the category codes printed on the form. The pilot study had determined that there would likely not be more than four conditions for a given lot of beans at a given half-hour (e.g., growing, harvesting, drying, cooking). Thus, the form has space for up to four conditions per lot. Instructions were given to use the backs of the sheets if more than four conditions were present or if there was any other information that might be helpful. Recorders were able to record as many different lots as they found simply by adding additional sheets as each filled up. As part of their half-hour readings, recorders used a "candy thermometer" to record the temperature of cooking beans, which was also recorded on the bean sheets.

Daily Health Survey (Appendix 7)

Each day the recorders were to make a general assessment of the health of all family members present. They were to list each family member's name on the form, give the health condition (including "fine" if apparently fine), the body place if appropriate and the severity (mild, serious or extreme). A new sheet was to be used each day.

Temperature/Humidity Readings (Appendix 8)

Forms were provided for recording an hygrometers' wet and dry bulb readings twice each day. The recorders were not asked to calculate the humidity as this could easily be done later. The readings were taken in the morning when they arrived at the household and again in the afternoon before they left. This component of the research was added in late 1984 and is therefore not available for the total research period.

Questionnaires

A set of six color-coded questionnaires were to be administered during the study at various points in time when it was convenient, but never more than one in a day. The questionnaires were General (demographic and other basic information) and five others concerning bean handling--Production, Storage, Economic, Preparation and Consumption. Questions were frequently duplicated across questionnaires as checks and, therefore, administration at different times was important. The questionnaires were repeated two to three times for most families during the course of the study to see if there were seasonal adjustments in the responses and to increase the likelihood that unanswered questions would eventually generate a response. Because of space, examples of these are not included in this document.

Field Measurements (Appendix 9)

A field measurements form was provided for measuring bean fields and assessing yield. The recorders were to give field measurements in paces long by paces wide. A pace is the distance heel to heel in a normal slow walking gait, which is estimated to be about two feet. Also to be recorded for each field were items such as number of ridges in the width (Malawi farmers generally plant on ridges) and average:

rows per ridge
plants per pace
pods per plant
seeds per pod

The recorders were also to indicate what, if any, other crops were growing with the beans in that same field. Timing was important for this measure because of the necessity of having the plants advanced enough to provide the needed information, and because daily visits to the frequently distant plots were not feasible.

> *I went to her dimba garden and I found that her bean plants have started podding. I hope by next week the pods are going to be a bit bigger for a person to see how many seeds have developed inside (11/20/85--PN6).*

Diary

The recorders were to keep a daily diary to report what happened that day: weather, especially any rainfall; their own condition; any interesting things they learned from the family; and generally what was going on with the family visited. The recorders were told by the author that they were to write as if they were helping the author to learn what they had learned from the women. While undoubtedly they personally knew many answers from their own experience, the idea was to find out what the women of the families knew (not, it was told them, what they—the recorders—knew) and pass that along. They were also encouraged to include any information about themselves they wished to share. Most of the vignettes throughout this report are excerpts from those diaries.

V. RESEARCH RESULTS

A. Basic Information and Demographics

Participants in this study were 85 families from the northern zone of Malawi. Of these, 36 were from Chitipa District, the northernmost area, and 43 were from Rumphi District. A few, 6, who were among those seen during the pilot study, were from Mzimba District, the southernmost area covered. The Mzimba families were usually omitted from the analyses because of insufficient representation. Table 49, Number of Visited Families per Month by Year and District, is included as Appendix 10.

The research families in Chitipa and Rumphi were comprised of 391 males and 423 females, of which 433 were adults (including adult children) and 381 were 19 years old and under. Their ages are shown in Table 2.

Among the 36 families from Chitipa district, 35 were husband and wife and one was wife only (widowed). Among the 43 families in Rumphi district, 30 were husband and wife and 13 were wife only (8 widows, 5 undesignated).

TABLE 2: AGE DISTRIBUTION

	All Adults--20+*							Children--0-19									Total Adults and Children		
	20-39		40+		Total			0-4		5-11		12-19		Total			Grand Total		
	M	F	M	F	M	F	M/F	M	F	M	F	M	F	M	F	M/F	M	F	Tot
Chitipa	47	82	42	29	89	111	200	16	14	23	30	32	43	71	87	158	160	198	358
Rumphi	73	74	38	48	111	122	233	31	22	37	40	52	41	120	103	223	231	225	456
Total	120	156	80	77	200	233	433	47	36	60	70	84	84	191	190	381	391	423	814

*Includes offspring over 19.

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In Chitipa, the average husband's age was 54 and the wife's 45. In Rumphi, the average husband's age was 54 and the wife's 48.

Among the husbands and wives in the families, not counting adult children, the number of years of schooling ranged from 0-13, with an average of 6.75. In Rumphi both males and females had slightly more schooling than in Chitipa (Table 3).

TABLE 3: ADULTS' YEARS OF SCHOOLING*

	Chitipa		Rumphi	
	Husband	Wife	Husband	Wife
Number Responding	33	33	23	29
Range	0-10	0-8	0-13	0-10
Average	7	5	9	6

*Does not include adult children.

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The families all spoke several languages. In general, the males spoke more different languages than the females (Table 4).

TABLE 4: NUMBER OF ADULTS SPEAKING INDICATED LANGUAGE*

	Chitipa		Rumphi	
	Husband	Wife	Husband	Wife
Number Responding	33	33	10	10
Chichewa	10	2	15	16
Chitumbuka	12	7	26	35
English	17	3	19	6
Other Languages	33	33	10	10

*Does not include adult children.

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The average number of wives per husband in both the Chitipa and Rumphi research group was reported to be 2. In both districts, the average number of children per wife was 6 with a range of 0-10. The average number of deceased children per family was 1 with a range of 0-5. The dominant religion reported among this population was Christian.

The research families' farms were made up of a number of plots, usually not contiguous with one another. On these plots they grow both food and cash crops. Of the families reporting the number of bean crops grown per year, most of the Chitipa families reported getting three, while most of the Rumphi

families reported getting only two. The three bean planting seasons are November/December when the rains begin, March/April which is considered the second season as the rains are tapering off and August/September which is the dry season when only residual moisture land (dimba) will produce. Most Rumphi families do not participate in the third-season production.

The families were chosen with the cooperation of the Agricultural Extension Department. Families were replaced as family crises, the logistics of reaching the family in the rainy season or other insurmountable problems had to be addressed.

B. Description of Regions and Report of Weather Patterns Recorded

Extensive information in this section is taken from the National Atlas of Malawi.

1. *Geography*

The families participating in this study were predominantly from Chitipa District—the Mwenemisuku Traditional Authority and from Rumphi District—the Mzikulamayembe Traditional Authority and the Mwankhunikira Traditional Authority. As previously stated, a few families, visited only briefly, were from Mzimba District—the Mzikubola Traditional Authority. Except where indicated, the Mzimba families were omitted from the analyses. If there is no designation of Mzimba's inclusion, the reports are for Chitipa and Rumphi Districts only.

As described in the National Atlas, ranges of mountains and hills with moderate to steep slopes rise above the plains in various parts of Malawi. They are the most extensive in the Northern Region. Hills with somewhat more gentle slopes exist in the agricultural area of Rumphi District but in some areas the terrain is still quite severe. This influences the farming of the research families (Table 5).

> *She had gone to her maize garden. We followed and it was a very long journey climbing mountains. We were just climbing non-stop until finally we found a number of men and women carrying maize. The lady had brewed beer and sweet beer for her neighbors to help her with maize carrying. We told her we would help. Each one of us carried a basket of maize down to the nkhokwe (storage). It took us almost 2-1/2 hours to reach it and we were very tired. Reaching home late and hungry, before I could take any food I needed to wash myself (8/21/84--PN4).*

The country of Malawi extends south of the equator from latitude 9°20' to 17°07' with altitudes reaching as high as nearly 8,000 feet. This wide range of latitude and altitude is important in a study of bean diversity. As little as 15 minutes of latitude can mean enough change in daylength to affect the flowering of photoperiod sensitive varieties.

> *Some beans were just climbing the maize without producing pods. She had planted ADMARC* beans (3/11/86--PN8).*

*The central marketing board of the government

TABLE 5: LATITUDE AND ALTITUDE OF RESEARCH FAMILIES

District	Number of Families	Approximate Latitude Range of Research Families	Approximate Altitude Range of Research Families (in feet)
Chitipa	36	9°40'-10°34'	1,000-1,800
Rumphi	43	10°35'-11°2'	1,000-1,550
Mzimba	6	11°2'-12°44'	1,000-1,550

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Photoperiod sensitivity can be a major problem for the central marketing board and perhaps is one reason farmers participating in this study prefer their own seed. When specifically asked their bean seed source, women in both Chitipa and Rumphi Districts overwhelmingly favored their own seed (Table 6).

TABLE 6: SEED SOURCE

No. of Responses	Chitipa 31		Rumphi 32	
	No. of Families	% of Families	No. of Families	% of Families
Saves Own	29	93	24	75
Neighbors/Relatives	1	3	7	22
ADMARC	1	3	1	3

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

Changes in altitude affect not only temperature but also moisture, two additional variables to which differing bean varieties apparently are variously adapted. The need for diversity among a family's stock is highlighted by the distribution of the garden plots. Among the numbers of bean plots that were recorded, many were widely dispersed quite far from the homesite (Table 7).

> *Her bean fields are very far. She says she has no suitable land for beans nearby (1/22/86--M15).*
>
> *She has gone to another village to plant beans (3/26/86--M3).*
>
> *In the afternoon we went to visit her first plot of beans which is very far. We had to climb a very high and slippery hill. As a result we all returned very exhausted (1/7/85--M13).*
>
> *She had planted her beans a kilometer away (8/4/84--PN2).*

TABLE 7: AVERAGE FAMILY PLOT DESCRIPTIONS AND DISTANCE BY DISTRICT—1984-86*

	Chitipa	Rumphi
Number of Families Reported	27	27
Average Total Bean Land Reported per Family 1984-86	4.32 acres	6.63 acres
Average Number of Plots Observed per Family	6.11 plots	5.19 plots
Average Plot Size Calculated from Paces**	.52 acre	1.56 acre
Average Visited Plot Distance Measured from Household	.48 miles	.55 miles
Farthest Visited Plot, Distance Measured from Household***	1.36 miles	2.7 miles

*Attempts were made to minimize the likelihood that plots counted were duplicated. Ones that were likely the same (same square paces in size, distance and direction from house) were omitted. However, because of fallow or loss of access to the land for other reasons, this figure may not be the annual average amount of land available per family.

**Dimba plot sizes are not included. Dimba sizes were only measured for Chitipa District. The average size was .10 acre. In Rumphi, using questionnaire information the average dimba size was calculated to be .33 acre.

***There were other plots counted in the total number too far away for the recorders to visit in their 8:00-4:30 time period.

The land for the families' garden plots comes from the Traditional Authority.

> *She said all land belongs to the Chief from whom all who want must receive it (11/6/85--PN4).*

Undoubtedly availability and perhaps fallow cycles are considered in the assignment of land. The dispersal of a family's plots through the steep hills likely means that, as with the daylength previously discussed, there are varying soils and rainfall patterns available to the different seed lots.

2. *Soils*

The National Atlas indicates that Malawi soils fall into four major groups: latosols, calcimorphic soils (not common in the north), lithosols and hydromorphic soils.

Latosols are the red to yellow soils of freely drained sites, acid in reaction and leached of bases. They include ferrallitic soils. Weathered ferrallitic soils, also known as plateau or sandveld soils, are yellowish red to yellow or brown, sandy in texture and weakly to moderately acid. They cover large areas from Kasungu (south of Mzimba) northwards. They have a low natural fertility and become rapidly exhausted but can be farmed with either fertilizer inputs or fallow periods.

> *She is harvesting maize now coz the soils from her place to Mphompha are different (6/24/86--P4).*
>
> *This is the only lady so far who doesn't care which season she plants beans. She plants in December, then March, then July--all year round as the soil in her area favors beans very much (7/3/85--P9).*

Lithosols are the shallow, stony soils of the hillsides. They are relatively common but in some areas such as the Misuku mountains in Chitipa District, there are areas of deeper soils which are suitable for agriculture. The Atlas also indicates there are also soil association areas where two or more soil types exist.

> *Her garden has all sorts of clay you want. There is white clay same as white wash, yellow clay, brown clay, grey clay and many other colors and that sort of clay is very fine (9/13/85--P2).*

Hydromorphic soils comprise the poorly drained soils or gleys, dark colored or mottled, that occur in the valley floors and marshes of Malawi. Sometimes called dambo land, these soils with their residual moisture are important, as for many farm families they provide the only avenue to a food supply late in the dry season and before the rains can produce a harvest. Gardens in these areas are called dimba gardens by the families in the north.

> *She had harvested her dimba beans but she had already finished them. She says she planted beans in dimba garden only to pluck leaves because usually beans don't do well in dimba gardens (1/30/86--PN6).*
>
> *She grows Saaba (A) in dimba garden because it suits the soil (3/8/84 Q--N6).*
>
> *Because she wants to have bean leaves quickly for relish she will first plant Saaba (A) in dimba garden as they give bean leaves quickly. Saaba (A) and Nyauzembe (P) will be planted as they are those which do well in that place (7/10/84 YQ--PN7).*
>
> *She does not plant beans in dimba gardens. Dimba soil of this area is not suitable for beans (6/6/85 GQ--PN3).*
>
> *She is harvesting dimba maize for nsima (2/6/86--PN2).*

16a

Photo No. 2

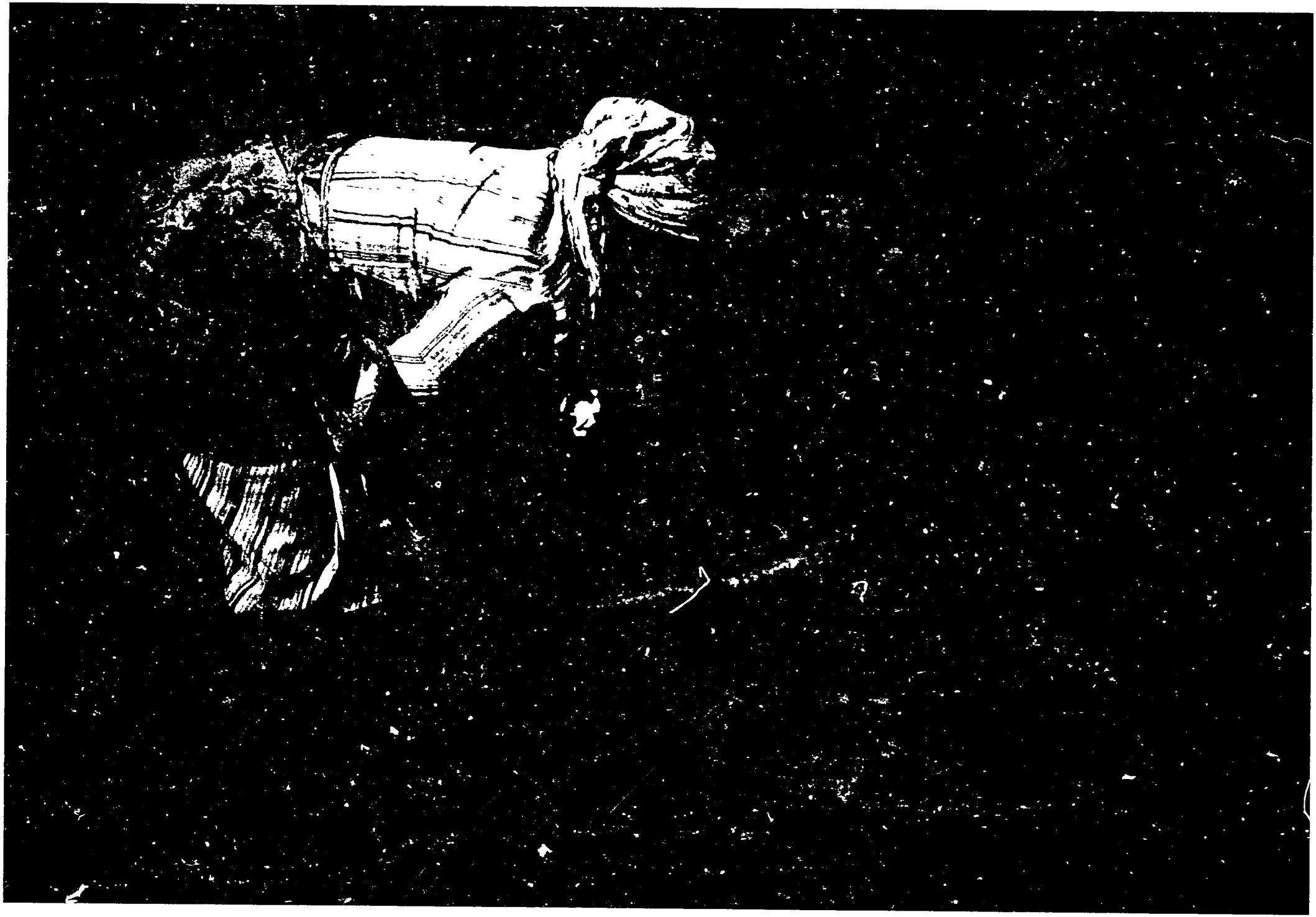

Photo No. 3

She is cooking fresh beans from her dimba. The yield is good although some were eaten by rats (1/7/86--P4).

3. *Sun*

The National Atlas reports sunshine duration generally long throughout the country all year long. The longest sunshine values occur in September or October during the dry season while the shortest values are recorded in December or January in the wet season when cloud cover is greatest. In general, shorter sunshine duration occurs over the mountains and high plateau areas where lower temperatures, owing to altitude, are reflected in higher relative humidities and hence greater cloud cover.

She said she had not planted all her beans this season because there is a problem of sunshine. She has kept the beans for March planting when her beans do better not so in December (1/6/86--M11).

4. *Winds*

Discussion of wind characteristics in the National Atlas reinforces reports by the farmers. The prevailing wind direction from March to September is south-easterly. As the hot season progresses, pressure decreases from September onwards. Airstreams become increasingly northerly and by November local thunderstorms occur as the air masses converge. Tropical cyclones generated over the warm waters of the Indian Ocean often distort air movements in Malawi.

She has gone to a funeral for a husband and wife who were struck by lightning while they were warming themselves in their kitchen (1/28/85--P4).

The rains have come. What frightens her the most is lightning and thunder. When it starts she just goes to bed (10/30/85--P7).

It was very cloudy and it rained heavily and there was thunder and lightning the whole morning until noon (10/10/85--P2).

Probably the most important factors affecting local winds are the topographic features of Lake Malawi and the escarpments. Differential heating of land surface and lake water creates pressure gradients. By late afternoon cool air moves onshore as a strong breeze. At night the relatively warm lake establishes a reversal of this pattern and cooler air flows down from land to lake.

Heavy winds were blowing from all directions (10/31/85--Rec).

The wind was so strong. I reached home at 6:00 p.m. and found that my roof had been blown off by the wind. My mother was away and the children could not fully explain to me. God help me. For I have no money to pay the carpenter a second time (3/9/84--Rec).

She has only one variety of beans. She said that all the beans were burned in the field by the strong winds (3/17/86--M12).

The bean harvest of this season is very poor compared to the harvest of last season because of too much rain and strong winds which blew

and burnt the leaves of the beans. The winds affected mostly (climbers) those staked (3/6/86--M13).

When the family came back from the fields they were basking by the fire because the wind was blowing strongly (1/6/86--M11).

5. *Temperature and Humidity*

The recorders began taking temperature and humidity readings at the end of 1984, when it was determined that such information could be helpful. Not all recorder teams began at the same time because of the need to set up training sessions and get the necessary forms and equipment to them at widely dispersed areas. Using a wet and dry bulb hygrometer, readings were taken by the recorders at the homesites in the morning shortly after arrival (approximately 8:00-8:30 a.m.) and in the afternoon just prior to departure (approximately 4:00-4:30 p.m.). Thus, the readings likely do not represent the day's peak high temperature nor the night's peak low. The average is likely a reasonable day-time average. Both the averages and the ranges are presented in Table 8 by month for both Chitipa and Rumphi Districts.

The Atlas reports from the national weather stations that the highest mean maximum is achieved just before the onset of the rainy season in October or November and the lowest in June or July, a pattern generally corroborated by the household readings. Annual temperature variations are reported as being generally small, with ranges between 9 and 15 degrees. While the temperature variations at the homesites were indeed generally small, they tended to be a little larger than the Atlas reported (Table 8).

The Atlas also reported the relative humidity patterns for the country. It indicated that the lowest values are recorded in September and October, the hottest months prior to the arrival of the rains. The lowest and highest seasonal values parallel the driest and wettest months. Diurnal variations occur from about 90 percent at dawn when temperatures are lowest to 40-60 percent (depending on the season) in mid-afternoon when temperatures are highest. Table 9 presents the recorders' readings for the research sample. Figures 1 and 2 are a plot of both temperature and humidity for each district.

The readings at the households and the experience of recorders both indicate that these patterns generally hold. However, the comfort index for people and plants as well suggests that these patterns are not as benign as the reports imply. For example, the coldest periods occur during the end of the rainy season when being warm and dry is a major challenge. Low readings even during the rainy period are not uncommon.

At this village it is just cloudy and very cold. I wonder how these people live without jerseys on in this cold weather (1/13/86--P8).

We were very wet from the rain when we arrived so we helped her pound maize so we would get warm (3/14/84--PN1).

The husband was basking by the fire because he had gone for clearing land--it was cold and windy and the rains found him and he was wet (4/11/85--M9).

TABLE 8: TEMPERATURE

	Chitipa—M1-17				Rumphi—P and PN					
	1985		1986		1984		1985		1986	
	Ave.	Range	Ave.	Range	Ave.	Range	Ave.	Range	Ave.	Range
JAN			72°	64°-78°			72°	66°-78°	71°	62°-80°
FEB	71°	63°-78°	72°	66°-81°			70°	64°-78°		
MAR	73°	67°-80°	71°	65°-78°			73°	66°-88°	71°	62°-76°
APR	71°	66°-78°	70°	65°-80°			68°	62°-75°	68°	62°-80°
MAY	69°	59°-76°	68°	62°-76°			68°	56°-75°	69°	58°-75°
JUNE	61°	58°-71°	64°	58°-76°			67°	56°-80°	69°	56°-78°
JULY	65°	56°-76°	64°	58°-78°			64°	58°-90°	63°	54°-72°
AUG	68°	58°-76°					69°	58°-78°		
SEPT	74°	62°-85°								
OCT	76°	70°-84°								
NOV	72°	60°-82°			77°	76°-78°	70°	68°-72°		
DEC	73°	66°-80°			70°	64°-78°	71°	64°-76°		

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TABLE 9: HUMIDITY

	Chitipa—M1-17				Rumphi—P and PN					
	1985		1986		1984		1985		1986	
	Ave.	Range	Ave.	Range	Ave.	Range	Ave.	Range	Ave.	Range
JAN			77	49-91			70	58- 90	76	59-90
FEB	77	60-91	79	58-91			82	64-100		
MAR	76	53-91	83	65-91			74	52- 92	74	47-90
APR	78	53-90	82	59-95			74	51- 95	82	54-90
MAY	75	51-90	80	45-91			77	57-100	79	51-92
JUNE	66	45-90	76	49-90			65	35-100	73	52-93
JULY	69	39-90	74	55-90			60	37-100	74	43-89
AUG	67	39-91					57	40- 79		
SEPT	60	37-89								
OCT	53	34-82								
NOV	74	35-95			44	34-53	76	64- 90		
DEC	76	52-91			76	58-90	74	57- 90		

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FIGURE 1: TEMPERATURE AND HUMIDITY—CHITIPA DISTRICT
A plot of the Temperature and Humidity data presented in Tables 8 and 9, page 19

- - - = High Temperature
——— = Low Temperature
— - — · = High Humidity
—— —— = Low Humidity

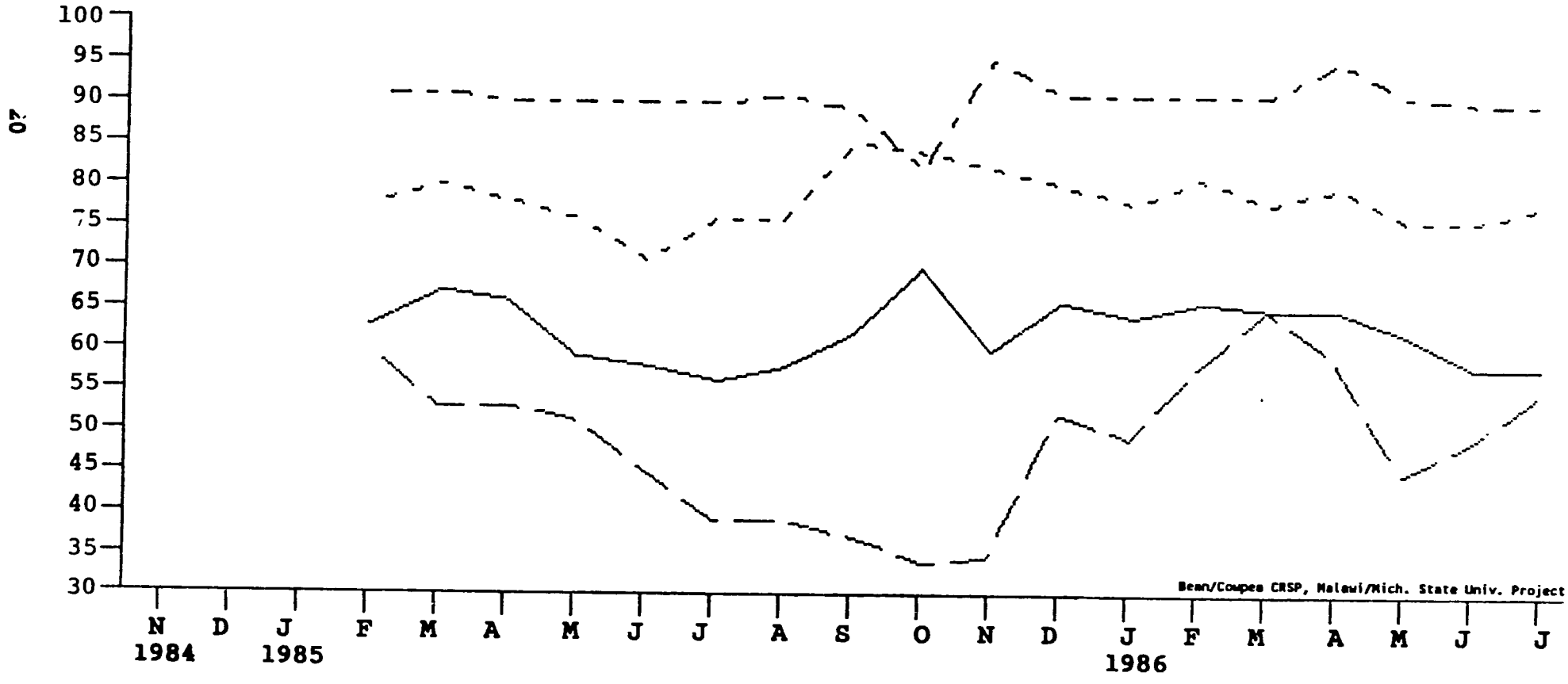
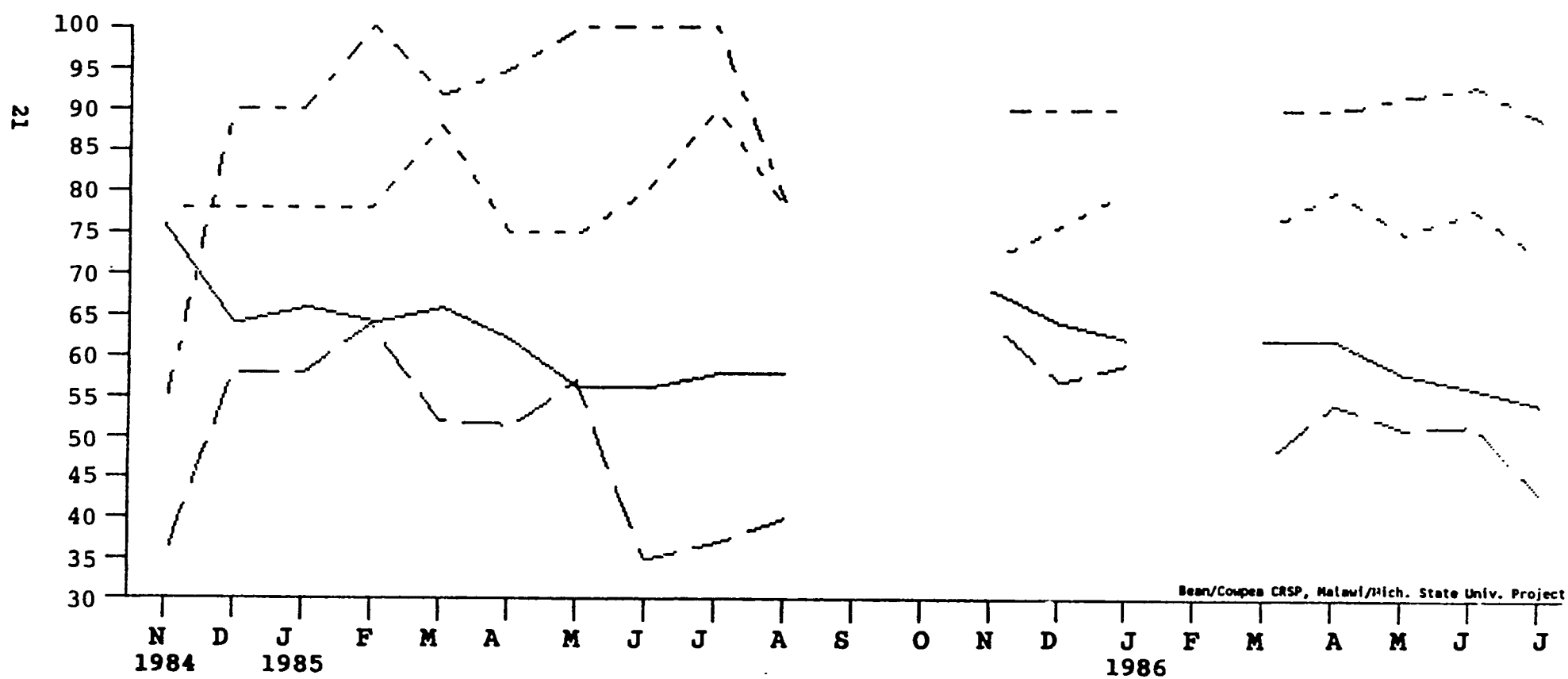


FIGURE 2: TEMPERATURE AND HUMIDITY—RUMPHI DISTRICT
A plot of the Temperature and Humidity data presented in Tables 8 and 9, page 19



She didn't do any big job because it was too cold. We were all just warming by the fire. The day was very cold (6/18/84--M33).

Conversely, during the same late season period, the variability in the weather can deliver the opposite problem. Heat at such times can be a major constraint as beans generally prefer moderate temperatures.

She complained her beans had not done well this year. She said it is so hot that she is afraid she has just wasted her energy for nothing (5/21/84--N6).

6. *Precipitation*

Rainfall in Malawi is markedly seasonal, beginning in November and extending until April or May in the north. The National Atlas reports that variations in total rainfall follow no regularly discernible cycle. A trend appears to exist of a series of wet years followed by a number of dry years, a most important phenomenon for agricultural activities. Normally, the lower the rainfall total, the greater the variability whereas areas with high rainfall totals show a much smaller variability. The Atlas indicates year-to-year variations in the mean annual rainfall are large. In some years the annual rainfall total may be less than half or, in some cases, more than twice the long-term mean.

Not just total annual amounts but variations within seasons can be equally disconcerting.

Last year she had a better bean yield because last year they had enough rain in March while this year it rained once and stopped (11/5/85--PN3).

She has not harvested much this season because of poor rains. It rained heavily from December (1984) to February then starting mid-March the rains were bad (9/2/85--PN1).

Her gardens are finished (cleared with ridges made) and she is waiting for the rains to come so she can plant both maize and bean seed. There is a breakdown of rain here coz it has not rained here since November. So when the rains come then everybody will plant (12/11/85--P5).

She is still waiting for the rains to plant her beans (12/16/85--P8).

She says she has to plant even though there is no sign of rain. She has planted Sugar beans (U) on one plot and Ndozi (K) on the other (12/18/85--P2).

The impact of these variations is increased by their unpredictable distribution over the countryside.

It is raining hard in Mphompha but at this village (it is) just cloudy and very cold (1/13/86--P8).

When I arrived at my house I was told that there were heavy rains but where we were working there was no rain. It was just a cloudy day (12/5/84--PN3).

Tables 10 and 11 present the precipitation observed by the recorders at the research families' home sites in Chitipa and Rumphi Districts by month and year. The early 1984 recordings were spontaneous entries in the diaries which prompted the author to request their formal continuation. Thus, the initial 1984 recordings should not be taken as accurate representations of that period.

The figures given in these tables are weighted quarter days: 4 = heavy rain all day and all night, 3 = mostly heavy rain for two quarters (e.g., all day) and at least some rain for a third quarter (e.g., at night), 2 = rain off and on all day, some heavy, 1 = occasional to normal rain for 1/4 day (e.g., all morning) or heavy rain for a shorter period. Sometimes the recorders did not give precipitation information for the weekends when they were not working. In the tables, the bottom two rows give a summary picture of the monthly distribution. The first of these two rows reports the weighted monthly totals, the second gives the number of days in which any precipitation was recorded, regardless of amount or duration.

As expected, the greater incidences of rain are reported in the period November through April with more limited reports in May and June. The infrequent occurrences of rain July through October follow the anticipated pattern. The variations across years with the rainy season itself is apparent, even allowing for some degree of recorder inaccuracy. The farmer's admonition, reported below, not to plant yet (in November) because the rains had started too early were reinforced by the record. Indeed, in both Chitipa and Rumphi Districts the ample November 1985 rains ended abruptly with the last three weeks in December very sparse. A quick glance back at the temperature during this period (Table 8) suggests a slight difference between the Districts, with Chitipa District a bit warmer, a situation which if the beans find themselves without water may add to the stress. Fortunately, according to the precipitation data, the rains returned in January (1986) and those plants genetically programmed to recover (climbers) were likely able to provide the families with yield.

While everyone looks forward to the coming of the rains and the promise of a new agricultural production season, the rains also bring their own problems. Some of these affect the family directly and immediately.

> *Her house was leaking heavily. There were pools of water in the house as well as outside. We were soaked coz all the corners of the house were leaking . . . It rained heavily all day (1/2/86--P1).*
>
> **It rained heavily at mid-day. We were surprised coz there were no clouds that could bring rain at that time. It was a downpour for at least 2 hours. The house leaked heavily, fortunately we hid ourselves at one corner where the leaking was not heavy (2/19/85--P4).*
>
> **She said she couldn't bear seeing us straggly under her leaking roof (2/14/85--P4).*
>
> *It was raining heavily and the place where I sat was covered with rain water (1/7/85--PN5).*
>
> *The children got soaked from head to toe coming from school (11/8/85--P6).*

TABLE 10: PRECIPITATION OBSERVATION RECORD--CHITIPA
Weighted Quarter Days of Rain Documented by the Recorders*

	January				February				March				April				May				June				July				August				September				October				November				December			
	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot
1						1		1					1	2	1	4		1	2	3																												
2			1	1					3			3	1	1	1	3			1	1	2			2																						
3		1		1									1	2		3	2			2	1		1	2																				1	1
4		1		1		1		1					1		1	2					2			2																						
5						2	1	3		1	2	3	1			1																														
6			2	2		2	1	3	3		1	4						2	1	3																										
7		1	1	2		2		2	2		2	4			2	2						1		1																	1	1				
8		1		1	1	1		2	2			2			1	1																									1	1				
9		1		1					2			2	1			1		1		1																										
10		1		1			1	1					2	1		3							1	1	1		1																				
11		1		1		1		1	2		1	3	2	1		3							1	1																						
12									1		1	2	2			2																										1	1				
13			1	1	1	2	2	5	1			1																																	1	1
14			2	2			1	1							1	1																									1	1				
15													2	1		3																														
16		1		1									1			1		1	1	2																										
17	1	1	2	4		2	2	4					2			2																														
18	2	2		4		1	1	2	3			3			1	1																									2	2				
19	1			1		3	1	4		1	1	2																													2	2		1	1	
20			1	1		1		1		2	1	3																																		
21			2	2		1	1	2			1	1							1	1																					2	2				
22			1	1		2		2		1		1							2	2																					2	2				
23			1	1																															1	1										
24		1	2	3							1	1	3		1	4	1			1																										
25	1	1		2		1		1		1	1	2	1			1																													
26													2			2																														
27			1	1		1	1	2		1	1	2																																		
28						1		1		2		2																																		
29		1	1	2					1	2		3		1	2	3													1		1										1	1				
30		1	1	2					2			2			1	1													1		1										1	1				
31		2		2																																							1	1		
Qtr. days	5	17	19	41	2	25	12	39	22	11	13	46	11	18	15	44	3	5	8	16	5	1	3	9	1			1	2			2	1			1				15			4			
No. days	4	15	14	33	2	17	10	29	11	8	11	30	8	11	13	32	2	4	6	12	3	1	3	7	1			1	2			2	1			1				11			4			

*In quarter days weighted by severity with very heavy downpour all day and all night recorded as 4.

TABLE 11: PRECIPITATION OBSERVATION RECORD--RUMPHI
Weighted Quarter Days of Rain Documented by the Recorders*

	January				February				March				April				May				June				July				August				September				October				November				December			
	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot	84	85	86	Tot
1			2	2		1		1		1		1			2	2																																
2			3	3									2			2					1			1		1		1																2		2
3			2	2			2	2					1			1										2		2															2	1		3
4			2	2		2		2			1	1	1			1																													2	2		4
5			2	2	1		2	3		1		1	1		2	3							1	1																				1	1		2
6						1	1	2			2	2			2	2			1	1																										1		1
7					1	1		2			2	2			1	1			1	1		1		1																								
8						1	2	3														1	1						2		2														3	3	1		1
9		1	3	4	2		2	4											1	1					1		1																1	2	3	1		1
10			2	2	1		2	3			1	1		2	1	3			2	2															2	2							1	2	3			
11			2	2	1	3		4	3		1	4		3	1	4			2	2															1	1							1	3	4	1		1
12			2	2		2		2	2		1	3		2	2	4														1		1											1	2	3	1	1	2
13			2	2		1	2	3	1		1	2			2	2																												2		2	1		3
14			1	1		3	2	5	1			1																															2	2	4	2		2
15							1	1	1			1		2		2		1		1	2			2																				2		2	2		2
16		1	1	2			1	1	2			2		1		1		1		1																								1		1	2		2
17			3	3			2	2						2		2		1		1										3		3												1		1		1
18			2	2		1	1	2	1		1	2			2	2									2		2			3		3			1		1						1		1	1		1
19			2	2		1	1	2		1	2	3			2	2							1	1											1		1					1	2	3	1		1
20						1		1			2	2	1		2	3														1		1										2	2	4	1	2	3
21		1	1	2	2	1		3											1	1																							1	2	3	1		1
22			2	2		1	1	2			3	3	1			1	1		2	3										1		1										1	2	3			
23			2	2			1	1			2	2			2	2					1			1										1		1							2	2			
24	3		1	4	1			1					1		1	2			1	1	1			1		1		1															2	2			
25					1	1		2			1	1			2	2			1	1		3		3		1		1																			
26						2		2			2	2			2	2														1		1															
27			1	1		1		1																																		2	2			
28			2	2		1	1	2			1	1			1	1			1	1																							1	1			
29	2	1		3							1	1			1	1						1		1																		2	2			
30	2		1	3							1	1	1		1	2						1		1						1		1												1		1
31			1	1							1	1																		1		1										1	2	3			
Qtr. days	7	4	42	53	10	25	24	59	11	3	26	40	9	12	29	50	1	3	13	17	5	6	3	14	3	5		8	2	11		13		1		1	4	3		7	12	39		51	23	14		37
No. days	3	4	23	30	8	18	16	42	7	3	18	28	8	6	18	32	1	3	10	14	4	4	3	11	2	4		6	2	7		9		1		1	4	2		6	10	20		30	17	10		27

*In quarter days weighted by severity with very heavy downpour all day and all night recorded as 4.

Other problems brought on by the rains affect the food supply and can have a long-term effect if severe.

> *The rain was very heavy and spoiled a number of bean plants in her garden (1/31/84--PN4).*
>
> *She said this year's yield will be less than last year's because the heavy rains came when the beans were flowering. So most of the flowers were shattered by the rains (3/13/85--P2).*
>
> *The planted beans are growing but not very strong because there is no rain and people are complaining that they will have a very bad yield (5/24/84--M28).*
>
> *She said yield was poor, some pods had no seeds inside. Even the ones now planted will not grow well. We are expecting low yield just because there is no rain (6/1/84--M34).*
>
> *She complained they will have bad yield because there has been no rain since they planted (6/4/84--M31).*
>
> *The planted beans are growing but there is not enough rain so people are expecting poor yield (6/14/84--M3).*
>
> *The beans are in the gardens but they are not yet ripened or even to produce flowers yet (6/15/84--M33).*

Even if the farmer is successful in producing a crop, her problems are not necessarily over. Dimba beans may require harvesting after the advent of the rains. If the farmer needs this harvest for planting seed, she may have some difficulty getting them dry.

> *After harvesting she puts her beans in the sun to dry. After that they are put in the kitchen near the fire so that they should get hard (1/7/85--M2).*

Similarly the beans planted early in the rainy season (e.g., November) are likely to mature during periods of heavy rain, again requiring harvesting and drying under very difficult circumstances.

> *The beans in the household were drying in the kitchen near the fire because there was no sunshine (2/7/85--M10).*
>
> *We were threshing beans in the house while the rain was flowing outside (2/19/86--M3).*
>
> *I have learned that beans can take a whole month to dry if the weather conditions are not favorable. If it is raining too much harvested beans do germinate in storage. This day I helped her to put her beans out to dry but they didn't dry for a long time because of the rains (2/20/85--M13).*

It is the rainy-season beans which bolster the family food supply and provide the seed for the main bean production season which follows. Timing is

critical in planting these beans in that growing beans for immediate food availability (if the dimba garden was unproductive or there was no dimba) must be balanced with having the major yield of those beans available as hearty seed stock for the next season. A major loss of viability would be a serious problem if beans were held moist too long, initiating premature germination and rotting.

> *She was peeling* the beans so that she dries them ready for planting. She could not thresh them as there was no sunshine to dry them (1/19/85--PN5).*

Thus, as has been shown, "planting with the rains" is indeed only a general phrase. It masks a whole array of variables that must be coordinated with skill and acumen, i.e., intelligent decisions regarding specifically when to plant,

> *She said it is not yet time for planting. The rains have just started early (11/25/85--PN1).*

where to plant,

> *She said she had a better bean harvest this year over last because the soil where she planted this year was more suitable for this variety--sugar beans (U) (8/15/85--PN5).*

and what.

> *(This season) she plants any bean that dries quickly (1/3/84 YQ--N1).*

> *They will start (planting) with sugar beans (U) as they need much rain. She said some varieties do better even if there can be little rain. One of these is Nyauzembe (P) (3/6/85--PN3).*

> *Beans they are planting now are the ones they harvested (a lot of) last year because these can stand too much rains--Busale (P) (4/22/85--M11).*

> *She is starting to plant Mwasipengele (U) now. She said she cannot plant Mangulungulu (E) early because there are too much rains so they can't do well (4/7/86--M3).*

> *In storage only 25 cups of Mangulungulu (E) remained (record shows some E already planted) while the other beans were all planted (4/23/86--M7).* (When the recorders returned 5/16/86, they recorded no beans in the household; all had been planted.)

As is true throughout the world, farming is a deadly serious game which requires great skill and a strong sense of the odds. Critical crop management decisions are made using one's best guess about how the elements will perform in concert with one's thorough understanding of one's own seed stock. The results may be overwhelmingly successful with profit-generating surplus for sale.

> *She has sold about 6,468 cups of beans to ADMARC for K198. She used for school fees (5/15/86--P6).*

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*Peeling was the term often used by the recorders when the beans were moist as in fresh shell beans.

On the other hand, the results may be devastating with loss of the total crop and the major investment made from the limited financial and human energy resources.

> *She got 2 varieties but the rest were spoiled in the field including the ones she had bought for that planting (3/27/86--M12).*

The best case scenario in some years is just to break even and not be forced to eat the seed stock, a happenstance for most of the farmers to be avoided at almost all costs.

> *She harvested very little beans because of poor rains. She said she will not eat much this season but keep the little she has for seed (8/16/85--PN6).*

Whatever the outcome, the family, especially the woman, is always plagued with the need to "hedge her bets" and have a contingency in place in case of the all-too-possible disaster.

> **With the rains she will plant in pure stand. She did not get much beans (from her last harvest). After giving some to her children she will have only a few to plant in December and March. So she'll plant pure and some together with maize in order to have seed in March. She was planting maize but not beans in dimba (9/10/85--PN4).*

> **The beans she had harvested were piled in the kitchen and had not done as well as expected because there has been too much rain for the beans planted in pure stand (3/8/85--PN4).*

It is possible that the woman who saves her own seed stock does, in fact, decrease the genetic variability of her varieties. That is, over time perhaps a family's varieties become more homogeneous for various agronomic characteristics needed for specific locations (soils, exposure to morning versus afternoon sun, in the rain shadow or not, etc.). While for other families, with visually similar varieties, the same thing has been happening--a gradual process of refining, within certain indigenous parameters but for characteristics totally different. The question we did not ask was "Do other people's beans of the same variety as yours act differently?"

There were women who reported that they did not save their own seed, but they were in the minority.

> *She said she started growing beans in 1960 and buys the seed from ADMARC and neighbors which is why she had different varieties (8/4/84--PN2).*

C. Integrated Report of Farm Family Systems

As has been demonstrated, providing for family survival needs requires making maximum use of the elements discussed in the previous section. Successful farming requires the farmer to understand the behaviors of those elements so well that they can be addressed more as resources than as problems. Unlike problems to be attacked, resources can be managed by matching with them other resources in the system over which one has more control, i.e., tried and true

plant varieties, adapted crop and farm management practices. As with a giant jigsaw puzzle, one does not get the picture until all the pieces are integrated in appropriate relationship to one another. The likelihood of a favorable outcome from the farming operation depends on similarly appropriate resource management.

1. *Socio-Culture*

In the small-scale farm setting of northern Malawi, socio-cultural resources are very important. In the limited resource setting, family survival often depends on these resources; they are frequently the bottom-line contingency plan if all else fails.

There are cultural resources that reach far back in the traditions of people. Sometimes these seem to intrude on the practical requirements of daily life. Nonetheless, they must be reckoned with and, to the extent that they are followed, they help maintain the sense of community.

> *The custom here is that when an elderly person has died his or her relatives do not go back to their homes til 3 days after the burial ceremony (4/18/86--P4).*
>
> *She and her daughter were pounding. Both of them were unable to cook because of the custom which says that when somebody has miscarried then she should not cook until such a time. So most of the cooking is done by her sons and her sister-in-law (7/11/84--PN6).*
>
> *One of the customs here in the north is that when a girl is married she does not see or talk to her father-in-law (10/9/85--P1).*

Community—At an official level, the sense of community is encouraged through such occasions as Youth Week, when all able-bodied men and women are expected to go to a designated place where some community improvement activity is underway. Examples of some observed self-help projects are digging trenches for water pipes, fixing water pipes, working on road repair, building school buildings and thatching the roofs of classrooms and houses for teachers.

> *The husband has gone to Youth Week to help mend the roof of a teacher's house (3/26/86--P3).*
>
> *The husband after weeding coffee went to work on maintaining the road because important visitors were coming to the area (5/16/86--M15).*
>
> *Her son went for communal work. They are making an ADMARC shed as the one they are using is for rent. They are renting one classroom at the Primary School til the one on self-help will be ready for use (5/16/86--M7).*

There are meetings held by the Traditional Authority.

> *She went to a local meeting held by the Village Headman (7/3/86--M9).*

There are also training courses put on by the Ministry of Agriculture, Extension Department in the area and the Smallholder Coffee Authority.

She is at the Training Center learning how to plant and care for coffee plus some other crops grown here in Mphoka Hills (2/8/84--PN4).

**She was at the Training Center attending lectures on general farming especially coffee management (6/11/86--P3).*

This day was the closing day of the Home Economics courses mounted by wives of the field staff of the Smallholder Coffee Authority here in Mphompha. We were invited guests. The display was very nice, the women had sewn lots of dresses, skirts, shirts and tablecloths. They had also prepared several tasty dishes and baked a lot of cakes, bread and biscuits. The chairman thanked the ladies for their keenness in these courses. At last we ate the foods which were on display. I enjoyed eating meat and vegetables. It was a nice day (5/24/85--P1).

The husband went to a meeting at the pulpery (3/5/86--M12).

She attended an agricultural meeting with the husband (3/13/86--M10).

The husband's sister is here to see her mother who has just come from a long illness. The sister is a cheerful woman. Additional to this she is also a Homecraft worker in her town. She obtained all of her Homecraft certificates in the southern region. She is a hardworking woman. I saw this when she was trying to advise her sisters-in-law on how to care for and look after their families, especially young ones (9/17/85--P6).

The Mother went for one week course at another town (5/15/86--M6).

She went to Home Craft School for 2 weeks at the Agricultural Training Center to learn how to sew clothes by hand and cook good food (11/14/85--M10).

She went to school to learn how to grow and take care of tobacco (5/8/84--PN1).

**She went to farmers' school to learn how to improve her yield (2/11/85--P3).*

These activities support the community and emphasize the importance of everyone's contributions. Subtly they also reinforce the custom that all are expected to help their neighbors if needed.

A lady came to beg millet for planting. She moved around the village and people were giving her bit by bit (1/6/86--M11).

This time of year people are finding problems to get maize but she gave some to a man who came asking for maize. Her maize is nearly finished so that they will not have enough nsima til they harvest their maize (2/20/86--P4).

She made her daughter-in-law help her neighbor to pound maize and help her draw water coz her neighbor had a swollen eye (5/21/85--P5).

The willingness of the community to help is often a critical factor in the ability of the farmer to make it through difficult agricultural periods.

> *She went to communal help in ridge making for her daughter-in-law whose husband had gone to African doctor for a time for chest pains. Relatives and friends with sweet beer for refreshment spent the whole day and ridged 2 hectares in a single day (12/16/85--P8).*

> *Because she has to continually take her grandchildren to the hospital and care for them she cannot get her beans planted. She is planning to prepare sweet beer and call a party of neighbors to help her build ridges and plant beans (3/21/86--PN8).*

The practice of communal support is apparently well established in both districts, with no reticence to participate observed.

> *She was helping relatives harvest coffee (8/30/85--M17).*

> *She was helping neighbors plant beans (9/25/86--M9)*

> *She has gone for communal work to help harvest millet (6/19/85--M4).*

Even so, there were apparently times when participation was difficult.

> *She invited her friends that they should help her to harvest coffee and they went with them to the garden together with her 2 children and her husband. She cooked potatoes for these people. I found that these people were sick. They were coughing terribly (8/5/85--M13).*

Remuneration for this work was observed to be in cash and/or in-kind.

> *The father has 2 wives so some days he cultivates for the first and others for the second. But mainly most of the time he depends on coffee. Bean production is mainly done by the mother alone and she has planted all her beans. This season people made ridges for her and she paid them K20. She did so because she had been sick (5/2/86--M14).*

> *They pay money in return for the Party people helping them cultivate beans (5/7/86--M9).*

If the woman cannot (or prefers not to) pay cash, the in-kind form of remuneration can be preferable because, for the worker, it can be like money in the bank. Nonetheless, the farmer is at least expected to provide for the energy needs of the workers laboring strenuously on her behalf.

> *She brewed beer for 11 neighbors who came to help her harvest and transport the millet from the garden to the village. When going to the millet field they carry a lot of things like water to drink, sweet potatoes, sweet beer, bananas and maize to roast. They harvest, have a drink and a rest. Then start again till sunset (7/2/85--P5).*

> *She was busy transporting the sweet beer to the garden where 12 people were clearing her land. They would clear a portion then sit a while and drink alternating this way for seven hours (3/12/85--P4).*

**The lady had brewed beer and sweet beer for her neighbors to help her with the maize harvest (8/21/84--PN4).*

**She brewed beer for neighbors who were helping her clear her dimba garden (9/11/84--PN4).*

The husband is thatching the house with 2 men he called to assist him. The wife is making food for the helpers (11/11/85--M15).

***She picked vegetables to prepare a relish for the people who are going to help her farm (5/3/85--M9).*

***Ten women from the Roman Catholic Church helping mother harvest maize. She gave them K4 and fed them maize cooked together with beans (4/15/86--M9).*

Formal agricultural cooperatives or clubs are other resources that can be very helpful to the total community as well as the individual member.

She had gone to a maize club to mold brick (8/7/84--PN3).

They belong to a cooperative which gets loans (10/2/85--P7)

She was weeding coffee in her coffee group made up of 4 women and 2 men. Her husband went to weed his own coffee because he is not in a group (2/19/86--P3).

As I arrived I found everybody at home. They were preparing things for the people who came to hold the coffee meeting. The Deputy Manager and Field Assistant were the ones managing the meeting. A large number of people from different areas were gathered at our farmer's house. At 10 o'clock the discussion started. The meeting was about supplying gifts to the best growers of coffee for the year. Two of them won the competition and they were each given one bag of fertilizer, coffee chemicals, a pruning machine and a badge. It was a wonderful day. After the meeting was over the staff ate food and off they left. All people who attended also ate food before departing for their homes (6/12/86--M10).

The church is also important in the lives of some of the families in this study. It provides another arena for social interactions and mutual support and beans also play a role.

Among the agricultural contributions to the church there were only about 2 cups of beans as beans are scarce these days (07/22/85--P3).

**Her 2 children went to church for choir practice (3/15/85--M13).*

**Wife is cultivating land for money for the church (5/1/86--M13).*

She is at the garden weeding millet for the church (6/17/85--M2).

She is an elder in the church (5/8/85--P2).

She had gone to another village to witness for those who wanted to be baptised (6/28/84--PN8).

Family and community celebrations provided additional opportunities for strengthening community ties.

She went to weed her cassava but was called to go to the school to present a ceremony of taking the baby out of the house. She is an herbalist and knows a lot of medicine for mothers and newly born babies (5/29/85--P2).

She said it is not yet time to harvest maize but she has done so anyway because she was invited to a celebration in another town where she'll stay some days. She has given her neighbors some of the harvest in return to thank them for helping her. She had a good harvest of maize, better than some of the other farmers (6/8/85--P3).

She went to Rumphi to practice dancing. The President of Malawi, President Ngwazi Dr. Kamuzu Banda, is coming and she will be among the dancers entertaining the President with traditional dances (2/18/86--PN2).

Husband went to the celebration at the relatives where they were bringing lobola for their daughter. He was invited to the marriage feast so he went there with his later wife. His first wife had gone to the Training Center for a 2 weeks course (11/14/85--M10).

Wife was preparing food for visitors who were coming to pay lobola for her daughter (8/13/85--M11).

There are other celebrations, not at all happy occasions, which also reinforce the communal ties. Attendance at funerals is a continual experience in northern Malawi. Table 12 shows by year funerals for the districts reported each month by the recorders. They, for the most part, represent the number attended by most of the study's families in the district. The district averages show generally more funerals reported in Rumphi (2.79) than Chitipa (1.95). On average, for the families this means, all year around, attendance at a funeral once every two weeks in Chitipa and once every week and a half in Rumphi—a very sobering experience. The heavy months in Chitipa were March and April, the heaviest in Rumphi was June.

No matter what other demands there are on the families or what little they have in the way of food resources, most of the women stopped whatever they were doing in order to lend support to their aggrieved relatives and neighbors.

The family is a kind one. They carry maize flour, beans and the like to the family of the deceased (8/23/85--P3).

She started preparing foods for carrying to the funeral (9/25/85--M7).

Mother was also busy making preparations for the funeral. Then she went to the funeral and planned to sleep there (2/3/85--M3).

She is still at the funeral. The children came back from school and prepared their food (5/1/85--M4).

TABLE 12: AREA FUNERALS REPORTED BY MONTH

	Chitipa				Rumphi			
	1984	1985	1986	Total	1984	1985	1986	Total
JANUARY	1	0	2	3	2	1	7	10
FEBRUARY	1	4	1	6	1	2	8	11
MARCH	2	3	6	11	4	2	7	13
APRIL	1	4	5	10	2	2	5	9
MAY	3	4	0	7	3	0	7	10
JUNE	2	0	6	8	4	8	11	23
JULY	0	3	5	8	0	1	11	12
AUGUST	2	4		6	3	5		8
SEPTEMBER		3		3	1	4		5
OCTOBER		3		3	1	4		5
NOVEMBER		1		1	4	5		9
DECEMBER		6		6	1	4		5
TOTAL				72				120
NO. FAMILIES REPORTING				37				43
AVERAGE REPORTS PER FAMILY				1.95				2.79

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She collected some green maize which was in the house and went with it to the funeral (3/18/86--M5).

Husband returned from funeral and reported a certain man was arrested because he stole a camera (4/22/86--M14).

She was busy preparing foods because she was going to the funeral at another village (5/30/85--M1).

This was not a nice week as in most of the villages there were deaths (3/21/84--P recorders).

She went to a funeral at a nearby village to finish up the funeral rites as she is one of the oldest in the area and she knows all the customs (6/10/86--P2).

More than once death came to families participating in this study. Sadly, appropriate adjustments were made.

We have a new family to replace this one. Since the death of her husband in August the previous one is always in tears and you could hardly speak to her. She has lost weight and is very weak. Every time you pass by her house you could hear her mourning and weeping. What a pity (9/9/85--P9).

The especially high elevation in Rumphi district deaths in June reflects, among other things, a severe measles epidemic in that region.

Today there was a funeral of a child who had died of pneumonia and measles. It was a year old (7/17/85--P8).

There has been an outbreak of measles. The whole of June and July children of the same age group of a year to 2 years have been dying of measles (7/19/85--Rec).

A second old lady died of nosebleed. This was the second case to happen at the same place in the same month with the same age group, sex and village (6/26/85--P1).

She went to attend a funeral at a nearby village. The funeral was of a boy aged 13 years who was suffering from anemia. As the mourners were still at the graveyard they were told that after burial they should go straight to one of our other farmer's villages to attend another funeral. The funeral was of a child about a year old who had died of measles (6/18/85--P3).

As we were about to leave our farmer we heard that the mother-in-law of one of our other farmers who was very sick has just died. On our way home we met many people going to the funeral at that family (6/9/85--Rec).

Clearly, one of the strongest resources in the northern region is the sense of community demonstrated by the people in formal settings, in informal settings, and just in the normal conduct of their lives generally. One's neighbors, relatives and friends are a place to turn when things don't work out; they are

the "contingency plan" in place for almost any crisis. It is a resource to be carefully nurtured and protected. As can be imagined, this is especially true for widows.

> *It was a fine day. She was happy to see us. This day she had brewed some beer and invited all her relatives and neighbors to this beer party. The aim of the beer party is to keep the spirits of the dead away from disturbing them. Now she has brewed some to keep the spirit of her dead husband in peace. She says every year she brews beer and calls her neighbors and relatives to celebrate. It takes about 2 to 3 days for the people to finish drinking the beer. A lot of people were present some from far away. They were dancing and singing as they were drinking the beer. She was always near the beer drinkers giving them boiled water to neutralize their beers (8/10/85--P8).*

> *The woman says she has no beans except 4 3/4 cups given her by relatives because she is ill and has nobody who can plant for her (1/30/84--N1).*

The importance of the sense of community cannot be overestimated. The importance of beans as one important currency in that context should not be underestimated. The role and importance of beans in strengthening relationships and building goodwill is well understood by the women of this study. As a provider of the all-important relish, beans are a gift always well received.

> *She was threshing beans to give to one of her neighbors. She said that she can't sell her beans without giving some to her neighbors to taste (4/18/85--P2).*

> *She started clearing her maize garden and she threshed her beans at last. But she has given out much of her beans to relatives and friends (11/6/85--P4).*

> *She harvested a full basket of beans (pulled the whole plant) and gave them to a relative (6/18/85--PN3).*

Family—As with any well-run organization, the families participating in this study had a clear understanding of the tasks which the family had to perform and who was responsible for those tasks. The author was impressed that, while most tasks as usual appeared to be assigned on the basis of gender, few were found where there was no gender cross-over observed when needed.

For example, males were observed cooking, engaged in child care, planting beans and harvesting food crops, although none was observed pounding maize or smearing floors (applying a black sealant clay to the dirt floors of the home). Similarly, as previously shown, women were observed engaged in land clearing, coffee growing and also animal care, although none was observed actually on a roof laying ridge poles or thatching.

> *Her daughters were grazing cattle. A woman passed by where we sat, she was grazing cattle although it is not common for the women to graze cattle. But here in Misuku they are grazing (2/3/86--M4).*

She was herding cattle because her husband was out of town (7/16/84--PN2).

While there were indeed gender roles, in successful families males and females filled in for each other in adversity.

**A large number of his coffee bushes were destroyed at coffee harvest time by fire of unknown origin. They live far from the field. Coffee was helping him a lot like money for school fees especially (10/4/85--P6).*

**Because fire destroyed their coffee they are having to sell maize for school fees (12/12/85--P6).*

She is very strong. She managed to pound more than 308 cups of maize all alone. Then she went drawing water for washing the pounded maize and soaking it* **(pounded maize in the market brings a good price) *(1/21/86--P6).*

**She is sick so her husband was weeding maize and beans. She was in bed with body pains so severe she could hardly sit upright for 10 minutes. She was in real pain (1/30/86--P6).*

The husband is the one who is cooking because the wife miscarried a few days ago so due to the custom the woman is not supposed to cook until after some months have passed (7/12/84--PN6).

Other family members can also be helpful during difficult times.

She and her daughter-in-law and sons were harvesting for one of our other farmers, who was very sick **(to whom she is related)**. *She was doing it because that farmer has a big garden and a lot of beans. They thought it wise to give a hand rather than let the beans rot in the field (4/15/86--P1).*

**She was on a very long trip walking the previous day. As a result she was tired and had painful legs. Her grandson helped her weed her coffee (5/16/85--M12).*

The son thought it wise to call his mother to assist his wife who is expecting. The husband has gone to escort his wife there because she doesn't know where the town is (6/19/85--P4).

What we have learned from this lady is that all her daughters-in-law are very cooperative. They do all their works together and they eat together and they all love their mother-in-law very much coz she doesn't segregate her children (6/13/85--P8).

**She and her husband are harvesting coffee with the daughter. The daughter was also harvesting beans. She came from Zomba to help (8/2/85--M12).*

**She was collecting firewood with her daughter. She is complaining that her knees were paining her. She has not harvested plenty of beans this season. She has few beans only for planting (9/10/85--M12).*

The family may also be needed in other difficult times as in the resolution of family disputes. At such times, the broader extended family may step in and assist in finding solutions.

> *With her mother, daughter-in-law, husband and some elderly men and women of the village, our farmer was discussing family matters. The husband of one of the women had started to be stubborn again. He drinks alot and when he does he beats his wife terribly so the wife was saying that she had enough of him so she was going back to her parents. All the elders including her in-laws were pleading with her not to go. They said they are going to talk to her husband and if he won't listen to them that is when she will go to her parents. Then they all returned to harvesting millet (7/12/85--P5).*

Being without young females in the family is at least as serious as being without males, so much of the daily maintenance work is done by women. It is difficult to get others to do it routinely. When a daughter marries and leaves home, there is a void which may be filled by a granddaughter or daughter-in-law, if one is fortunate enough to have a cooperative one.

> *She complained she is unfortunate to have only sons and no daughter to help her with the work (2/21/85--P5).*
>
> *She is cutting grass for thatching. This lady is now a bit lonely because her two daughters both have left her. They got married almost at the same time (11/2/85--M10).*
>
> *Her granddaughters are all hardworking and can stand hunger. They sometimes spend the whole day working without eating anything (9/3/85--P2).*
>
> **She was admitted to the clinic with abdominal pains for 3 days now. Her daughter is the one tending her mother at the clinic since her new daughter-in-law has gone with her husband to an African doctor for chest pains (3/11/86--P8).*
>
> **She is seriously sick in the hospital since the death of her grandson. She has grown very thin and pale and very weak. To make it worse her only daughter (who was tending her) deserted her and married a certain laborer who works on a bean estate. Her new daughter-in-law is the one harvesting her beans (4/14/86--P8).*
>
> **There is a funeral, this farmer just lost her new daughter-in-law. She died with an unknown disease and left 3 children (5/27/86--P8).*

Having a family able and willing to provide the necessary care in one's old age is another concern.

> *The mother-in-law is very old but hardworking. She can cook and collect firewood from the hills (5/16/86--P7).*
>
> *When we arrived only her father was there who was old and deaf (1/15/85--PN2).*

Her mother-in-law is old but hardworking. She manages all household activities but due to epilepsy she discourages her from entering the kitchen coz of fire and never allows her to draw water from the well (10/3/85--P5).

At this family there is a very old woman who doesn't work and she is sick. So the people of this family don't go anywhere they just stay there looking after her. They can carry her if she wants to go out, they lay her if she wants to lay, they make her sit if she wants to sit (2/3/84--M4).

As a rule, the most successful and productive families were those in which all family members, including the males, worked as a unit. The females could maintain the family at a certain basic level but the tasks assigned to males occur at critical points in the farming system. The family relies on his sense of responsibility, dependability and efficiency in getting the tasks done on time for the next tasks to follow.

The beans in this garden were not growing well because they were planted late since the father was sick and they went to Rumphi for African doctor (5/30/85--M1).

She is complaining her yield is low coz she is doing farming alone while the husband is busy helping his second wife. She said that the husband doesn't bother about her anymore. She tries to make herself neat but coz she has not clothes she fails (5/2/85--P1).

Husband is thatching the main house because it is leaking (2/7/86--M11).

With new baby she has not yet finished planting because the husband is still clearing bean land (4/24/86--M17).

The husband has gone to African doctor for chest pains and she is making ridges alone. She is thinking of visiting him there sometime from now (12/4/85--P8).

Children are also important in the farm enterprise. Children's contributions are integrated with the adults from an early age.

A five year old girl passed by where we sat carrying a heavy pounding stick (2/3/86--M4).

Her grandson came and helped her weed her coffee (5/16/85--M12).

Incidentally, while making an often critical contribution to the family labor pool, they are also learning, under supervision, the skills they are expected to have mastered as adults. Concurrently, and to the extent that the family can manage without them, the children go to school and are encouraged to do well in their studies.

Husband was spraying insecticide and land clearing. Wife with the mother-in-law was planting beans. The son went for land clearing with his father in the morning and after that he went to school. After coming back from school he was writing maths given him as homework (5/6/85--M9).

She and her son went for cultivating beans in the morning but were forced to return due to too much rains. After this they remained indoors by the fire. Later she and her 2 daughters went for harvesting maize while the son went for cultivating beans. Late in the afternoon about 2:30 the son went to school (4/9/85--M13).

The girl was involved in domestic work after she came from school. At her free time she was studying notes (11/8/85--M14).

Husband and wife were planting coffee in the field all day. The girl remained behind because she was copying notes from her friend's notebook. After she finished she joined her parents. They spent the whole day planting and transporting coffee from the nursery (12/3/85--M15).

It should be remembered that most of the homes in the areas of this study were without electricity. Thus, school work had to compete with farm and domestic work for the available hours of sun light.

Her son's 5 year old daughter wants to go back to Mzuzu where they live because she doesn't like staying in a house without lights at night (12/10/85--P9).

Alternative sources of light are firelight from the wood burning for cooking or warmth or lantern. There are many such factors which mitigate against the educational success of the children.

There is a shortage of teachers so the students go in 1/2 day sessions (3/17/86--P4).

Her son is back from African doctor after a long illness and enjoyed speaking chewa with us. He speaks chewa very well as he is a bit educated. But because of illness he was unable to complete school (2/5/85--P1).

Yet, the parents' emotional and economic investment in their children's education is substantial and in the limited resource setting cannot be taken lightly.

She has grown a lot of maize for sale. Last time she sold a lot of beans and now was a turn for maize. She makes a lot of money. She uses the money for paying school fees for her grandchildren as well as clothing them (10/3/85--P5).

**Because their coffee was destroyed by fire they are having to sell maize for school fees (12/12/85--P6).*

**She sold 6,468 cups of beans to ADMARC with more to sell. She used the money for school fees. She wants her son to pass and be admitted to the University (5/15/86--P6).*

Father has gone to town to pay school fees for the children (1/21/85--M5).

She complained that all the money she earned from selling maize and beans went to pay her children's school fees, uniforms and pocket money (9/27/85--PN1).

Her son missed school for lack of school fees for this term (1/26/86--P3).

She wasn't at home when we arrived because she went to school to attend her children's tests to see if they passed. It was school closing day. She arrived home late and found us there. She was very happy because her children passed except 2 who failed (3/27/85--M4).

The results of the Primary School-leaving Exams are out and none of the children of the farmers we work with have passed. It is a pity (10/18/85--P7).

2. *Economics*

The economics of the small-scale farming system in northern Malawi involves an exchange/barter economy as well as a monetary/market economy. In earlier sections of this report, examples of the very substantive work exchange system were presented.

She has gone to weed millet and will get salt in payment (5/6/86--PN8).

Exchanging and bartering are also common as people are able to exchange specific goods without having to convert to official currency more easily lost, stolen or confiscated for non-intended purposes.

The women were exchanging food like flour (for nsima) and bananas (5/5/86--PN7).

In the barter system, both parties are both specifically "buyers" as well as "sellers" and the appropriate exchange value can be directly negotiated, based on observed (and maybe even tested) quality. Persons without cash, access to banks, or mathematical skills can nonetheless demonstrate great acumen in this ancient art. Because both parties are buyers and sellers, the game which is at once potentially profitable, challenging and entertaining renders each in control and each vulnerable.

She has grown a lot of maize for sale. She uses the money for school fees. She had bought some baskets for carrying flour and other things. She just exchanged maize for this basket. These baskets came from the lakeshore. Sometimes these lakeshore people carry fish to exchange with maize. They like barter system (10/3/85--P5).

Husband sold some beans worth K2 in exchange for a calabash of sour milk (3/20/85--M9).

I have learned how this woman helps relatives in giving food like beans and flour. She is also clever. She exchanged salt for beans (4/23/85--P3).

She told me that last week on 13th July she had exchanged three tins of beans (1 tin of Lusaka (K) and 2 tins of Nyauzembe(U)) with salt. She had run short of salt so the time she met people who were selling salt for beans she was happy (7/18/85--PN1).

Participation in the monetary economy involves such activities as off-farm employment, cash crop production and on-farm enterprise. Each of these three activities has the potential to contribute significant income for family needs and raising family well-being. It must be considered however that none of these three necessarily does so. If the person earning the income resides outside the household during the earning period or if the person is male, the choice may be made to concentrate on personal comfort and pleasures. Females, for a variety of reasons, generally have less freedom to make such decisions. Ultimately therefore, additional factors, i.e., family health status, existence of a tin roof or cement floor, need to be considered in addition to the three economic activities in determining the family's standard of living and the extent to which value earned from family resources returns to support the total family. What follows is an overview of the three activities as they were determined to exist among the families of this study.

Participation in the money economy through off-farm employment was assessed for the Chitipa and Rumphi Districts. The total number of families for which this information was recorded was 50 out of the 79 families in these districts (Mzimba omitted). Table 13 shows the district and gender distribution of the members of these recorded families holding off-farm jobs some time during the 1982 and 1984-86 periods of this study.

TABLE 13: OFF-FARM EMPLOYMENT
1982 AND 1984-86

	Chitipa	Rumphi	Total Recorded
No. of Families Recorded	21	29	50
No. of Male Workers	14	55	69
No. of Female Workers	10	26	36
Total Workers	24	81	105
Percent Males, Districts Combined	20	80	100
Percent Females, Districts Combined	28	72	100
Percent Total, Districts Combined	23	77	100
Percent Male Workers, Within District	58	68	66
Percent Female Workers, Within District	42	32	34
Percent Total, Within District	100	100	100
No. of Recorded Families with Workers	7	23	
Average Workers per Family with Workers	3.4	3.5	

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The generation of money does bring up other issues which the family has to resolve.

> *They save their money at the Post Office after selling beans (5/7/86--M9).*
>
> *She has sold 500 cups of beans to ADMARC. Her husband is keeping the money for his wife (6/4/86--P4).*
>
> *Her son is a busy man and a hard worker. But he doesn't forget booze. Yesterday he went to collect his coffee money and went straight to Rumphi to drink (9/8/85--P5).*

There were clear differences between the districts. Many more off-farm workers were recorded from Rumphi (81) than from Chitipa (24). The gender distribution between districts reflected this same pattern with 80 percent of all male workers in this sample coming from Rumphi and, similarly, 72 percent of all females coming from Rumphi. Within the districts, the male/female distribution of workers in Chitipa was 58 percent to 42 percent and for Rumphi a more traditional 68 percent to 32 percent male/female distribution. While employment sites were not recorded for all workers, the general trend of those that were recorded appeared to be that workers from the more remote Chitipa District were working more in neighboring countries or in the more urban central region of Malawi while many workers from Rumphi, more urban than Chitipa District, held jobs in the area. Likely reflecting the local availability of jobs, this may account for the more limited participation of Chitipa families in off-farm employment. Interestingly, if one considers only the number of families in each district that actually were recorded to have members working off the farm (Chitipa 7 of the 21; Rumphi 23 of the 29), the average number of workers per family was about the same in both districts (Chitipa 3.4; Rumphi 3.5).

Cash crop production was also assessed for these districts. The major cash crop in the area was coffee. A few of these coffee families (5) also were observed to grow tobacco.

> **One of the laborers was busy planting tobacco while the other one was clearing the maize garden (10/15/84--PN1).*
>
> **In the afternoon she went to the market to sell tobacco. She came back at 4:00 p.m. and told us that she had found K500 and last week on 2nd June she sold tobacco for K300. She was very happy indeed (6/9/86--PN1).*

Among the 79 families in the two districts, 71 percent were observed to be coffee growers. Table 14 shows, however, that there is a clear district difference. Within the districts, 86 percent of the Chitipa families grow coffee but only 58 percent of the Rumphi families do so. Between the districts, the coffee growers are 56 percent in Chitipa and 44 percent in Rumphi. This imbalance is expected because of the greater abundance of higher elevation coffee-growing land in Chitipa District.

The participation of women in coffee growing was more apparent in Chitipa District. However, the data are not clear on the extent to which Chitipa women have their own coffee gardens more than Rumphi women.

The wife has her own coffee garden (1/7/85--M3).

She has her own coffee garden (5/15/85--M10).

She has her own plot of coffee (11/1/85--M1).

She went to an agriculture tour (at a town some distance away). Her husband said she is one of the coffee growers and that's why she was chosen to go (8/7/85--M15).

She has her own coffee field. She was weeding her field and her husband, son and friends were helping her. She is in a farmers' group (5/10/85--P3).

When the information on coffee growing is reviewed in relation to information regarding off-farm employment, the propensity of the families to make maximum use of whatever resources exist in their environment is clear. Rumphi families, in the more urban area where jobs are likely more available, turn to off-farm employment while Chitipa families in the more remote, mountainous region rely on coffee production.

TABLE 14: COFFEE GROWERS

	Chitipa			Rumphi			Region Total		
	Grow	Non-Grow	Total	Grow	Non-Grow	Total	Grow	Non-Grow	Total
No. of Families	32	5	37	25	18	43	57	23	80
Percent of Families Within District	86	14	100	58	42	100	71	29	100
Percent of Families Districts Combined	56			44			100		

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The third set of activities which enables families to participate in the monetary economy is on-farm enterprises. Many of the enterprises observed tended to be gender related. For example, all the butchers, tailors, metal workers (including sharpeners of knives, hoes, etc.) and wood workers (including makers of handles, furniture, coffins, etc.) were recorded as male. Although the author has seen a woman tailor running a pedal-sewing machine in a tailor shop, it tends not to be the norm.

She has 2 handsewing machines one for home use and one in tailor shop which help in some economical problems (11/19/85--P5).

Husband has sewing machine and makes dresses for people in the village. He is a good tailor (11/20/85--M14).

Husband slaughtered a pig and a lot of people came for meat. He was very busy selling meat together with his son (5/30/85--M10).

Similarly, all the clay pot makers, beer brewers and home-processed coffee makers were recorded as women.

She was selling beers. There were a lot of people (1/11/85--M9).

She was making her clay pots. She said some will go to her daughter-in-law so she can find it easy to cook in several pots and some she was making for her neighbor (11/14/85--P2).

Both males and females were observed selling produce, although only males were observed butchering and selling meat.

Sale of farm products was the most common enterprise recorded for the families. A wide range of fruits and vegetables, including beans, were involved and their production appeared to be very responsive to market demands.

**This time of year he is busy selling vegetables from his dimba garden. Vegetables here at Mphompha are very expensive--2 rape leaves for 1 t (8/23/85--P3).*

***She planted more cassava this year because she finds a lot of money selling cassava (2/28/86--P2).*

**Her sons are planting wheat gotten with a loan they will repay with sales from beans or Irish potatoes because they have grown more of each this year (3/14/86--P3).*

****She is digging Irish potatoes for sale and planting wheat (3/18/86--P5).*

Daughter went to market to sell onions (2/5/85--M3).

She went to sell ripe bananas at market (3/5/86--M12).

***She was drying her Ndozi (K) beans. She said now its time to thresh her beans to sell and for storage. She said she will not sell to ADMARC but locally to businessmen who usually come from Chilumba (6/20/86--P2).*

****Sugar beans (U) are for eating and for sale. They bring a good price at the market (12/14/84--P5).*

Some of the products were sold as already processed foods.

She is pounding rice to sell at traditional dances competition called "mabenenga." The elder boy was selling tea there (9/25/85--M15).

She sold recorder coffee at 60t (5/2/86--P6).

The economic importance of beans was very apparent from these data. They provided an especially appropriate avenue to earned income. The women were quite astute in their management of this resource.

Women plant their own fields of beans so they can have money. People are growing a lot of beans these days because the price per tin is high. This farmer says she alone fails to plant a lot because of less energy (10/30/85--PN7).

**Beans are a source of money to this lady. She cares a lot if the harvest is poor (5/1/86--M13).*

**She said beans are a source of money and food (1/8/85--M13).*

She was shelling maize to sell to ADMARC. She said she would not sell beans to ADMARC because the price there is very low (7/17/84--PN1).

This day she sold a lot of things at her house and some of the things were ripe bananas and beans (1/11/85--M9).

***She would like to sell some beans but nobody has come. She will not sell to ADMARC because the price per tin is very low. She said it is better for her to keep her beans and sell them during the rainy season (9/19/85--PN3).*

***She said she will sell in March after she has planted. She thinks that by February the price per tin will have gone higher (11/27/85--PN3).*

She is doing the last weeding before harvest. By April she will start harvesting and selling beans (3/8/85--P4).

****She got a lot more beans this year than last. She will sell in coming months (6/10/86--P2).*

She sold 3 tins of beans the day before at K12 each tin (3/19/86--PN5).

****She sold a tin of Nyauzembe (P) consisting of 120 cups for K10 (5/7/85--P2).*

They sell as private vendors in the markets, to ADMARC, or to "middlemen." In one market the author met a female entrepreneur in this role. The women sell, usually small quantities, to these merchants who pour them all together and take them to the cities (and sometimes neighboring countries) for resale.

She sells her beans as mixtures. People don't ask her to separate because most of them are not bothered by color and size as they also sell in markets (11/8/85--PN6)

The woman was selling some beans to some businessmen. We asked her why she was selling and she told us she had planted enough (4/12/84--PN3).

For most of the women, the issue of having enough for the household was critical and they would sell only after determining that this need was satisfied.

Photo No. 4

All beans are for selling but she doesn't sell always. She only sells if she has seen that she has enough to eat and to plant for the next season (4/25/84--M28).

She can't sell because she has low yield (4/26/84--M29).

I learned that they handle beans with care because the wife said they are a great source of money. She likes selling beans if she harvests more (1/4/85--M12).

She finished threshing her beans and sold 7 ADMARC bags to businessmen for K60 each. She sold 3,334 cups (ca. 26 bushels) *with some left in storage in clay pots in ash. Some of these are seed for next season (5/21/85--P5).*

She will sell only a few of her beans and save the rest to give her daughters when they come to visit her (5/7/86--P1).

Visitors came to this farmer looking for a bag of beans to buy but she had none to sell. She had three kinds in storage but they were not for sale (11/20/85--PN6).

She said this year she has not kept enough bean seed because she had received the money from customers before she harvested the beans (10/15/84--PN1).

Some indicated they preferred not to sell at all.

She only sells beans when she has some problems (4/27/84 YQ--M30).

The production of hybrid maize for sale was another one of the major ways the women earned money. Again the issues of market demand and prices were considered.

She was bagging shelled maize for sale to ADMARC (8/4/84--PN2).

She grows two types of maize UCA for selling and local for home use (3/5/86--P4).

Some of the women also bought beans, usually for planting. However, since these observations generally relate information about specific varieties, they will be discussed in a later section.

Production support expenditures, sometimes including casual labor, were required for successful yields, especially for hybrid maize and coffee. Sometimes this was a problem.

She has gone to buy fertilizer from ADMARC (1/3/85--PN4).

She bought 4 bags of fertilizer, two for maize and two for coffee (11/22/85--P8).

She won't apply fertilizer this year because of financial problems (11/25/85--P1).

She managed to buy only 1 bag of CAN fertilizer. She gets money only from clay pots and some of her harvest (11/26/85--P2).

Husband bought four bags of fertilizer for maize and coffee (11/20/85--P7).

**She bought four bags of fertilizer for coffee, maize and Irish potatoes (12/9/85--P3).*

Father bought fertilizer for coffee (12/12/85--M6).

She bought 8 bags of fertilizer for coffee (12/11/85--P5).

She bought maize from ADMARC (11/18/85--M12).

She employed a worker to help her and her son make ridges (12/10/85--P4).

**They had to hire a woman for money to apply fertilizer since they were busy weeding (1/28/86--P3).*

In many of the families, the children also were encouraged to have gardens. This practice provided them not only with early learning opportunities but also rewards for a job well done. These rewards, in the form of the produce, were usually considered theirs to share or sell for spending money.

In this family the children have their own maize and bean garden and they sell these crops (11/21/85--P7).

Each person keeps their own money from the sale of their own crops (6/6/86--P6).

Her son sold almost a bag of beans which is 462 cups to local businessmen. Her daughter sold 115 cups to ADMARC (5/1/86--P2).

Her son has sold 693 cups of his beans. He keeps the money for himself (5/30/86--P1).

It is not an idle exercise as there is peer pressure to demonstrate early one's adult skills.

The son was away to another area looking for a girl to marry. He can't find a girl here coz all the girls know that he is very lazy. He fails even to have his own garden as most of his age mates are doing. He has now started building a house to live in. He says as soon as the house is finished then he will bring the unlucky girl whom he has found (9/3/85--P2).

For those too young to grow their own, beans were still observed to be used as a reward.

The young children said that their grandmother had given them each some beans and after selling them each does what she wants with her money (6/2/86--P2).

Perhaps it was from just such a source that some of the children playing the bean game noted in the report by Martin (in an earlier publication of this project) got their stake. It is clear that beans are well integrated into the northern Malawi life style.

As noted earlier, the women in the study used the proceeds from their gardens for school fees and uniforms for their children. They also purchased household necessities for the family.

> *This year she will have a lot of money after selling her beans which are now all harvested. She says she will buy salt, soap and sugar (4/23/86--P7).*

> *She gave daughter sugar beans (U) to sell at ADMARC market to buy soap for washing and bathing. She sold 77 cups for K6.40 (4/29/86--P3).*

From all indications, 1986 was a good production year and the farmers were very much rewarded for their efforts.

> *Her husband has started working at the pulpery as the coffee there is already ripe. They sold more than 800 cups of beans to ADMARC. Everybody is happy about the yield (5/26/86--P5).*

> *She has harvested a lot of beans. She sold 6,468 cups to ADMARC for K198 with more to sell (5/15/86--P6).*

> *She and her daughter-in-law went to ADMARC to sell beans planted in her third plot (a mixture of 10 varieties). They sold 154 cups for K12.80. It is the first time to sell (4/27/86--P1).*

3. *Production*

Many crops are grown in northern Malawi, each of which can be a critical although sometimes small contribution to family consumption. In a good year, they can also contribute to family income. These crops illuminate a well-integrated production cycle that functions as a well-rehearsed pattern of community synchrony.

The production system also includes animals, the most prevalent of which were observed to be chickens. The chickens were largely allowed to scavenge for food, their diets frequently containing maize remnants. Chickens were considered important in family affairs and were available for serving special guests. Occasionally the consumption of eggs for special occasions or special people was also noted.

> *She killed a chicken and made rice for some visitors (3/29/86--M7).*

Cattle generated both income and food. In addition to meat, the cows also gave milk. Care and grazing of these animals was usually the responsibility of males, who also were observed taking them to dipping tanks for insecticide baths.

> *Their cow gave birth to a small calf (5/30/86--M9).*

Table 15 reports the average number of animals recorded by district. The numbers are based on family reports as recorded on the questionnaire. As one indicator of family wealth, the recorded Rumphi families report having twice as many chickens as the Chitipa families. However, among the large animals (cattle, sheep and goats), the distribution of animal wealth favors Chitipa. That is, in Rumphi, a large proportion of these animals appear to belong to a few families. In Chitipa, on the other hand, more families own such animals, albeit fewer per family.

TABLE 15: AVERAGE ANIMALS PER REPORTING FAMILY BY DISTRICT 1982 AND 1984-86

	Chitipa			Rumphi		
Total Families Reported	21			26		
	Average All Reporting Families	No. of Families Owning the Animals	Ave. of Families Owning the Animals	Average All Reporting Families	No. of Families Owning the Animals	Ave. of Families Owning the Animals
Chickens	10.9	20	11.4	17.1	26	17.1
Cattle	2.6	14	3.9	3.1	8	10.2
Goats	2.0	13	3.2	.5	3	4.7
Sheep	2.0	10	4.2	2.1	2	26.7
Doves	.5	2	5.0	4.7	4	30.6
Pigs	.8	2	8.2	.1	1	3.5
Ducks	.1	1	3.0	.6	2	7.5
Rabbits	.1	1	2.0	0.0	0	0.0
Pigeons	1.1	1	24.0	1.1	3	9.3
Geese	0.0	0	0.0	.1	1	3.0

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Information concerning the crop production cycle is presented under discussions of land preparation, planting, crop maintenance and harvesting. Included are data regarding all cash and food crops observed to be grown by the families. Tables 16 and 17 and Figures 3 and 4 show by month and district the average number of activities observed per family in each of the four production categories. Balancing the demands of the overlapping crop growth cycles, the weather and the availability of labor during peak periods, as will be shown, was no easy feat.

> *She was harvesting coffee and shelling and pounding maize. Only then after the other she turned to picking beans (8/9/85--M9).*
>
> *She is planting beans with her two daughters. They were stopped by the rains but still they planted throughout the day. At the same time they were harvesting maize because they are in the same garden where*

TABLE 16: PRODUCTION CYCLE—CHITIPA
Average Number of Observed Production Activities Across Crops per Family in Designated Month
1984-1986

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Land Preparation	.95	.68	1.10	1.12	1.27	.67	.63	.50	1.00	.80	.81	.94
Planting	1.63	1.16	.80	.50	.23	.05	.37	.65	.87	.93	.75	.69
Crop Maintenance	2.42	1.21	1.70	1.37	1.09	1.19	1.05	.15	.19	.13	.37	1.19
Harvesting	1.16	1.63	1.70	1.54	2.09	3.38	2.21	1.90	1.12	.73	.69	.62
Number of Families Observed Across Years*	19	19	20	24	22	21	19	20	16	15	16	16

*Individual families counted maximum of once per activity across all years in designated month.

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TABLE 17: PRODUCTION CYCLE—KUMPHI
Average Number of Observed Production Activities Across Crops per Family in Designated Month
1984-1986

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Land Preparation	.93	.57	.68	.50	.30	.22	.10	.42	.89	1.27	2.00	1.58
Planting	.73	.79	.32	.33	.09	.04	.25	.21	.50	.64	.37	1.50
Crop Maintenance	1.93	3.07	1.18	.87	.96	.57	.15	.29	.39	.27	.25	.25
Harvesting	.80	1.07	.68	.83	1.30	2.35	2.55	2.21	1.33	.82	.37	.42
Number of Families Observed Across Years*	15	14	22	24	23	23	20	24	18	11	8	12

*Individual families counted maximum of once per activity across all years in designated month.

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FIGURE 3: PRODUCTION CYCLE—CHITIPA DISTRICT
Average Number of Observed Activities per Family by Month
A plot of the data in Table 16, page 51

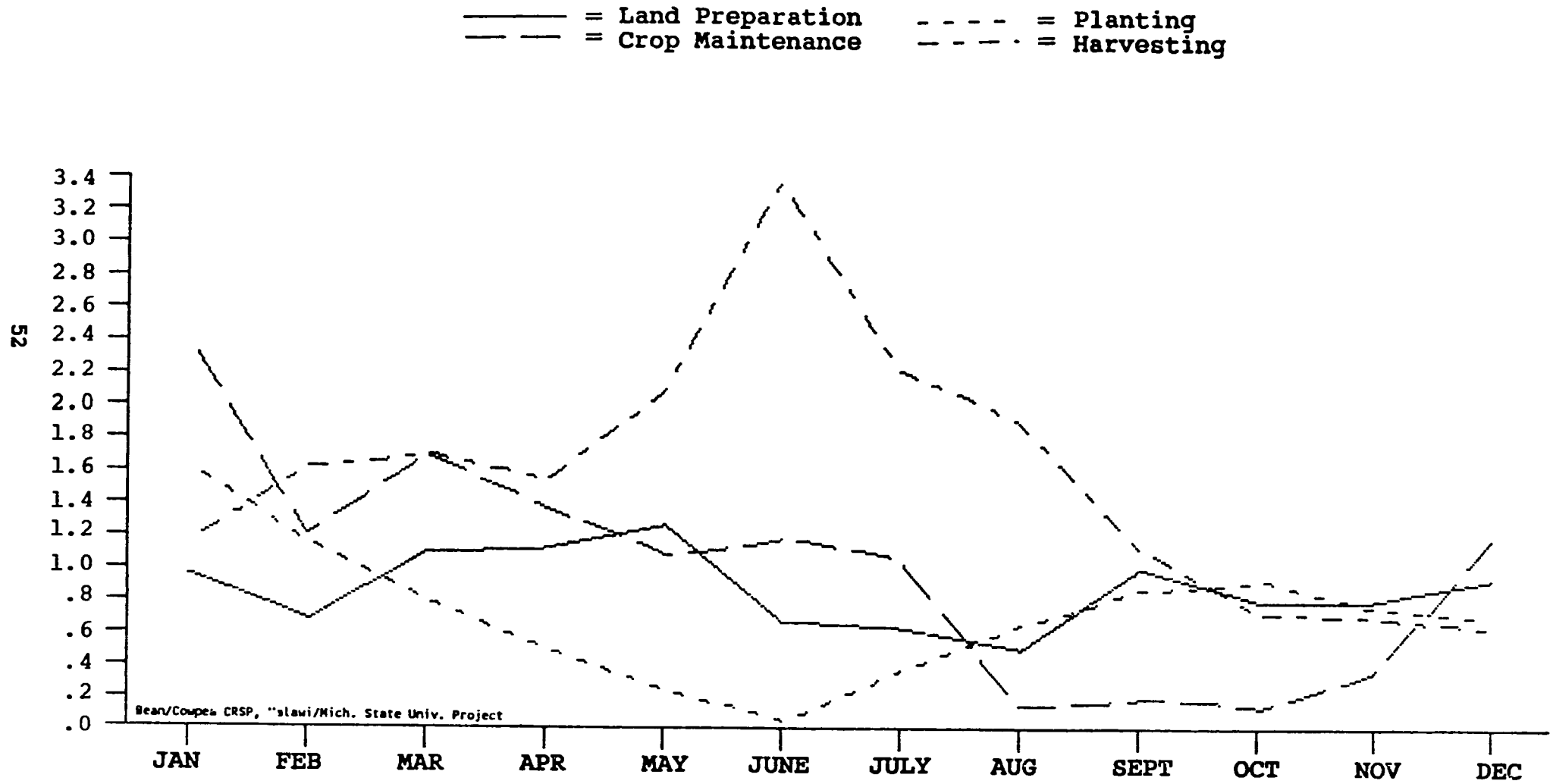
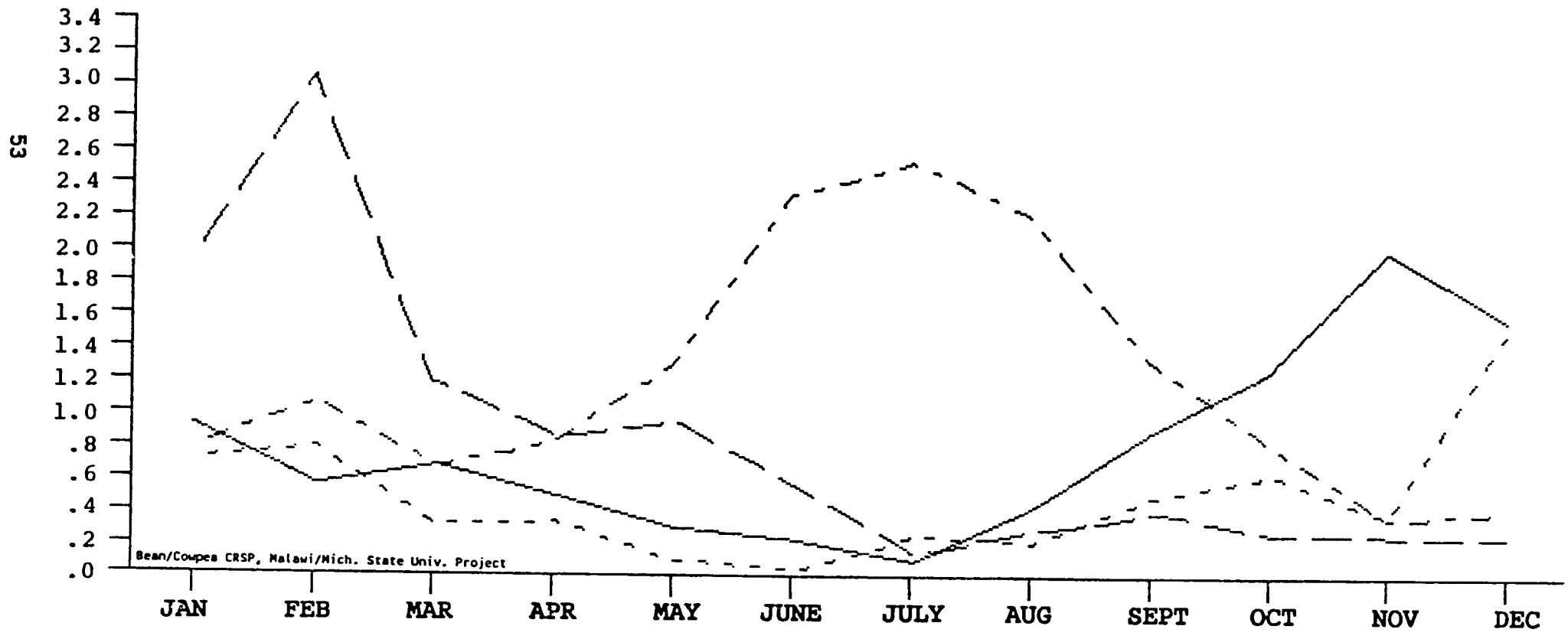


FIGURE 4: PRODUCTION CYCLE—RUMPHI DISTRICT
Average Number of Observed Activities per Family by Month
A plot of the data in Table 17, page 51



they are planting beans. The husband was cultivating the field for beans in the morning and in the afternoon clearing land and making ridges for planting potatoes in the dimba. The whole family was very busy and hardly rested all this day (3/28/85--M11).

She burned her field on which she is going to broadcast millet. She has finished planting her beans (12/11/85--M13).

Land Preparation--Land preparation includes felling trees, opening up new land and clearing brush from land more recently used. It also includes building or repairing terraces, constructing ridges and building dimba garden mounds--all very heavy and strenuous work. The data in the tables suggest a district difference in land preparation. From March through July, more land preparation was observed in Chitipa than in Rumphi. Rumphi families, on the other hand, appeared to do their major land preparation in October through December just prior to the rainy season.

The greater activity in Chitipa may be a reflection of the steeper slopes there and the associated work required to maintain the terraces. This is likely related to the amount of coffee growing in the Chitipa District and the greater amount of land there which is at appropriate altitudes for coffee growing.

The husband and wife were making coffee terraces. They spent the whole day at it though it was raining (11/8/85--M14).

Land preparation was observed across all the months in both districts (Figure 5). The crops for which the land preparation observed was taking place are shown in Tables 18 and 19.

She and her husband are making small bean ridges. They said they are going to leave the small ridges for about 2 weeks. Then they shall broadcast the beans on the small ridges and bank them, thus, making real ridges at the same time planting beans (3/5/85--PN3).

**Husband and son are preparing land for bean planting. In the afternoon the boy went again for land clearing (4/15/85--M10).*

Her son is clearing land for dimba vegetables such as cabbage, tomatoes, rape and onions (3/14/86--P3).

**She was busy harvesting maize with the girls while father and sons cultivated land. After a short rest both males returned to land preparation (4/16/85--M10).*

**Mother with daughters kept harvesting maize but the son rested because he had overworked the 2 previous days (4/17/85--M10).*

Her husband was clearing new land for millet, cutting down trees. He will set fire to the new land so that ash can be used as manure for the millet. The other year he may plant other crops, i.e., maize and beans (7/2/85--P7).

FIGURE 5: LAND PREPARATION—CHITIPA/RUMPHI DISTRICTS
Average Number of Observed Land Preparation Activities per Family by Month
A plot of the Land Preparation data in Tables 18 and 19, page 56

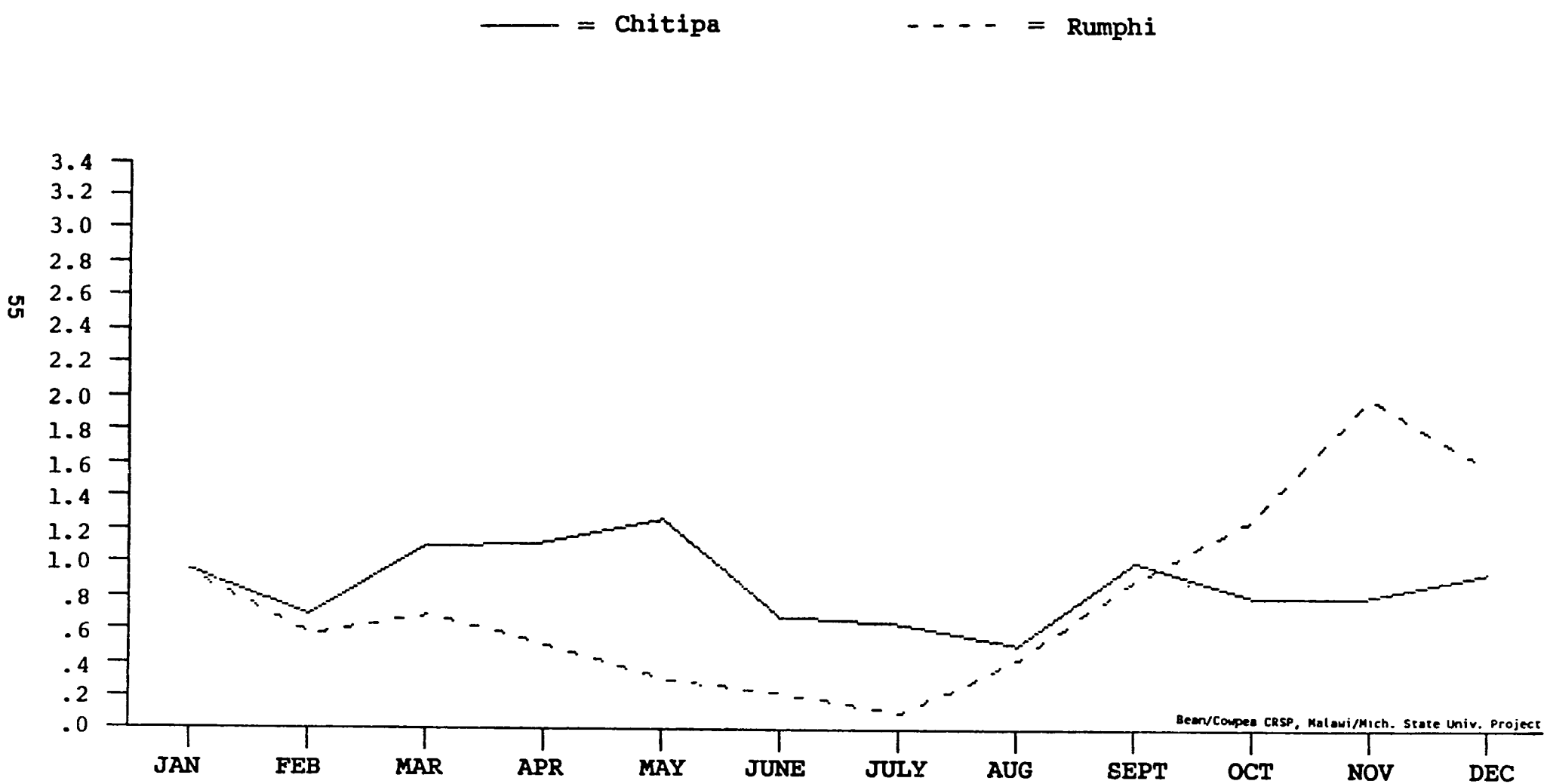


TABLE 18: LAND PREPARATION—CHITIPA

Number of Chitipa Families Observed Engaged in Land Preparation for the Indicated Crop Across All Years—1984-1986

	Coffee	Tobacco	Maize	Beans	Sweet Potatoes	Potatoes	Millet	Cassava	Crop Not Designated	General Dimba*	Total
JAN					4	7	2		5		18
FEB				2	1	4	1		5		13
MAR	2	1		6	2	2		4	5		22
APR	1			21					5		27
MAY	6		1	10					11		28
JUN	1		1	1		1			10		14
JUL	2				6	1			3		12
AUG	4			1					5		10
SEP	5		1	3					7		16
OCT			1						11		12
NOV	3			2					8		13
DEC	1			1	2	1	2		8		15

*The recorders in Chitipa reported dimba land preparation under the crops to be planted there—see July, August and September food crops.

TABLE 19: LAND PREPARATION—RUMPHI

Number of Rumphi Families Observed Engaged in Land Preparation for the Indicated Crop Across All Years—1984-1986

	Coffee	Tobacco	Maize	Beans	Sweet Potatoes	Potatoes	Millet	Cassava	Crop Not Designated	General Dimba	Total
JAN			1	2	2	1		1	7		14
FEB				1	2	1		1	3		8
MAR				5			1	1	7	1	15
APR	1			4				1	6		12
MAY	3							1	1	2	7
JUN		1							2	2	5
JUL							1			1	2
AUG					*				5	5	10
SEP									5	11	16
OCT		1	3						6	4	14
NOV	2	1	5				1		7		16
DEC			7	1					11		19

*The recorders in Rumphi generally reported dimba land preparation under general dimba without designating the crops to be planted there.

Photo No. 5

As is shown, the participation of males in land preparation is important for the family. When there is no adult male, or the male is incapacitated, the family must seek other options. The significance of maintaining good family relations is clear.

> *The nephew came to stay with them a few days and help them cultivate their garden. She is unhealthy so she does not take part in hard work like cultivating. So the production of beans is mainly done by children (2/12/85--M11).*
>
> *The daughter was making ridges--later she was very sick (4/7/86--M3).*
>
> *She hired two men from Tanzania to make ridges for bean planting for wages (4/7/86--M1).*
>
> *She has not yet planted. She is looking for a man to clear the place where she wants to plant beans (3/25/86--PN2).*
>
> *Sometimes she clears land herself if she feels she has enough energy (1/3/84 YQ--N1).*
>
> *She is busy making ridges with her son and an employed worker (12/10/85--P4).*

Preparing the land for planting was also observed to include integrating animal waste as a fertilizer for the families' cash crop, coffee.

> *She was transporting khola manure to the farm where coffee is going to be planted. She was doing this after she had come from cultivating (10/28/85--M13).*
>
> *The husband was transporting Khola manure to the coffee garden. After that he was applying manure in his coffee (10/12/85--M12).*
>
> *Mother went to put cattle manure in the coffee holes (10/31/85--M8).*

Planting--The second category of activity is planting. The peak period for this activity (Figure 6) was observed to be a month later in Chitipa than in Rumphi, which likely reflects the northward movement of the rains. The planting tables (Tables 20 and 21) show the crops which were observed being planted and highlight the distribution of such activity throughout a twelve-month period. Planting clusters were seen for the various crops throughout the year. District differences in the planting are also notable. For example, no wheat was seen being planted in Chitipa, while some was observed being planted at the end of the rainy season in Rumphi. On the other hand, sweet potatoes and millet (important for beer brewing), which were planted in both districts, were observed more often in Chitipa. Timing was considered critical in the multiple crop systems.

> *She has planted sweet potatoes. She said this is the right time to plant them so that by the end of July she'll start harvesting (2/18/85--P4).*

FIGURE 6: PLANTING—CHITIPA/RUMPHI DISTRICTS
Average Number of Observed Planting Activities per Family by Month
A plot of the Planting data shown in Tables 20 and 21, page 59

——— = Chitipa - - - - = Rumphi

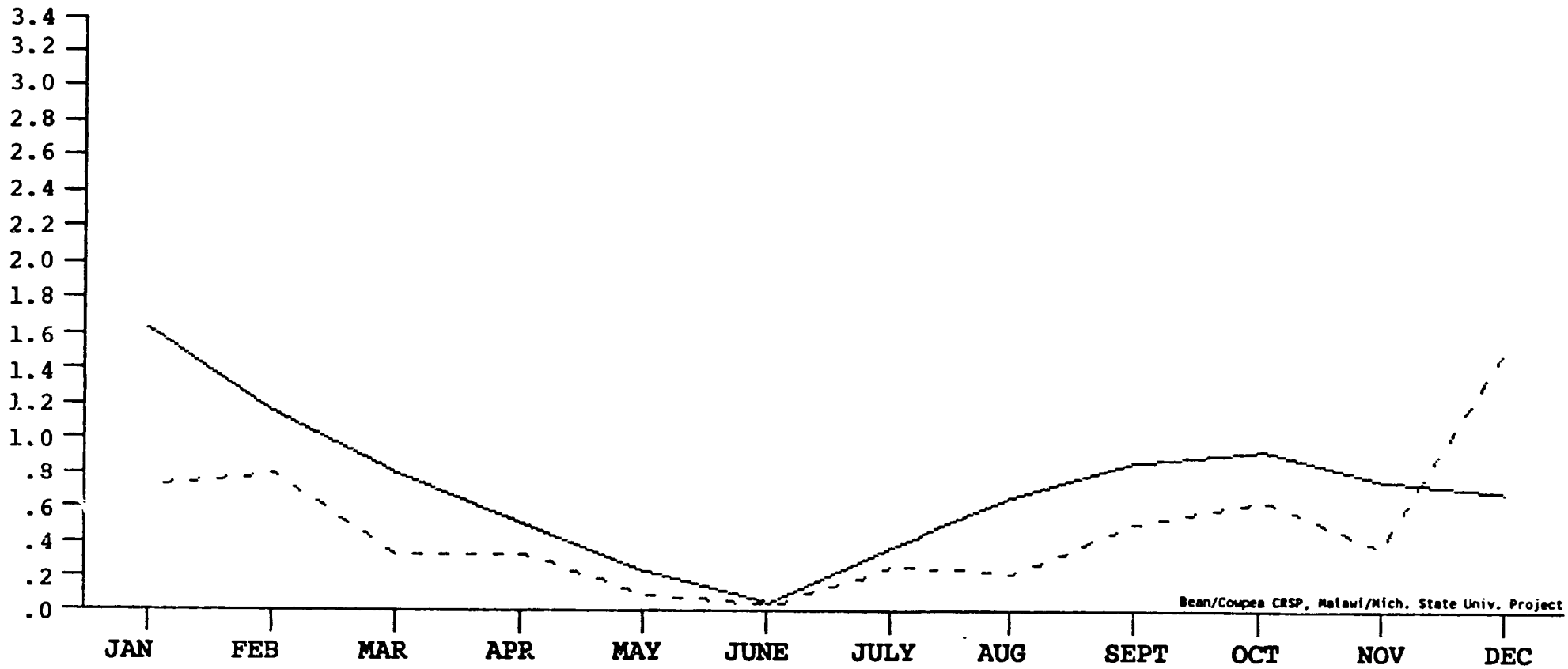


TABLE 20: PLANTING--CHITIPA

Number of Chitipa Families Observed Planting the Indicated Crops Across All Years--1984-1986

	Coffee	Tobacco	Sweet Potatoes	Potatoes	Millet	Cassava	Maize	Beans	Vegetables	Wheat	Ground-nuts	Other*	Total
JAN	3		11	5	7						1	4	31
FEB	1	2	8	3	4							4	22
MAR	1	1	7	2		1		2				2	16
APR						1		11					12
MAY								5					5
JUN									1				1
JUL			5	1				1					7
AUG			4	1			1	5	2				13
SEP			2				4	8					14
OCT			1				9	2			1	1	14
NOV							6	6					12
DEC	4				1			6					11

*Mostly fruits

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TABLE 21: PLANTING--RUMPHI

Number of Rumphi Families Observed Planting the Indicated Crops Across All Years--1984-1986

	Coffee	Tobacco	Sweet Potatoes	Potatoes	Millet	Cassava	Maize	Beans	Vegetables	Wheat	Ground-nuts	Other	Total
JAN	2		3		1		3	1			1		11
FEB	2	1	4	3		1							11
MAR	1					1		3		2			7
APR						1		6		1			8
MAY								2					2
JUN									1				1
JUL				4					1				5
AUG				3			1		1				5
SEP				2			5	1	1				9
OCT							5	2					7
NOV							2	1					3
DEC		1					8	9					18

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

The maize and bean pattern is interesting. Maize is planted to a limited degree in dimba gardens in both districts. However, it appears often to be planted alone, without beans, in Rumphi but usually with beans in the Chitipa dimbas. In Rumphi, there was even evidence of staggered dimba planting of maize.

> **She has not planted beans (in dimba). Together with maize she has planted pumpkins and chinese vegetables (7/6/85 GQ--PN4).*
>
> **She went to her dimba garden to plant maize. I asked her whether she was going to plant beans in her dimba but she said she won't plant. She said beans don't produce in dimba (9/10/85--PN4).*

Responses from the field measurements and production questionnaire shed additional light on the mixed cropping/sole cropping patterns. Across the period of this study, the recorders assessed the crop composition of the families' bean plots. While all plots were not assessed, 166 were recorded in Chitipa and 148 were recorded in Rumphi. The results are shown in Table 22 which presents Chitipa and Rumphi data on plots planted with beans only and Tables 23 (Chitipa) and 24 (Rumphi) which present data on beans with associated crops. As show in Table 22, in both Chitipa and Rumphi the predominant pattern of planting beans in the dry season was as a sole crop (96 percent and 79 percent, respectively, of bean plots recorded that season).

> *She has planted all of her beans--2 seeds per station. She added that in April she will plant pure stands of beans and these will be dwarfs while this time she has planted both dwarfs and climbers (1/13/86--P8).*

TABLE 22: BEAN PLOTS PLANTED WITH BEANS ONLY
Plots Assessed for Crop Composition by District and Season

	Chitipa			Rumphi		
	Wet Season	Dry Season	Dimba	Wet Season	Dry Season	Dimba
Pure Plots	23	93	8	7	48	8
Total Plots Recorded	46	97	23	76	61	11
Percent Pure	50	96	35	9	79	73
No. Families with Plots Assessed	19	31	16	33	21	7

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The wet season difference between the districts is striking. In Chitipa half the bean plots recorded were grown alone, while in Rumphi only 9 percent were that way. Put another way, 91 percent of the bean plots recorded in Rumphi during the wet season were grown in association with one or more other crops, while only half of those in Chitipa reflected this pattern.

TABLE 23: CROPS GROWN IN ASSOCIATION WITH BEANS--CHITIPA

Pattern Number	Incidents	Maize	Pumpkins	Ground-nuts	Irish Potato	Sweet Potato	Bananas	Cassava	Pine-apple	Rape	Sugar Cane	Wheat	Cow-peas	Pigeon Pea	Coffee	Yam	Other
1	27	X															
2	2													X			
3	3			X													
4	2							X									
5	1	X					X									X	X
6	1	X			X		X									X	
7	1	X															X
8	1						X										
9	1						X								X		
10	1	X					X										

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TABLE 24: CROPS GROWN IN ASSOCIATION WITH BEANS--RUMPHI

Pattern Number	Incidents	Maize	Pumpkins	Ground-nuts	Irish Potato	Sweet Potato	Bananas	Cassava	Pine-apple	Rape	Sugar Cane	Wheat	Cow-peas	Pigeon Pea	Coffee	Yam	Other
1	4	X					X										
2	22	X	X														
3	1	X	X	X													
4	1	X					X										
5	1	X			X	X		X									
6	1	X	X				X						X				
7	1	X	X	X	X												
8	1	X	X		X					X				X			
9	2	X	X	X										X			
10	1	X	X	X	X									X			
11	1	X	X		X												
12	1	X	X							X							
13	1	X	X				X										X
14	1	X	X		X	X					X						
15	1	X					X			X	X						
16	1	X	X			X			X			X					
17	4																
18	1	X				X	X				X						
19	4	X	X				X										
20	1	X	X		X		X										
21	1		X			X		X	X	X					X		X
22	1	X				X	X	X	X						X		
23	1	X				X		X		X							
24	1	X	X		X		X			X							
25	1	X	X		X		X										X
26	2	X	X		X		X				X						
27	2	X	X										X				
28	1	X	X		X	X	X										X
29	1	X	X							X			X				
30	1	X	X			X				X							X
31	3						X								X		
32	1	X	X				X				X				X		X
33	1	X	X				X								X		
34	1	X	X				X			X							
35	4	X	X														X
36	1	X								X	X						
37	1	X	X			X	X										
38	2	X					X							X			X
39	1																X
40	2											X					X
41	1							X							X		

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Tables 23 and 24 suggest that there was also much greater variability shown in the mixed cropping patterns in Rumphi. However, the predominant association in Rumphi was beans with maize and pumpkins. In Chitipa District the predominant associated crop with beans was maize only.

When asked why farmers grow beans in association with other crops, the Chitipa responses were (1) not enough land for beans only--47 percent. (2) to reduce labor--22 percent and (3) to lessen the job of cleaning several fields--17 percent. In Rumphi, the same question generated similar responses: (1) to lessen the job of cleaning several different fields--34 percent, (2) to reduce labor--28 percent but also (3) to make use of the maize stalks (for the beans to climb)--17 percent.

> *With her daughter she planted all their beans in the garden with maize to reduce labor and give support to beans (1/10/86--P7).*

When questioned specifically about planting maize and bean seed in the same station, a surprising district difference emerged. Across all years, the Chitipa women responding to this questionnaire indicated they do not plant maize and beans in the same station.

> *She said beans cannot grow well if they are planted together (1/2/85 GQ--M1).*
>
> *They don't plant in the same station because if they are planted together they don't grow well (4/27/84 YQ--M30).*

Conversely, in Rumphi District, across all years, the women responding to the questionnaire indicated that they do plant maize and beans in the same station.

> *She said she plants maize and beans in the same station to avoid cutting them when weeding especially by children (1/3/84--N1).*
>
> *She plants in the same station because she does not have enough time to grow beans separately (1/26/84 YQ--N4).*
>
> *We found them busy in the garden planting maize and sugar beans (U) in the same planting station (12/12/86--P6).*
>
> *She just completed her planting with her grandchildren. She has planted all her beans together with maize in the same planting station (1/3/86--P2).*

Yet women from both areas acknowledge that maize roots are strong and break up the soil and planting together allows both to use the fertilizer. Apparently the Chitipa women either see these features as inconsequential as long as the beans are close to the maize or as not positive enough to offset the resulting yield constraint. Perhaps this reflects the soil or topological differences between the regions. This question was not pursued in this study.

Coffee, the major cash crop in the north, was also observed being planted. Slightly more families were observed planting coffee in Chitipa than in Rumphi.

The husband and wife were planting coffee in the field all day. They spent the whole day planting and transporting coffee from the nursery (12/3/85--M15).

The husband was adding more holes for planting coffee (11/15/85--P3).

Crop Maintenance—The third category in the production cycle is crop maintenance shown in Figure 7 for both Chitipa and Rumphi. Peak periods for both districts generally follow the rains. The peak month for crop maintenance was observed to be January for Chitipa and February for Rumphi. This difference reflects the amount of early coffee care by Chitipa families.

Tables 25 and 26 show crop maintenance activity dominated by the demands of coffee, which apparently requires almost constant weeding for many months if it is to be of acceptable quality. Adults and children were observed engaged in weeding.

The son was weeding coffee with the father in the morning then going to school in the afternoon (5/20/86--M9).

In addition, maize, especially the hybrid variety, requires weeding. When beans are grown with maize, they are also weeded. Some of the women indicated they only weed beans when they are grown with maize.

They weed the beans which are planted together with maize but not when they are planted separately (1/26/884 YQ--N4).

She only weeds those beans planted together with maize (2/7/84 YQ--PN9).

From the Crop Maintenance Tables (Tables 25 and 26) this seems to be the case for Rumphi, where beans were observed being weeded January through March, as was maize. Undoubtedly the rainy season beans planted with maize in Chitipa also benefitted from maize weeding, although the recorders in this area did not single out beans in their weeding records. During the dry season, on the other hand, where beans were generally sole cropped, not in association with maize (see Table 22), generally it was in Chitipa that bean weeding was observed.

During the dimba season, families were observed watering their vegetables in both districts. Because these vegetables could be the only source of food for relish before the rainy season harvest, their care may be crucial for family consumption.

While the women did not mention much about their plants' disease problems, many gave considerable concern about pest problems.

She has started harvesting beans. She says she won't plant beans in April coz when the first cotyledons have appeared stem eaters attack the plant and it dries up (4/15/85--P2).

Her beans were attacked by aphids because she planted late (8/8/85--PN8).

She has started harvesting her maize coz she is afraid termites will attack the stalks (6/28/85--P3).

FIGURE 7: CROP MAINTENANCE—CHITIPA/RUMPHI DISTRICTS
Average Number of Observed Crop Maintenance Activities per Family by Month
A plot of the Crop Maintenance data in Tables 25 and 26, page 66

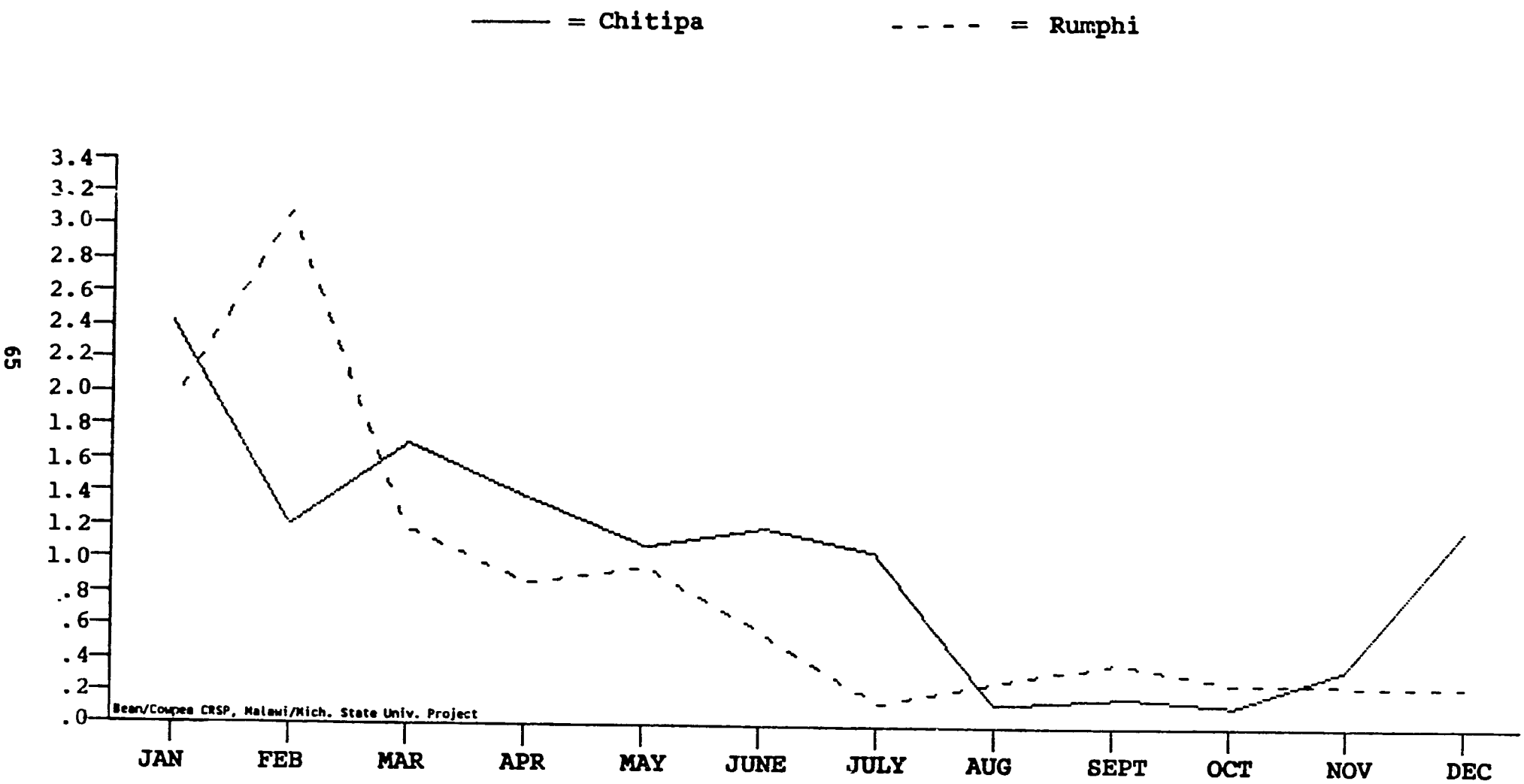


TABLE 25: CROP MAINTENANCE--CHITIPA

Number of Rumphi Families Observed Performing the Indicated Tasks Across All Years
1984-1986

	Fertilizing		Mulching	Spraying	Weeding										Watering	
	Coffee	Maize	Coffee	Coffee	Coffee	Tobacco	Beans	Maize	Cassava	Millet	G/nuts	Potatoes	G/beans	Vegetables	V'table	Total
JAN	6	7	2	1	13		1	11	1		1			3		46
FEB	3		1	1	15	1		8		2	1		1			23
MAR	6			3	14			1	1	6	2		1			34
APR	6		1	3	13		4				3		3			33
MAY			1	2	17		2				2					24
JUN			9		11		2				2				1	25
JUL			5	3	9							1			1	20
AUG			1		1										1	3
SEP														1	2	3
OCT				1	1											2
NOV	3		2		1											6
DEC	2	3	1		2			11								19

TABLE 26: CROP MAINTENANCE--RUMPHI

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

Number of Rumphi Families Observed Performing the Indicated Tasks Across All Years
1984-1986

	Fertilizing		Mulching	Spraying	Weeding										Watering	
	Coffee	Maize	Coffee	Coffee	Coffee	Tobacco	Beans	Maize	Cassava	Millet	G/nuts	Potatoes	G/beans	Vegetables	V'table	Total
JAN		3			2	1	8	12	1			2				29
FEB	3	11			6	1	7	12	1		1	1				43
MAR		2	2		3		3	10	1	2	2			1		26
APR	2			1	9			3	2	1		2	1			21
MAY					11		1		7	1		2				22
JUN			1		7				4						1	13
JUL					1										2	3
AUG			1		1				2					1	2	7
SEP			1		2									2	2	7
OCT			1											2		3
NOV					1			1								2
DEC								1						2		3

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

The beans planted in dimba garden July 30 germinated but were eaten by birds (8/24/84--M6).

She said birds are eating some of the newly growing bean plants (12/5/85--M1).

In the afternoon she went to visit her bean field because she heard the birds were spoiling her beans (6/1/86--M9).

They dress sticks with white papers, old clothes and feathers so the birds will think they are people and not eat or spoil the crops (1/16/85--M10).

Rats are destroying her beans (6/23/86--M9).

Crop maintenance demands over the entire production period cannot be overemphasized. Yields of food crops as well as cash crops are affected by appropriate care or the lack of it. Figure 7 and Tables 25 and 26 show the potential labor bottleneck in the peak wet months of December, January February and March, when crop maintenance competes heavily witn leftover land preparation chores, planting and some degree of harvesting from early plantings as shown in Figures 3 and 4. The importance of labor during this period is obvious as the family must make use of all able persons, adults and children, to optimize the outcome of the farming effort.

She applied fertilizer to maize. She was unwell but still she was cooking and so many other jobs. I visited her first bean field but her beans were not promising. She had not even weeded them because she had a lot of things to do. The grandson came to help her make ridges for potatoes (1/17/86--M12).

She was harvesting coffee, preparing food for husband's visitor. She has not yet harvested her beans because she is busy with coffee and millet (7/30/85--M9).

Harvesting—The fourth category in the production cycle is harvesting. Between the districts, Chitipa was observed harvesting more often than Rumphi (Figure 8), except during July, August, September and October when the lead is reversed.

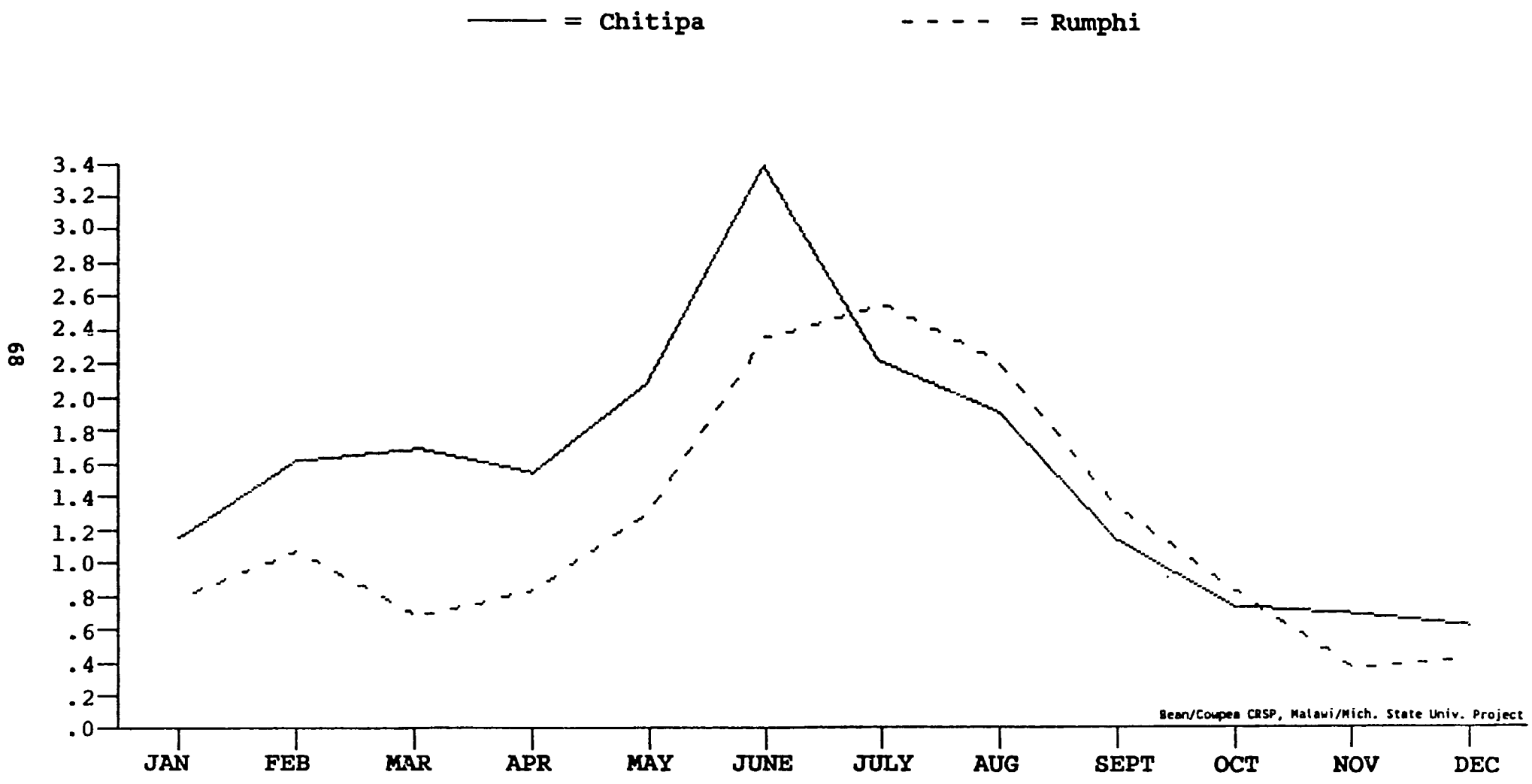
As with the other activities, and to the extent that the farming effort is successful, harvesting is going on all the time. Because of the difficult terrain and the distance of the plots, harvesting has to be planned and carried out with ingenuity and frequently cooperative effort.

The family is harvesting maize, carrying it from the field to the barn at home for storage. There are 15 women helping them (8/13/82--C32).

When harvesting beans they uproot the whole plant and they dry them (that way). Sometimes they shell them at the garden because she says it is a tough job to carry beans because she has a big garden (8/6/85--M14).

In harvesting beans, the Chitipa farmers reported that they harvest the whole plant of bush beans, but some of them say they harvest climbers by removing

FIGURE 8: HARVESTING
Number of Chitipa Families Observed Harvesting the Indicated Crop Across All Years--1984-1986
A plot of the Harvesting Data in Tables 27 and 28, page 70



the pods. In Rumphi, almost all the farmers indicated that they harvest the whole plant of climbers as well as bush. They report that harvesting the whole plant saves time. Since pods and plants are dry, it is more difficult to take the pods only. Further, most agreed that plants are easier to carry home the long distances than pods alone. When the harvested beans are threshed, the remaining plant residue is reported to be used by some farmers as mulch for coffee or burned. The ash is then used as a storage medium and as soda for cooking, especially for cooking hard leaves.

The peak period of food crop harvesting is just prior to the peak period of harvesting of coffee (Tables 27 and 28), which is not as fortunate a circumstance as one would think at first glance. Consider that harvesting food crops has associated with it the appropriate processing and the preparing of those foods for storage. The foods must be processed quickly so that they will be available for family consumption during the long dry season which by June/July is already under way.

To complicate things further, for most crops it is critical that harvesting is done on time and in the appropriate manner. For example, all the coffee harvesting was observed to have been done in the morning, never in the afternoon heat of the day. If necessary, other crops were delayed until that time. Maize was observed to be the next priority, especially the hybrid maize to be sold to ADMARC. This maize was ready for harvest just as the coffee was ripening. Short-cycle beans planted in May or 120-day varieties planted in April, both maturing in July, frequently just had to wait their turn.

> *Her beans were attacked by weevils because they were not threshed quickly enough--just left piled. She had harvested a lot of hybrid maize therefore most of the time was spent shelling and selling maize (8/16/84--PN3).*
>
> *Ladies were helping the wife harvest millet. She cooked nsima for them and she also harvested. Her beans are dry but not yet harvested (7/18/85--M9).*
>
> *She won't thresh her beans until after she has harvested her maize (5/27/85--P1).*

The harvesting data (Tables 27 and 28 and Figure 8) show just how much harvesting is going on throughout the year. Because the families save their own seed stock, subsequent plantings depend on the farmers' ability to harvest a healthy crop and generate viable, well-adapted cuttings, seed, etc. for the next season. If the family manages all four of the production activities well, they could have enough continuing harvests to provide adequate maize for nsima and, as importantly, adequate supplements for the relish needed to make it palatable. The economic importance of these harvests to family well-being reinforces the families' efforts to balance these activities well.

TABLE 27: HARVESTING--CHITIPA

Number of Chitipa Families Observed Harvesting the Indicated Crop Across All Years--1984-1986

	Export Crops			Food Crops												
								Sweet					Leaves			Grand
	Coffee	Tobacco	Total	Cassava	Maize	Beans	Millet	Potatoes	Potatoes	G/nuts	V'tables	G/beans	Wheat	B	P	Total	Total
JAN						6	1	4	3		2			6		22	22
FEB	1		1		5	15		3	4		1			2		30	31
MAR		1	1	1	13	9			2		3			1	4	33	34
APR		1	1	1	16	1		1		3	7			1	6	36	37
MAY	2		2	2	2		1	11	3	5	5	2		9	4	44	46
JUN	7		7	2		3	8	16	6		7	5		15	2	64	71
JUL	11		11			10	7	9			3			1	1	31	42
AUG	15		15	1		8	3	4	2		4	1				23	38
SEP	10		10			1	1		2		4					8	18
OCT	3		3					2	1	1	4					8	11
NOV	1		1	1							3			6		10	11
DEC				1		2					2			5		10	10

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

TABLE 28: HARVESTING--RUMPHI

Number of Rumphi Families Observed Harvesting the Indicated Crop Across All Years--1984-1986

	Export Crops			Food Crops												
								Sweet					Leaves			Grand
	Coffee	Tobacco	Total	Cassava	Maize	Beans	Millet	Potatoes	Potatoes	G/nuts	V'tables	G/beans	Wheat	B	P	Total	Total
JAN		1	1	1	1	1					4			3	1	11	12
FEB				2	2	1			2		3			5		15	15
MAR		1	1	2		6			1		3			1	1	14	15
APR		1	1	3	1	7			2		3			3		19	20
MAY	4		4		2	3		1	2	4	5			5	4	26	30
JUN	8		8		12	2	3	4	7	6	4	1	2	2	3	46	54
JUL	12		12	1	10	4	6	1	6	1	4	1	2		3	39	51
AUG	15		15	3	12	4	3	4	3	2	6				1	38	53
SEP	9		9		3			2			8	2				15	24
OCT	3		3					2			3		1			6	9
NOV								1			1			1		3	3
DEC				1							3				1	5	5

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

4. *Domestic Maintenance*

Often overlooked because of its constant draw on family resources, domestic maintenance should not be taken for granted. Activities in this category cover a range of unappreciated jobs from food processing and storage to home maintenance and repair. For example, food processing is a glib phrase which covers a range of strenuous tasks such as the bone jarring job of pounding maize into flour with a heavy wooden pounding stick.

> *She is suffering with toothache the whole week which came back because she was pounding (4/4/86--PN2).*
>
> **They live 3 kilometers from the maize mill, it took 5 hours there and back (10/4/85--P6).*
>
> **She rose at 4 a.m. and pounded 3 tins of maize (77 cups each) and finished before 6 a.m. (10/16/85--P6).*
>
> **She is very strong. She managed to pound more than 308 cups of maize all alone. Then she went drawing water for washing the pounded maize and soaking it (1/21/86--P6).*
>
> **She is sick so her husband was weeding maize and beans. She was in bed with body pains so severe she could hardly sit upright for 10 minutes. She was in real pain (1/30/86--P6).*

Produce is sorted to assure that the highest quality possible is what is put into storage.

> *She sorts beans--the best for storage and selling (6/18/85--P3).*

Some foods require processing before they can be stored.

> *She is harvesting bean leaves which she is going to cook and then dry for relish during the dry season (5/7/84--PN3).*
>
> *She taught us how to make leaves storage for mushrooms and roasted vegetables and how to store food for the winter season. They wrapped the dried vegetables and mushrooms in some large nonpoisonous green leaves and tied them with strings so tight that not a single mushroom could come out. Then they hung the tied thing to the kitchen roof so that the contents should be fumigated by the smoke. In that way they smell nice when cooked (3/13/85--P5).*

Other foods such as beans require less specific processing but the storage medium must be made available.

> *They burn the dried stool of cattle and put it in beans in storage to prevent them from rotting. This method is not 100 percent effective. All beans of this season get bad very easily in storage due to too much heat. She has plenty of beans (9/5/85--M9).*
>
> *She mixes ashes with chemicals (copper) and puts in beans in storage to keep them from rotting (9/13/85--M15).*

For storage she mixes with cattle manure. sand and DDT if she has money to buy (1/2/85--M1).

**The family has enough beans for eating and selling throughout the year. She adds ashes, pounded mango leaves and chemicals to prevent rotting and weevils. She says the longer the beans stay, the higher the resistance to very cold weather or too much rains when planted (1/21/85--M11).*

**We found the beans are getting rotten in storage and the mother says she doesn't know the reason (8/13/85--M11).*

She stored her beans mixed with millet to keep out the weevils (11/8/85--PN6).

She stores beans by layering in yellow tobacco leaves (8/4/84--PN2).

She was told by one of her neighbors that lime is good for storing beans. So she mixed lime with her beans. but when she planted them they did not grow all of them at once. Some took two weeks, others more to grow. So she thinks that lime was the cause of these beans not growing quickly. She concluded that lime hardened the outer seed coat (12/11/84--PN4).

Of the 51 families responding to the storage questionnaire, 39 said they stored their beans with ash. This response was balanced (19/20) across districts. However, the next highest medium, actellic, was used by 15 of the 30 responding Rumphi families but only 3 of 21 Chitipa families. The storage vessels were clay pots (39 respondents), sacks (31 respondents) and baskets (22 respondents).

There are many domestic maintenance activities that are required on an almost daily basis. These include food preparation, childcare and activities related to family hygiene such as transporting and boiling water for the bathing of family members and collecting and transporting wooden logs for fuel. Clothes and dishes are also to be washed and the household kept clean.

She is always neat. Her house is well swept, the surroundings are all swept and even her cooking area is neat that you can't refuse to eat her food coz everything is neat (6/7/85--P4).

The father was clearing land at 8 a.m. when we arrived. When he returned the mother boiled water for him. He bathed and dressed (2/23/85--M5).

Daily meals for the family, and occasionally large feeds for a communal work force, take time and labor.

She always prepares a balanced meal (4/22/85--P2).

She has gone to take food to the husband doing wage work at the coffee factory (8/11/82--C24).

She is grinding fresh maize with stones and tying it into small pieces with banana leaves and cooking them. This is eaten with nsima as relish or as bread with tea. The vernacular name for this is chipipi (3/11/85--M12).

She prepared nsima and cowpeas (5/21/84--N6).

The menus are strongly dependent on the time of year and the farmer's success in crop management.

**She has planted her beans in the first plot and she said for these beans she will like to eat the leaves only (12/14/84--P5).*

**She has planted all of her beans in the second plot which will be eaten while green (12/17/84--P5).*

***She uprooted some of her beans she had planted earlier in her first plot--picking one plant from every station in an area 17 paces by 9 paces. Shelled they came to 20 cups which she cooked with salt only and they seemed very tasty (mixture of 5--ABDUV)(2/27/85--P1).*

***She has the sweetest pumpkins I ever tasted in my life. These pumpkins resemble the pattern of watermelons and they are small, the leaves are thorny (3/8/85--P1).*

****She prepared bean leaves with salt only (7/16/85--P7).*

During the dry season she is having cassava leaves as relish (2/28/86--P2).

****She is digging cassava to make cassava flour for nsima by soaking 2-3 days then pounding (3/10/86--P7).*

The family got flour for nsima from their neighbors. She is plucking bean leaves for relish (5/16/86--PN7).

The beans are still growing in the fields and giving her green vegetables due to late planting. They were planted late due to lack of labor (7/2/86--M17).

The children picked and threshed little beans which were added to the vegetables (2/27/85--M4).

There are distinct economic implications to some of the domestic maintenance activities such as making for sale surplus clay pots used in cooking and storage, the preparation of processed food for sale and the sale of one's labor for domestic "piece work" (i.e., making bricks, cutting thatching grass).

She makes a lot of clay pots. Some are used for putting in maize flour, for storing beans, for storing sweet beer, some are used for planting flowers (6/6/85--P3).

Husband went to pick the remaining coffee which will be home processed as it is not good at all. It is shrunk and burnt with the heat of the sun (10/14/85--P4).

There are other domestic maintenance activities which are not constant but are critical and occur at certain times in the year. For example, to be the most helpful such activities as digging new pit latrines, home repair and roof thatching must be completed prior to the onset of the rains. In the case of thatching, timing is important because grasses that are too old and dried up are less effective than the fresh, new cuttings. The actual thatching is done by males who must work this chore in with land clearing. The cutting and transporting of the tall, heavy grass, however, falls to the females.

She is cutting grass for thatching (10/16/85--M14).

Husband putting poles on top of the newly built house for the roof (10/18/85--M15).

The women of the family go out in the bush to cut grass for the house. They usually rise at dawn coz the bush where they cut the grass is very far and they are afraid to walk in the heat of the sun if they wake up late. They spent the whole morning and came back late in the afternoon each carrying a heavy load of grass (on her head). We feel pity for the old lady to carry such a big load. Her granddaughters are all hardworking and can stand hunger. They sometimes spend the whole day without eating anything (9/3/85--P2). She goes as early as possible to cut bundles of grass to avoid the heat of the sun. She is a very old lady but she is very afraid to stay under the leaking roof and to have sleepless nights because of the night rains. Therefore she is putting much effort and energy in cutting grass (9/10/85--P7).

Other construction or repair jobs throughout the year, such as storage sheds for maize, pens and coops for animals, can also be facilitated by family assistance.

All except husband making bricks for new house (8/22/85--M10).

These domestic maintenance needs must be fit within the production requirements of the farm and the constraints imposed by the weather. Failure to meet the family's domestic maintenance needs within the appropriate time period can cause considerable difficulty.

We had no place to sit because there was a lot of water in the house from heavy rain (11/20/84--PN5).

She was sorry to see us because their house was leaking very heavy (2/1/85--P1).

The husband is thatching the main house because it is leaking (2/7/86--M11).

These chores are very important for the health and well-being of family members. As such, they influence their stamina and ability to carry out the other responsibilities to be addressed.

5. *Health*

The importance of health in an agrarian economy is tremendous. Much of the labor required draws heavily on caloric energy and general overall physical strength of the populace. Significant as it is, this is one factor often overlooked in agricultural development efforts, even in studies of impact analysis. It is nonetheless a critical issue in the lives of the families participating in this study and, as such, is included here as an important part of the research.

The National Atlas of Malawi reports that the main causes of mortality and morbidity in that country are communicable and water-borne diseases and diseases resulting from malnutrition. The most common of these diseases are malaria, schistosomiasis (known as bilharzia), measles, gastroenteritis, whooping cough, tuberculosis, respiratory infections and parasitic infections. The Atlas points to malaria as a major cause of death in young children as well as the working population. Parasitic infections, it says, are not usually fatal but probably play a large part in reducing production. For women of child-bearing age, complications of pregnancy are major causes of death.

In conjunction with a number of outside agencies working in the country, the Malawi government has emphasized prevention and the support of measures to promote better health. These include maternity and child health programs, under-five clinics, health education, water health inspection, meat inspection, and mass immunization campaigns using mobile clinics.

Reports from the UNICEF publication entitled The State of the World's Children indicate that considerable progress has been made in Malawi over the decades since independence. However, for this land-locked nation of few non-agricultural natural resources, much remains to be done. While considerably improved over the last 25 years. The country reports the rural population below the absolute poverty level at 85 percent in 1984. Life expectancy is 46. Child mortality in 1985 was 275 per 1,000 for children under five and 157 for infants under a year per 1,000 live births. In that year the country had a fertility rate of 7 and these statistics suggest poor health condition of mothers as well as infants.

> *She went with her daughter-in-law to the hospital where the daughter-in-law had a cesarean section on her pregnancy but unfortunately the baby was already dead. She had had an episiotomy. So she has suffered two wounds for nothing. What a pity (6/9/86--P1).*

> *Her granddaughter is in the hospital expecting and lacking blood for a second month. She is a hardworking girl who got married early this year. She helps her grandmum in domestic work, like pounding maize, cooking, hauling water and the like (10/10/85--P2).*

> *She was in the garden weeding maize. She was sent for by her in-laws. Her sister-in-law had delivered twin babies but one had passed away. She went there to help her carry the other child to the hospital together with the mother who is ill (3/11/86--PN8).*

The literature supports the reasonable effectiveness of nursing as one birth control measure which was extensively adopted by one of the families.

> *Her daughter-in-law is still nursing her 3-1/2 year old. The child goes playing and comes back to her mum saying that she is thirsty and wants to suckle. We asked her why she is still giving breast milk to a big child and she says that she won't bear any more children. If they lived in town the child would be in nursery school (7/26/85--P7).*

As drastic as it is and perhaps as hard on the physical stamina of the mother, there is indication the nursing gives another benefit. Protection from malaria by placenta antibodies from the mother and from breast milk appears to protect newborns for 6 to 9 months (Dr. Terrie Taylor, Blantyre Hospital/ Michigan State University, personal communication, 1987). Health benefits to a 3-1/2 year old, while undoubtedly less strong, may be worthwhile.

As was discussed earlier, death is a very common occurrence and in the area of this study was shown to be very high, especially at the end of the rainy season. The district difference was noted showing the much more frequent incidents in Rumphi District than Chitipa (see Table 12).

As part of the study, general health condition was assessed to give an idea of the role of health in agricultural production, especially bean production. Health, it was considered, is one of the many factors that influence farmers in organizing activities and making production decisions. Health, in the form of available caloric energy and muscle stamina for the arduous farm tasks, is one index of well-being and work capacity of the labor force.

> **The weather was warm, humid and rainy. She went to weed coffee with her son who was not in school because it was a holiday. Her husband went to fabricate plants but he didn't take a long time because he was not feeling fine. In the afternoon he was just sleeping. She was not feeling fine also (3/19/85--M9).*
>
> **The weather was cool, and cloudy with showers. She went to weed millet while the husband was just resting in bed because he was seriously sick. She was also sick but her sickness was mild (3/20/85--M9).*
>
> **In the morning it was cold and cloudy but warm in the afternoon. We found her weeding millet and the husband was trying to clear land for planting beans. They are still sick with some little fever but the sickness is mild. He didn't work long because of his sickness. When he came back he was just doing simple jobs like repairing a sickle and instructing some one how to build a pit latrine (3/21/85--M9).*
>
> **It was sunny in the morning but rainy in the afternoon. It rained heavily for a while then turned cool. When we visited today she was working in her coffee garden. The family was not happy because the father is sick and he remained indoors the whole day resting and sleeping. The wife didn't work for a long time because she heard of a funeral and she had to leave the work and go to the funeral. We left the place while she was still at the funeral and he was just resting and reading the Bible (3/22/85-M9).*

As was noted in an earlier section of this report, production demands are not only great, their timing is critical. The significance of the illness must be weighted in relation to immediate crop needs and the impact on both production and the family if the work is delayed.

> *She was planting beans. She told us she is going to the hospital the next day and she said it would be unwise to leave the ridges unplanted. She went to the maize mill to grind maize and got back about 4:00. She looked so tired (4/2/86--PN8).*

> *Beans ready for harvesting are still in the field because she broke her leg and can't reach the place where they are planted (9/3/84--M4).*

The health data (Table 29 and Figure 9), as most of the other data collected in this study, were analyzed by month, district and gender. It is acknowledged that, because the recorders were all females, there are several situations which may somewhat confound the data. For example, they may have been more sensitive to the health problems of other females. In turn, the women may have been more likely than their husbands to report health problems to the recorders. From another perspective, however, the recorders' familiarity with the setting and the people may have increased the likelihood of their taking many things for granted, which might have offset the concerns raised initially. Nevertheless, the impact of health in the farm family system was so impressive that its inclusion as a part of the overall study was required. The author is confident that the findings realistically reflect life among the families participating in this research.

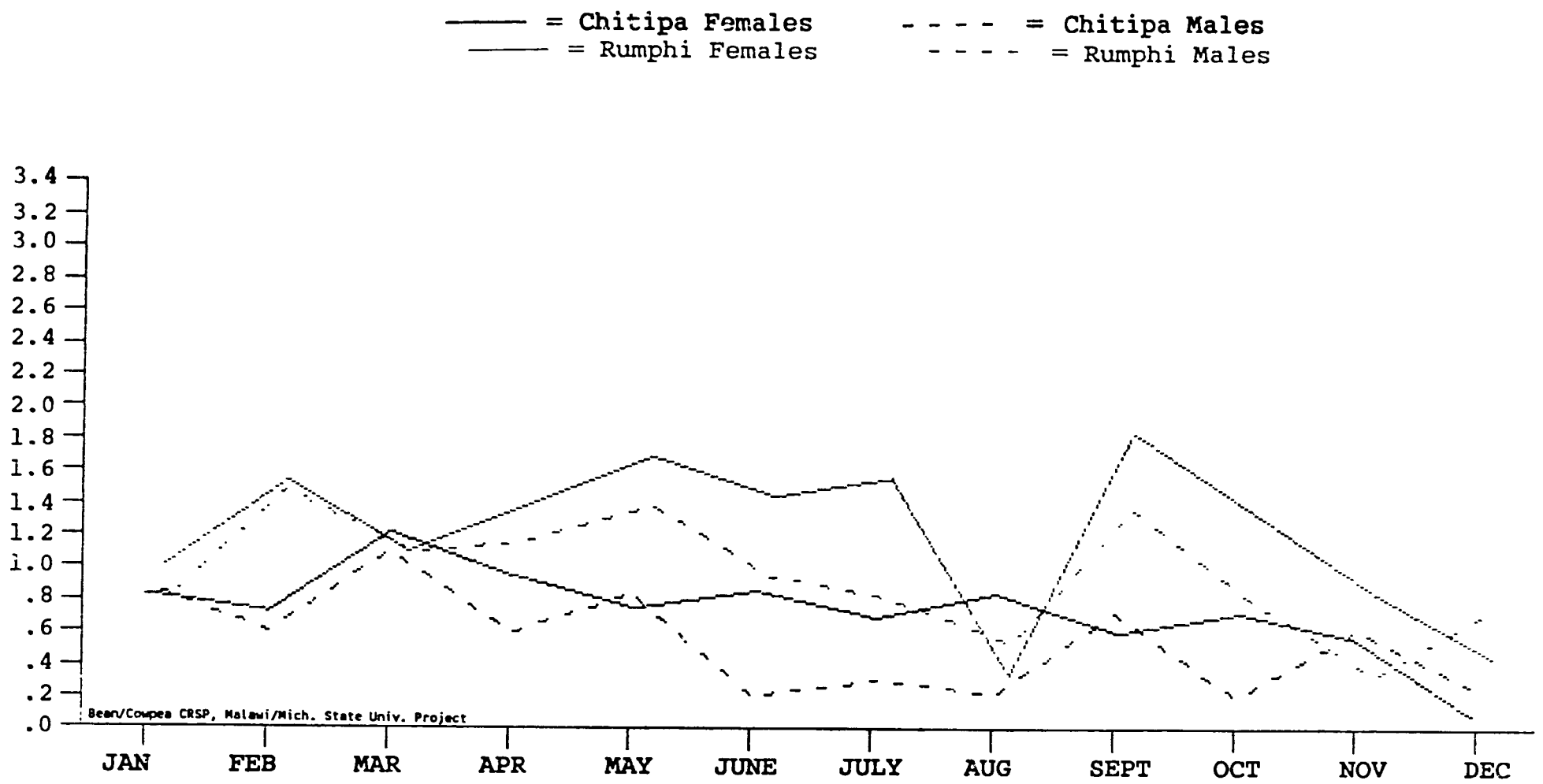
TABLE 29: AVERAGE REPORTED HEALTH CONDITION DAYS PER VISITED FAMILY BY MONTH, DISTRICT AND GENDER*

	Chitipa			Rumphi			Districts Combined Average		
	M	F	Total	M	F	Total	M	F	Total
JAN	.87	.83	1.70	.79	1.00	1.79	.84	.90	1.73
FEB	.60	.73	1.33	1.47	1.53	3.00	.94	1.04	1.98
MAR	1.10	1.21	2.31	1.10	1.10	2.19	1.10	1.15	2.25
APR	.61	.94	1.55	1.17	1.40	2.57	.90	1.18	2.07
MAY	.84	.75	1.59	1.39	1.69	3.08	1.13	1.25	2.38
JUNE	.22	.86	1.08	.95	1.45	2.40	.61	1.17	1.78
JULY	.30	.70	1.00	.82	1.58	2.39	.56	1.14	1.70
AUG	.21	.84	1.05	.55	.35	.90	.38	.59	.97
SEPT	.72	.61	1.33	1.38	1.85	3.23	1.00	1.13	2.13
OCT	.20	.73	.93	.82	1.36	2.18	.46	1.00	1.46
NOV	.62	.56	1.19	.37	.87	1.25	.54	.67	1.21
DEC	.25	.06	.31	.80	.47	1.27	.52	.26	.77

*The raw scores by year are presented in Table 50, Appendix 11.

FIGURE 9: AVERAGE REPORTED HEALTH CONDITION DAYS PER VISITED FAMILY BY DISTRICT, MONTH AND GENDER—CHITIPA/RUMPHI DISTRICTS

A plot of the data on Average Reported Health Condition Days in Table 29, page 77



Among the families in this study, total illness and injuries recorded gave an overall picture of average health conditions which may affect family functioning (Table 30).

> *Her last born son went to Lilongwe coz of eye trouble. He says that a foreign body entered his eye and he was unable to see. The eye swelled that he had sleepless nights for two days. then he was sent to the hospital by his parents. He was operated on the swollen eye and was admitted for 2 weeks. Then he recovered and was discharged. At home he can't look properly. When he is in the sun the eye becomes dim and tears drop from it (6/9/85--P5).*

The pattern, as could be anticipated, tended to follow the season, with the greatest problems observed during the wet season. Following a decrease in this season's numbers, a smaller rise is noted near the end of the dry season.

The district differences are striking as more families in Rumphi than Chitipa were observed to have days in which health conditions were noted. During the wet season, the peak month in Chitipa was March, the only month with an average of two or more sick days recorded. The Chitipa Health Surveillance Record (Table 31) shows headache and coughing as the leading causes of problems during that period. In Rumphi during this period, the months with days in excess of two were February, March, April, May, June and July. The Rumphi Health Surveillance Record (Table 32) shows cough, running nose, abdominal pains/stomach ache and headache as important during this period.

Later in the year in Chitipa, a slight elevation is apparent in September, although not even approaching their earlier highs. In Rumphi, on the other hand, the average September days with recorded health conditions reached 3.23 days, the highest average recorded there for the total year. October also registered health condition days in excess of two. The primary cause of these elevations in the dry season appears to be a return of coughing and sneezing.

The gender distribution mirrors the district differences. Females were generally observed to have more days of recorded health conditions than males; but, for most months, Rumphi females had the greatest number of all.

> *Her daughter-in-law had a stroke. She is very scared about her as she never knows where she'll get the stroke again. She fears mostly fire and the well. She says this sort of disease hates these two things (9/12/85--P1).*

The males, however, also had many serious health problems.

> *Now that the sons have completed their exams they will be helping in garden work. The husband and one of the sons they do suffer from abdominal pains sometimes. Due to this sometimes they are very quiet to the family and to visitors (7/25/85--P9).*

The data reinforce the idea that there is a relationship between production and health. One such relationship, which is quite striking in the data, is the correlation between the curve for average male health condition days in

TABLE 30: HEALTH CONDITIONS REPORTED

2. Running nose
3. Cough
4. Chest pains
5. Headache
6. Fever
7. Weak
8. Malaria
9. Ear infection
10. General malaise/sick
11. Toothache
12. Sneezing
13. Nosebleed
14. Body pains
15. Pneumonia
16. Asthma
17. Heart trouble
18. Open sore(s)
19. Wound/injury
20. Conjunctivitis/red eye
21. Weak eyes (vision)
22. Ring worm
23. Dermatitis
24. Rash
25. Burn
26. Distended stomach
27. Stomach ache
28. Abdominal pains
29. Swollen limb (arm or leg)
30. Blind
31. Fits
32. Convulsions
33. Backache
34. Diarrhea
35. Yellow fever
36. Old and incapacitated
37. Pregnant
38. Infection
39. Red hair
40. Neck (painful)
41. Leg (painful)
42. Shoulder pain
43. Swollen gums
44. Purging
45. Painful hands
46. Swelling of body
47. Operation
48. Muscle twitches
49. Boils
50. Emaciated
51. Edema, splotches
52. Jigger attack
53. Sore throat

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

TABLE 31: HEALTH SURVEILLANCE RECORD—CHITIPA DISTRICT
Summary of Incidences of Numbered Health Conditions (Table 30, page 80)
Reported by Recorders, by Month and Gender--1984-1986

Cond. No.	JAN M	JAN F	FEB M	FEB F	MAR M	MAR F	APR M	APR F	MAY M	MAY F	JUNE M	JUNE F	JULY M	JULY F	AUG M	AUG F	SEPT M	SEPT F	OCT M	OCT F	NOV M	NOV F	DEC M	DEC F	TOTAL M	TOTAL F
2			0	1	0	1	1	0	0	1	0	2	0	2											1	7
3	9	6	5	3	6	10	3	2	5	5	1	5	4	7	2	3	2	2	0	1	2	2			39	46
4					1	0			0	1									0	1					1	2
5	2	4	4	3	8	9	2	12	6	5	3	6	2	9	0	5	0	1	0	3	0	3	1	1	28	61
6	0	2	0	1	1	0	0	1	1	1															2	5
7							1	0													1	0			2	0
8					3	0	1	1	1	0			0	1	2	1	2	0	0	1					9	4
9									1	0															1	0
10							0	1					1	0											1	1
11	1	0			0	2	3	1	0	2	0	1													4	6
12	7	3	4	3	4	5	2	3	4	1	0	1	1	0			2	2	0	1	2	0			26	19
13																										
14	1	4	0	3	0	1	0	1					0	1	0	2	2	0	1	1	1	0			5	13
15	0	1	0	2	0	1	1	0							0	1									1	5
16																										
17	0	1									0	1													0	2
18					1	0	0	3	2	4	2	1	1	0			1	0			1	0	2	0	10	8
19			0	1	3	0	1	0	0	2					0	1									4	4
20											0	1	1	0			1	0							2	1
21					2	0													1	0					3	0
22																										
23																										
24																										
25	3	0																							3	0
26																										
27			2	1	0	2	1	1	2	0	0	4			0	1	0	1					1	0	6	10
28	2	1	1	2	0	1	0	3	2	0	0	1							0	1	2	0			7	9
29											1	0							0	2	0	1			1	3
30																										
31																										
32																										
33					1	0			3	0															4	0
34																										
35																										
36	0	2	0	2											0	1									0	5
37					0	3	0	2			0	6	0	1											0	12
38																										
39																										
40									0	1	0	2					1	0			0	1			1	4
41											0	1	0	2	0	1	1	3	1	0	0	2			3	8
42																										
43	0	1							0	1							1	0							1	2
44	1	0					1	0									0	1			1	0			3	1
45																	0	1							0	1
46			2	0	2	0	3	0																	7	0
47																										
48																										
49																										
50																										
51																										
52																										
53																										
Total	26	25	18	22	33	35	20	31	27	24	8	31	10	23	4	16	13	11	3	11	10	9	4	1	175	239
	51		40		67		51		51		37		33		20		24		14		19		5		414	

Bean/Coupea CRSP, Malawi/Mich. State Univ. Project

TABLE 32: HEALTH SURVEILLANCE RECORD—RUMPHI DISTRICT
Summary of Incidences of Numbered Health Conditions (Table 30, page 80)
Reported by Recorders, by Month and Gender—1984-1986

Cond.	JAN		FEB		MAR		APR		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV		DEC		TOTAL	
No.	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
2	1	1	5	2	6	4	6	8	4	7	3	7	3	11			1	2			0	3	2	0	31	45
3	3	6	11	8	10	7	12	15	12	25	8	18	12	16	2	4	8	9	3	7	0	1	2	3	83	119
4																										
5	2	2	1	0	2	1	2	2	7	5	5	5	0	5	0	1	0	2			1	0	1	1	21	24
6							1	0			1	0													2	0
7	1	0			0	1																			1	1
8							2	1																	2	1
9																										
10																										
11							0	1	0	1															0	2
12			0	1	1	0	1	3	2	3	1	1	2	1			3	3	0	6					10	18
13																										
14	0	2	1	6	2	5	0	2	1	2	0	2	0	8	0	1	0	4	0	2			1	0	5	34
15																										
16	1	0																							1	0
17	2	2	1	0	0	1	1	1			2	0											1	0	7	4
18	0	1	0	2	2	1	1	2			1	1	2	0			0	1	2	0	1	2			9	10
19	1	0	3	1	4	4	4	3	5	1	2	4	3	0	5	0					0	1			27	14
20							1	0	0	1															1	1
21	1	0	1	0			0	1	0	1	0	1	0	1			1	0							3	4
22																										
23					0	2			1	1	0	3	0	3	0	1									1	10
24																										
25																										
26	0	1											0	1									0	1	0	3
27	2	0	0	1	2	0	5	1	5	2	1	1	1	2					2	0					18	7
28	0	3	0	2	3	4	0	3	2	2	6	8	0	3			2	1					2	1	15	27
29	0	1	0	5	0	1	2	2	1	1							1	0			1	0			5	10
30																										
31			1	0	2	0	2	0	4	0	5	0	3	0	2	0	1	0					2	0	22	0
32			1	0																					1	0
33																							1	0	1	0
34			0	1	0	1			1	2	1	0	1	0	1	0			2	0					6	4
35					0	1	0	1	0	1															0	3
36																										
37									0	1															0	1
38																										
39							1	1	2	0	0	4	0	1			1	0					0	1	4	7
40											1	0													1	0
41							0	2	0	3	1	0					0	2							1	7
42																										
43																										
44															1	0									1	0
45																										
46			1	0																					1	0
47	1	0	2	0							0	2													3	2
48									1	0															1	0
49											0														0	1
50					0	1			0	1															0	2
51									0	1															0	1
52																										
53									2	0															2	0
Total	15	19	28	29	34	34	41	49	50	61	38	58	37	72	11	7	18	24	9	15	3	7	12	7	286	362
	34		57		68		90		111		96		79		18		42		24		10		19		648	

Bean/Coupea CRSP, Malawi/Mich. State Univ. Project

Chitipa and the curve for land preparation there. Figure 10 shows the strong relationship between these two variables. Pearson r was 0.71, demonstrating a very high correlation. The Chitipa female health curve, on the other hand, much higher than that of the male, shows a correlation of only 0.1 with the activities of the production cycle. Figure 10 also presents the female data. Further, there is no such relationship apparent in Rumphi for either gender (Figure 11). An explanation for the Chitipa correlation is not clear. Indeed, land preparation is generally done by males but Rumphi males are apparently unaffected. Perhaps there is a connection between this correlation and the dry season increase in respiratory problems noted above. One might suspect hyperallergenic or entomological agents stirred up while clearing brush. Another possibility is soils since, as was noted earlier, the soils in the two districts are somewhat different. Perhaps soil bacteria, fungi or other such agents are worth considering. At any rate, this issue requires considerably more investigation.

For the present, however, it is apparent that a number of health conditions exist that can influence labor output, that the incidence of such conditions fluctuates and that gender/district differences are real. Subsequent analyses may shed further light on these relationships.

D. Analysis of Bean Observations

Information reported in this section was generated predominantly from the Bean Observation Sheets recorded each day a family was visited (see Appendix 6). Supplemental information from the questionnaires and diaries are included as appropriate.

Of all the beans observed, it should be noted that the data on bean lines in the families represent only what the observers recorded. The data are not necessarily all inclusive as there may have been other beans in the household or fields which the growers, for whatever reason, chose not to make known to the observers. Every effort was made to gain the trust of the growers and over time to identify all the beans in the families. Most families were very willing to cooperate. With the involvement of the extension officers and the occasional visits of the field supervisors, sometimes with grateful offerings of salt, sugar, etc., the families were reinforced for their participation. Nevertheless, one can never be positive of the level of success. Thus, these data should be considered as representative of family beans in Northern Malawi at the time of the study.

1. *The Bean Categories*

On visiting the households, the recorders listed all lots or batches of beans belonging to the family, including the names (as given by the farmer) and the description of every bean observed in each lot. Subsequently coders assigned each bean designation its own code number (see Appendix 4).

Analysis of the beans by code number was determined not to be possible because the individual coded lines were not distinct from one another. Many were, in fact, duplicates of other beans but with different code numbers. For example, beans were given a different code number if there was anything that suggested

FIGURE 10: AVERAGE NUMBER OF OBSERVED PRODUCTION CYCLE ACTIVITY AND THEIR RELATIONSHIP TO AVERAGE REPORTED HEALTH CONDITION DAYS BY GENDER—CHITIPA DISTRICT

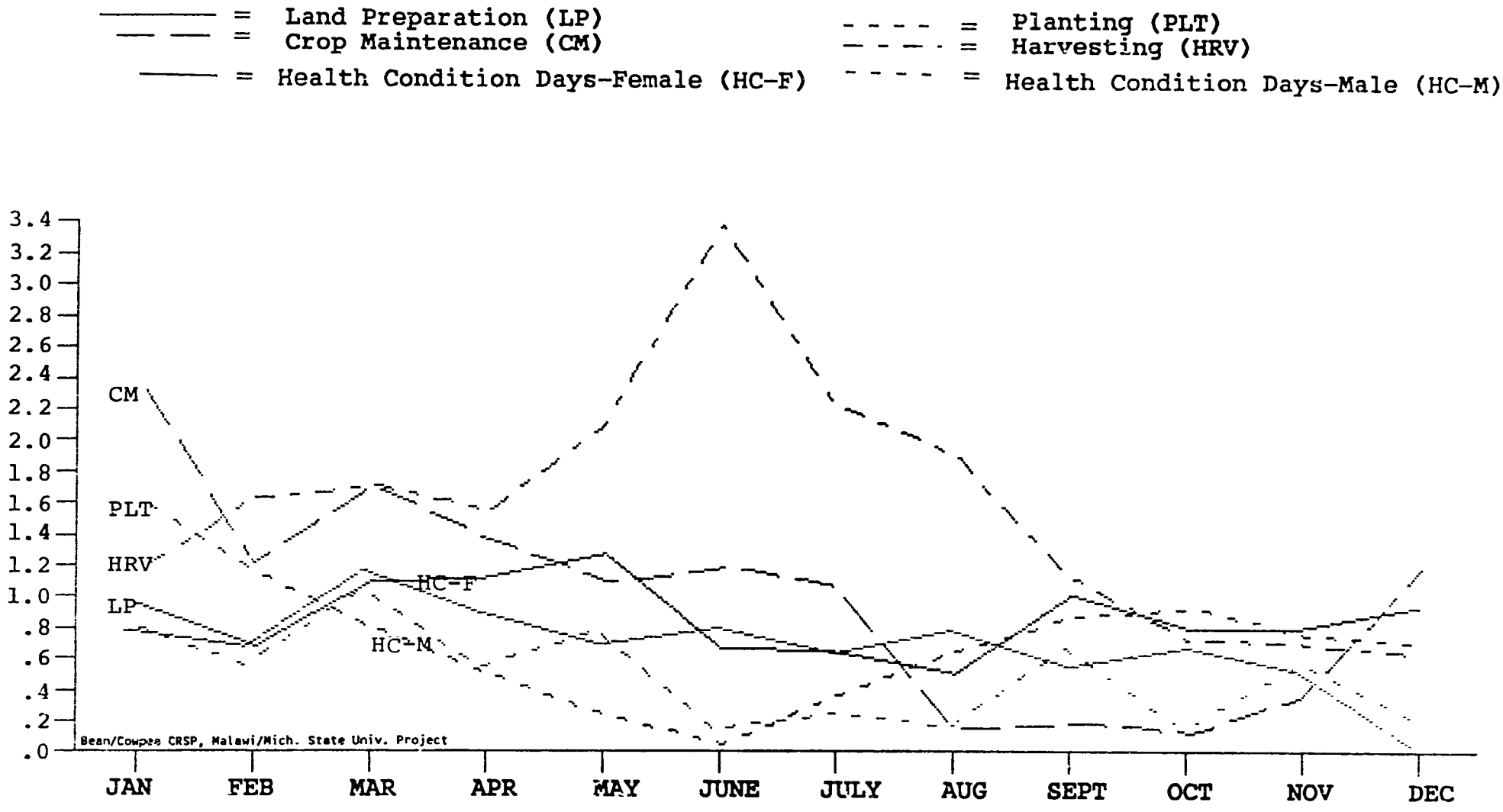
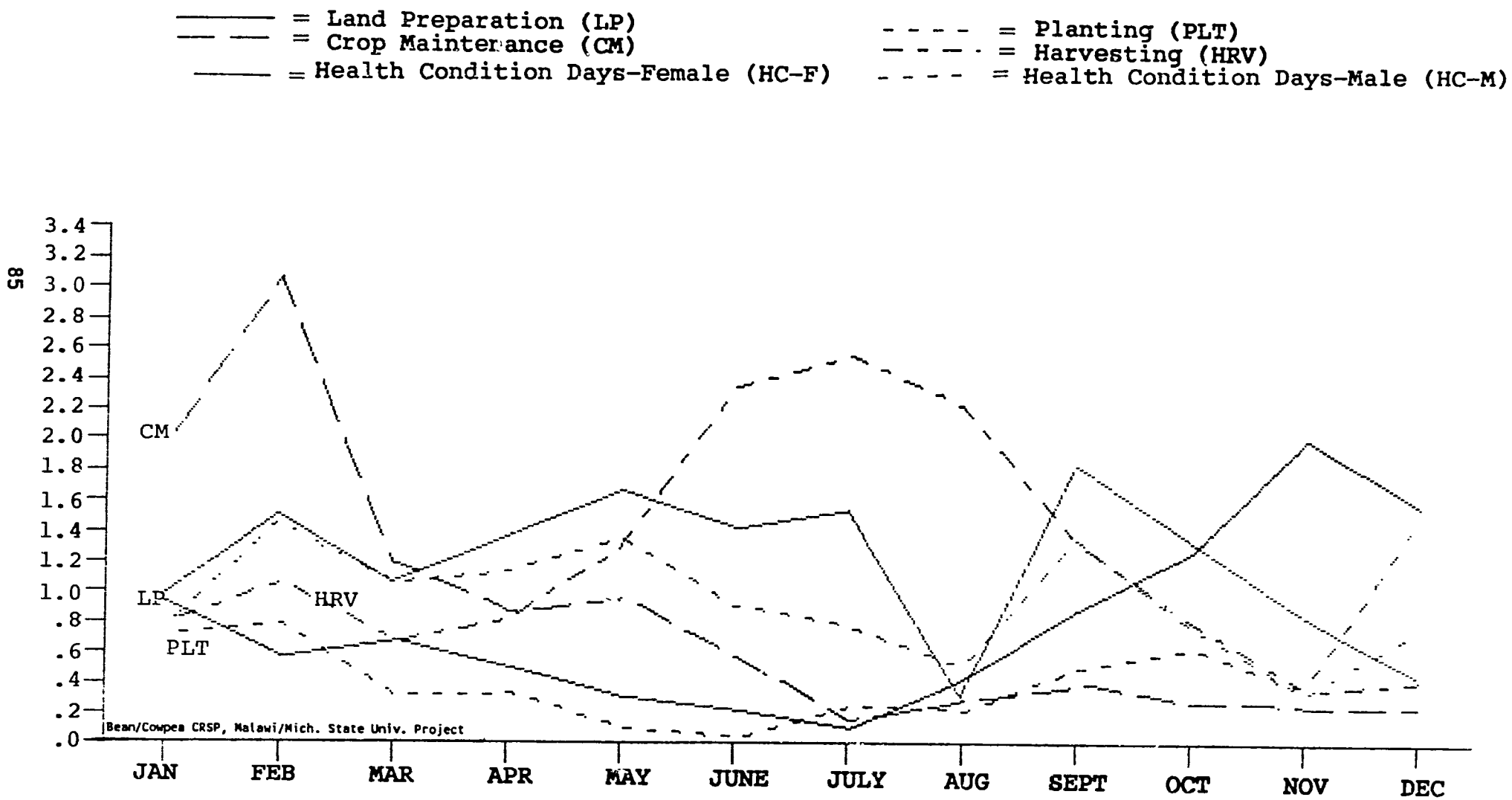


FIGURE 11: AVERAGE NUMBER OF OBSERVED PRODUCTION CYCLE ACTIVITY AND THEIR RELATIONSHIP TO AVERAGE REPORTED HEALTH CONDITION DAYS BY GENDER—RUMPHI DISTRICT



to the coders that they might be different from those already coded. In some instances, beans with the same overall descriptions had different names, (e.g., different communities, ethnic groups or languages frequently had different names for what appeared to be the same bean). Each differently named bean was assigned a different code number. In other instances, beans with the same names had different descriptions (e.g., beans may have turned darker because they were older or beans grown under insufficient moisture may have been smaller than normal in size). Each differently described bean was assigned a different code number. Whenever the circumstances were doubtful, the coders were trained to assign new code numbers. This duplication also existed in a few instances where there were minor but inconsequential differences, where something in the recording was unclear or where a line's original code was simply overlooked by the coder.

To address this problem of duplication, single-coded bean lines were grouped into categories from the descriptions and grower-designated bean names. Consideration was given to color, shape and size as recorded at the family farm sites. These beans were grouped according to reasonably clear, unambiguous natural divisions with input from bean production scientists having years of experience with the bean diversity in Malawi. The predominant criteria considered in forming the groups were, in order of priority, color (reds, greens, etc.) followed by pattern (solid, zebra, variegated, etc.), shape (kidney, round, etc.) and size (small, medium large). However, because shape is relatively subjective and size is influenced by variability in the environment, these final criteria were held less mutually exclusive within a group than the first two criteria. Thus, for example, where the growers used the same name for beans having the same color and pattern but some were large and some were medium, the large ones had a different code number from the mediums but both were included in the same group. Observers' diaries, different observers' reports of the same beans (the observers generally worked in pairs with each reporting individually) and the same bean lots followed over time were all used to help reconcile the discrepancies. In a few instances, with the help of the bean scientists experienced in Malawi, a best professional judgment had to be made. Overall, project production scientists had input into the designation of the bean groups. Table 1 indicates the twenty-three categories and descriptions of the coded bean lines which comprised them.

It is likely that the categories represent extensive genetic heterogeneity. For example, one farmer distinguished between kwayti (described by the recorders as small round white) and kabaya (described by the recorders as small round whitish) which she grew separately (6/12/84--M10). Throughout this analysis, for ease of data handling, no attempt was made to maintain such subtle distinctions. Variety is a term loosely used in this paper for ease of communication. There is no assumption of degree of homogeneity beyond that acknowledged within the category descriptions that follow.

Category A: Beans in this category are large or medium solid reds. The shape is kidney or round, each of which is clearly distinguishable from the other. In most cases the shape observed was kidney (without the round). This was coded A. On occasion, a lot had both kidney and rounds; it was coded AA and, even without other beans, was classed as a mixture. Other lots had rounds (without kidneys) but were too few to warrant separate designation and thus were also coded A.

A089	Saaba (large)	(no description given)
A094	Blantyre	large, kidney, red
A002	Chazgama(Chizgama)	big, round, red
A007	Chazgama(Chizgama)	medium, oval, red
A021	Chikamboui	large, round kidney shaped, red
A125	Chikamboui	medium, round, red, solid
A133	Chikamboui	medium, kidney, red, solid
A088	Kambuchuli	medium, round, red
A156	Mashimikila	(no description given)
A011	Mkhalasonga	medium, oval, purple
A035	Mshisha	large, kidney shaped, red
A081	Mwikala	long, kidney, red
A152	Mwikala	long, kidney, red
A017	Saaba	medium, kidney, red
A063	Saaba	large, kidney, red
A159	Saaba	medium, round, red
A191	Saaba	large, kidney, white
A127	Zambia	medium, round, red, solid

Category B: These beans are small solid, round reds and red kidneys. Their small size is the most distinguishing feature. The small size tends to blur the shape somewhat.

B077	Chibeti	small, round, red
B015	Chimzimba	small, round (oval), red
B167	Chimzimba	small, kidney, red, solid
B003	Katolika	small/medium, round, red
B424	Kayera	small, round, red
B072	Masumbighaholo	small, oval, red
B103	Nambotwa	small, round, red
B192	Zambia	small, oval, red, solid

Category C: These beans are large and medium solid white or cream white. The shape is kidney or oval. Across the families and in both regions, the distinction between white and cream white was not clear. Similarly, while most of these beans were kidney shaped, some with the same name were described as oval. All were coded C.

C122	Bunda	large, kidney, cream white
C018	Kayera	large, round/oval, white
C19?	Kayera	medium, kidney, white
C031	Mbosi	large, kidney, white
C106	Moshi	large, kidney, white
C082	Mwikala	long, kidney shaped, white
C052	Nyauhango	medium, kidney, white
C123	Nyauhango	large, kidney, cream white
C180	Saaba	large, oblong, red, solid
C183	Saaba	medium, kidney, white
C117		medium/large, white
C425		large, kidney, white

Category D: Beans in this category are small and white. The shape is predominantly round. A few cases of small white beans with the same name as the round ones but with roundish, oval or kidney descriptions were also included.

D037	Kabaghe	small, round, white
D158	Kabaya	small, round, white
D099	Kabaye/Kabaya	small, round, white
D024	Kayera	small, round, white
D048	Kayera	small, round, white
D134	Kayera	small, kidney, white, solid
D083	Kwayiti	small, roundish, white
D074	Masumbighaholo	small, round, white
D075	Masumbighaholo	small, round, cream
D001	Zitwa	small, round, white
D046	Zitwa	small, round (oval), white
D148		small, round, white

Category E: These are large and medium white or cream beans with any combination of black, green and/or khaki stripes, generally referred to as zebra beans. The promiscuousness of this zebra pattern was noted through observations of beans with backgrounds other than white. These were included in other categories as appropriate.

E176	Jandalala	medium, kidney, white black green striped
E029	Mangulungulu	large, kidney, green/white zebra
E080	Mangulungulu	long, kidney, white with black stripes
E131	Mangulungulu	white
E149	Mangulungulu	long, kidney, white with black or red stripe
E179	Mangulungulu	medium, kidney, green/white, zebra
E036	Mbisi	large, white with black khakish stripes
E097	Mlusha	long, kidney, whitish with khakish stripes
E142	Moshi	large, kidney, green/white, zebra
E172	Moshi	large, kidney, white/black, zebra
E100	Nanjole	big, long, kidney, white with black stripes

Category F: These beans are all large and medium white or cream white beans with red (and in a few cases also purple, orange or pink) spots or stripes. Some of the beans categorized here may belong, in fact, to Category U. If, however, there was any uncertainty, the bean was placed here. It can be appreciated that the distinction between broken stripes and many joined spots is not always clear even when one is looking directly at both, side by side.

F475	Chihowe	large, kidney, white, red striped
F030	Kanutauzgani	medium, round, red spotted
F067	Kaumtauzgani	medium, round, orange (pink)/red stripes
F019	Mzaza	large, (white) cream with (red) gray stripes
F132	Mzaza	medium, kidney, zebra pattern
F138	Mzaza	large, kidney, white and red striped
F187	Mzaza	large, kidney, zebra pattern
F053	Nyauhango	medium, oval, white red spotted
F054	Nyauhango	large, oval, red khaki striped

F182	Saaba Chimwera	large, kidney, zebra pattern
F188	Saaba Chimwera	large, kidney, cream white, zebra pattern
F022	Saaba Wachimwella	kidney shaped
F078	Selenji	large, kidney, red striped, orange
F020	Wachimwera	cream with purple stripes
F524		medium, round, white, red spotted

Category G: Beans in this category are large and medium. The color is yellow with black and/or green zebra stripes. They occurred often enough to warrant their own category separate from E above. Interestingly, beans falling in this category (G) were observed almost exclusively in association with solid yellow beans (K). This was so much so that in some such lots the descriptions were interchanged over time, with the record some days indicating a given lot was solid yellow and other days indicating that the same lot was yellow with zebra stripe. In looking briefly at a basket of yellow beans, only some of which have stripes, one is clearly faced with the decision "is the glass half full or half empty." Where this situation existed, the lot was classed as a mixture even in the absence of beans other than G and K and allowed to carry both the G and K codes.

G164	Chimukwezulu	large/medium, kidney, black and yellow (green) striped
G128	Jandalala	medium, round, yellow, zebra pattern
G170	Mayini	medium, kidney, yellow/green zebra
G181	Mayini	large, kidney, yellow/green zebra

Category H: This category had large and medium brown or khaki beans usually with dark brown zebra stripes. The shape is kidney. While not especially frequent, these beans were distinctive enough to be given their own category. Additionally, unlike G and K above, beans in this category (H) were observed in mixtures and as singles, both unassociated and in association with solid color beans the color of their background. Apparently not especially hardy, these beans were recorded in six families in 1982, one family in 1984 and none in 1985 and 1986.

H032	Mangulungulu	kidney, brown with dark brown stripes
H111		medium, round, khaki, green/gray striped
H533		large, kidney, brown striped

Category I:

Beans in this category are large and medium with a pink, violet or blue color which is a muted, fogged or fine speckled pattern. The shape is mostly round or oval. The pattern is so fine that the description of solid color when all other descriptors match is not taken to warrant its exclusion from this category.

I026	Chula	large, oval, pink
I102	Chula	round, red with whitish spots
I150	Chula	large, kidney shaped, pink with cream specks
I162	Chula	medium, round, pink (violet), solid
I173	Chula	medium, kidney, pink, solid

I196	Chula	large, kidney, violet, solid
I008	Jandalala	large, kidney shaped, pink with cream specks
I073	Masumbighaholo	medium, oval, pink
I108	Mzimba	medium, round, pink/white
I136	Mzimba	medium, round, blue/white
I429	Shawala	small, round, pink

Category J: The beans in this category are somewhat varied but all are large and medium with a white background. The pattern is generally red but is minor in the sense that it does not cover the whole bean. Thus, included are beans with one red stripe along the hilum edge and beans with a large red spot at the hilum surrounded by a few specks.

J016	Chandazulu	white with red specks, red part on hilum
J121	Bunda	medium, kidney, white with red spot
J189	Mbosi	large, kidney, white with black spot
J509	Mzaza	large, white with spotted dots
J076	Saaba (white)	large, kidney red striped, white

Category K: These beans are large and medium in size. The color is solid yellow or, in a very few cases, orange or mustard/dark yellow. The large beans tend to be kidney shape while the mediums tend to be round.

K087	Busale	medium, round, yellow
K098	Choshi	medium, kidney, yellow
K144	Choshi	large, kidney, yellow, solid
K153	Chosi	medium, round, dark yellow
K033	Ghoshi	medium, round, dark yellow
K120	Jandalala	large, kidney shaped, yellow, solid
K528	Jandalala	medium/small, kidney, yellow solid
K079	Kambuchuli	large, kidney, yellow
K139	Lusaka	medium, round, yellow
K107	Mayini	large, yellow
K141	Mayini	medium, oval, yellow, solid
K161	Mayini	large, oval, yellow, solid
K163	Mayini	large, kidney, yellow, solid
K114	Mngomani	large, square, yellow
K049	Mungomano	large, kidney, yellow
K093	Musaka	medium, round, yellow
K130	Ndozi	medium/small, round, yellow, solid
K051	Nyauhango	medium, kidney, yellow
K069	Sugar beans	large, kidney yellow
K381		medium, square, orange
K124		large, kidney, yellow, solid

Category L: These are the small solid yellow beans which are sometimes a gold color. The shape is round. Included here are also small pale yellow round beans with a raised hilum.

L197	Mine	small, pale yellow with raised hilum
L056	Sweat beans	small, round, gold
L101	Zambia	small, round, yellow

L045		small, round, gold
L175		small, round, orange
L058		small, round, yellow
L177		small, square, yellow

Category M: These beans are large and medium and solid khaki in color. The shape is kidney, round or oval.

M112	Lusaka/Zambia	medium, round, khaki
M084	Masusu	long, kidney, khakish
M112	Mzimba	medium, round, khaki
M190	Nalusaka	(no description given)
M090	Nasaka	large, kidney, khaki
M426	Nasaka	small, round, khaki
M428	Sugar beans	large, kidney, khaki
M112	Zambia/Lusaka	medium, round, khaki
M091		large, kidney, khaki

Category N: Beans in this category are small round solid khakis. Their occurrence among the families' lots was infrequent.

N050	Nyauhango	small/medium, round, khaki

Category O: These are large and medium solid brown beans. The shape is kidney or oval. This bean is similar to H without the zebra stripe. There is another bean not categorized here described as dark brownish green. An arbitrary decision was made to categorize that one under P below.

O057	Coffee	big, oval
O071	Masumbighaholo	medium, oval, dark brown
O065	Nyauhango	large, kidney, greenish brown
O135	Nyauhango	large, kidney, brown
O200	Nyauhango	large, oval, grey
O427	Nyauhango	medium, grey beans

Category P: Beans in this category are large, medium and, in one case, described as small. They are solid and fundamentally green but also included are the dark green, blackish and gun metal color relatives. Unlike the zebra stripe, it was often difficult to determine whether these color variations were natural changes from age and condition or whether they were likely candidates for true crosses. For the sake of consistency, all were coded as P, as the green bean was very popular and had ample opportunity for mixing.

P025	Busale	large, oval, green, solid
P104	Busale	big, kidney, blackish, long
P171	Mangulungulu	large, kidney, green, solid
P151	Masusu	long/medium, kidney, gunmetal (blackish green)
P023	Nyakamutauzganga	round, green
P013	Nyauzembe	small, round, green
P054	Nyauzembe	medium, round, green
P066	Nyauzembe	large, kidney, green

P060	Nyauzembe	small, oval, solid green
P041	Tanzania	medium, oval, dark green
P185	Busale	(no description given)

Category Q: This category is large and medium solid black beans. The shape is mostly kidney although some are round. As noted above, a description of blackish was taken to mean the beans were not true black and were coded with the various dark green combinations under P.

Q086	Busale	medium, kidney, black, long
Q010	Fipa	medium, kidney shaped, purple, large type
Q523		large, kidney, black

Category R: Beans in this category are small solid dark blue, blue black or black. They are round or oval in shape.

R199	Chimukwezulu	small, round, black
R009	Fipa	small, oval, black, small type
R178		small, round/square, black
R446		small, square, dark blue
R110		medium, round, black

Category S: These beans are large and medium solid blue kidneys. Although not very common, the color has been observed all the way from a strong lavender blue to a dark blackish blue.

S174		medium, kidney, blue
S116		large, kidney, blue
S109		large, kidney, blue/black

Category U: Beans were included here if they carried the name Sugar Beans or Mwasipengile and were large or medium with broken red stripes. Extremely popular, it seemed we could learn more about it by keeping it "pure." Those with similar descriptions which may also be the same bean but with different names were coded under F.

U034	Mwasipengile	medium, oval, beige with red specks
U096	Mwasipengile	long, kidney, whitish with red spots
U143	Mwasipengile	large, kidney, red/white
U157	Mwasipengile	long, kidney, whitish with red spots
U004	Sugar beans	large, khaki with red stripes
U059	Sugar beans	large, cream white with brown flowers
U068	Sugar beans	large, round, orange red striped
U119	Sugar beans	large, kidney, cream white, variegated
U129	Sugar beans	medium, cream white, variegated
U137	Sugar beans	large, kidney, khaki with red stripes
U146	Sugar beans	large, kidney, red and white striped
U155	Sugar beans	medium, kidney, cream white, red or purple (spots)
U168	Sugar beans	medium, kidney, cream white, variegated
U055	Sweat beans	medium, oval, beige with red specks

Category V: This is the category for the remaining large and medium red variegateds usually with white or khaki backgrounds.

V012	Kazengamuzi	medium, kidney, red khakish
V095	Mabupula	long, kidney, khakish with red spots
V028	Mabupula/Maupula	kidney, red/white variegated
V154	Mabupula/Maupula	long, kidney, khakish with red spots
V186	Mabupula/Maupula	large, kidney, red white variegated
V039	Maloko	long, kidney, white with red stripe along hilum edge
V085	Mashabala	red with black spots
V014	Zambia	large, kidney shaped, red with pale flowers
V027	Zambia	large, kidney, red white
V118	Zambia	medium, kidney shaped, red, variegated
V530	Zambia	small, kidney, red variegated
V006	Zgamamuluwa	medium, oval, red with pink specks

Category W: All remaining medium beans of any color, pattern or shape were placed in this category.

W070	Masumbighaholo	medium, round, green white speckled
W160	Masumbighaholo	medium, square, black white spotted
W445	Masumbiyaholo	medium, round, white brown (white black) spotted
W005	Mbosi(Mbisi)	medium, oval, yellow with pink specks
W113		medium, round, black, white spotted

Category X: All remaining small beans of any color, pattern or shape were placed in this category.

X342	Chihoke	small, round, red/white spots
X147	Chimukwezulu	small, round, gray spotted
X126	Kambulumia	small, oval, cream white variegated
X343	Masumbi ghanchwali	small, round, blue with black/white spots
X193	Mutifi	small, pepper
X551	Nyakamutauzganga	small, round, reddish brown, striped
X092	Tanzania	small, round, brown black spotted
X140	Tanzania	small, round, blue/black spotted
X145		small, brown/white spotted
X194		small, kidney, green/white
X195		small, kidney, red/white
X540		small, round, pink with red flowers
X165		small, round, blue/black, spotted

2. *Category Distributions: Single vs Mixed*

All bean lots in the possession of the families who participated in this study were reviewed by district and month. A lot is an actual batch or cluster of beans, identified by member seed type or types, that may or may not be broken up into smaller units. The smaller units are not the concern of this report.

Thus, a lot may be several baskets or plates; it does not matter. For purposes of this analysis, the lot either exists or does not exist in a given family at a given time. A lot may have only one seed type (single variety lot) or it may be made up of two or more visibly different seed types (mixed lot or mixture). The data are in terms of lots per family per visited month. A visited month is the unit used, collapsing days, indicating whether that lot existed any day that month the family was visited. That is, no matter how many days a lot was observed in a given month, it was counted as one.

For the analyses in this section, the observations years 1984-1986 were collapsed to give an overall picture of the seasonal distribution of the beans. The findings are presented in Table 33.

Families coded C are pilot study families who, for the most part, were seen only in August or September of 1982. Some were in Chitipa District and some were in Rumphi District. M families are all from Chitipa District while Rumphi District families are coded P, PN or N. Kasungu District families, although very few in number, were also included in this table.

A review of the bottom line (i.e., all families, all districts) indicates that overall across months families had their beans separated into more single variety lots than into mixtures. That is, whatever the amounts in each lot, overall single variety lots exceeded mixtures in the northern Malawi families studied by a ratio of almost 2 to 1. The exception to this trend was in the month of September when most Rumphi families had more lots of mixtures than lots containing only single lines. To a more limited degree, the exception was also apparent in Rumphi for a few families in the months of October, January and February. The question of why the change, especially in September, will be addressed subsequently. For the moment, it is sufficient to acknowledge that the difference exists.

While all families generally had an average of more lots of single varieties than mixed ones, a review of the totals (all families) for each district demonstrates that the families in Chitipa District had the most, in some cases approximately 3 to 1. Across all months, their average number of single variety lots well exceeded those in Rumphi, the other district where families were observed in all months.

Families in all districts had about the same average number of mixed lots, i.e., for the most part, approximately one such lot. Anticipating the later discussion, it is worth noting that the September change in Rumphi toward more lots of mixed beans is apparently at the expense of the number of single variety lots the month before. The easy assumption of the single variety lots being deliberately mixed together is a bit troublesome in light of the eventual return to the single variety lot dominance at the end of the year. As has been demonstrated throughout the earlier sections of this paper, these families do not waste energy. Subsequent data will help address this question.

TABLE 33: AVERAGE NUMBER OF DIFFERENT SINGLE VARIETY BEAN LOTS AND AVERAGE NUMBER OF MIXED LOTS BY MONTH AND BY DISTRICT*--ALL BEANS 1982/84-1986

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total	Ave. Annual
Chitipa District--														
M Families														
Single	2.47	2.73	3.00	2.58	2.66	3.00	2.85	2.85	2.17	2.33	2.50	2.25	31.39	2.62
Mixed	1.33	1.70	1.17	1.18	1.06	.94	.97	1.05	1.28	1.40	1.37	1.25	14.70	1.22
C Families (1982)														
Single								3.00					3.00	3.00
Mixed								1.00					1.00	1.00
Totals (All Families)														
Single	2.47	2.79	3.00	2.50	2.68	3.00	2.84	2.87	2.17	2.33	2.50	2.25	31.41	2.62
Mixed	1.33	1.72	1.17	1.22	1.06	.94	1.00	1.04	1.28	1.40	1.37	1.25	14.78	1.23
Rumphi District--														
P Families														
Single	1.64	1.61	1.58	1.61	1.58	1.87	1.67	1.87	1.62	1.71	1.62	1.38	19.76	1.65
Mixed	.73	.85	.92	.85	1.00	.80	.73	1.25	.87	.57	.75	.85	10.17	.85
PN Families														
Single	1.40	.33	2.93	2.37	2.47	2.45	2.19	1.77	1.20	1.50		3.00	23.07	2.10
Mixed	2.80	1.33	1.93	2.00	1.47	1.45	1.56	1.77	2.80	3.00		2.00	21.79	1.98
N Families														
Single	1.00	1.67	1.60	1.67	2.29	2.20	2.50						12.93	1.85
Mixed	1.00	1.33	1.20	1.17	1.00	.80	.50						7.00	1.00
C Families (1982)														
Single								2.12	.20				2.32	1.16
Mixed								1.25	2.20				3.45	1.72
Totals (All Families)														
Single	1.47	1.42	2.19	1.97	2.14	2.20	1.97	1.90	1.11	1.64	1.60	1.83	21.44	1.79
Mixed	1.32	1.00	1.42	1.43	1.22	1.12	1.12	1.48	1.78	1.45	.75	1.17	15.26	1.27
Kasungu District--														
Single								2.00	4.00		4.00		10.00	2.50
Mixed						1.00		2.00	.75		1.00		4.75	1.19
All Districts--														
All Families														
Single	2.08	2.22	2.58	2.26	2.38	2.58	2.41	2.38	1.64	2.04	2.21	2.03	26.81	2.23
Mixed	1.33	1.43	1.30	1.31	1.15	1.04	1.05	1.32	1.53	1.42	1.17	1.21	15.26	1.27

*Across the identified lots, each was counted only once in a month.

3. *Category Rankings: Single vs Mixed*

Only for purposes of assessing the incidence of the bean categories in mixed and single variety lots, the data were manipulated as follows. Families having fewer than six months of total observations were grouped, with each group treated as one family.

In Chitipa there were 16 families having 11 months or more of total observations. The average number of such observations was 17 in a range of 11 to 23. In addition, there were in Chitipa families having fewer total observations. These families were grouped so that their combined number of observations fell within the range of the initial families.

This grouping of insufficiently observed families was done as follows. There were 21 families having an insufficient number of observations. They had a total of 38 observation months among them. The range was 1-4. There were no families in this district having 5-10 observation months. These insufficiently observed families were divided into two arbitrary groups. An attempt was made to balance, as much as possible, years represented, geographic locations within the district and number of observation months for each group. The two groups were comprised of 10 and 11 families representing 18 and 20 observation months respectively. These two composite families were then added to the original 16 Chitipa families, making 18 families all together.

In Rumphi there were 16 families having 10 or more months of observations. The average number of months observed in this case was 15, with a range of 10-20. Therefore, 15 was used as the general guide in grouping the Rumphi families.

In addition, there were 21 insufficiently observed families in Rumphi. These families had a total of 50 observation months among them. The range was 1-5. There were no Rumphi families observed from 6 to 9 months. Because of the large number of observation months among them, these families were divided into three arbitrary groups. Attention was given to balance for years represented, geographic location within the district and total number of observation months among the groups. The three groups were comprised of 7 families each representing 16, 17 and 17 months of observations respectively. These three composite families were then added to the original 16 Rumphi families, making 19 Rumphi families in all.

Table 34 (Chitipa) and Table 35 (Rumphi) give the rank ordering of beans as components of mixtures and as single variety lots over the period of this study. The tables list in rank order all the bean categories observed each year. It is important to recall that 1982 families were only observed August or September (during the pilot study) and therefore the distribution shown may not be representative. Based on these data, which in the aggregate (single/mixed, all four years) show a natural break after the first six bean categories, further analysis will concentrate on this top number.

The figures next to the beans in the tables represent the average number of single or mixed or the total of the single/mixed lots containing that bean per family per visited month.

TABLE 34: RANK ORDERING BASED ON MONTHLY INCIDENCE OF TYPES ACROSS ALL FAMILIES*--CHITIPA

	Single					Mixed					Single/Mixed				
Rank	1982	1984	1985	1986	All 4 Years	1982	1984	1985	1986	All 4 Years	1982	1984	1985	1986	All 4 Years
1	K .80	D .81	D .52	P .52	D .51	K .60	U .38	K .68	K .73	K .65	K 1.40	D .93	D .95	E .97	D .92
2	H .60	E .50	P .47	D .48	A .43	D .40	K .36	E .62	E .63	E .55	D .80	K .82	E .93	P .96	A .87
3	A .40	A .48	A .42	A .38	P .43	A .20	A .31	U .50	U .56	U .53	H .80	U .80	A .88	D .93	E .85
4	D .40	K .46	E .27	E .34	E .30	C .20	E .14	A .46	D .45	A .44	A .60	A .79	P .83	U .88	K .84
5	B .20	U .42	U .23	U .31	U .28	F .20	D .12	D .42	P .44	D .41	C .40	E .64	K .82	E .85	U .81
6	C .20	P .29	I .19	V .13	K .19	H .20	I .10	P .36	A .34	P .31	F .40	P .31	U .74	A .72	P .74
7	E .20	V .14	V .19	K .12	V .16	I .20	C .05	V .13	V .26	V .15	I .40	V .14	V .32	V .39	V .30
8	F .20	C .07	K .14	C .09	I .11	P .20	L .05	I .10	I .20	I .14	U .40	C .13	I .29	I .27	I .24
9	G .20	B .05	C .10	I .08	C .10	Q .20	Q .05	G .09	G .13	G .09	B .20	I .10	C .14	C .21	C .17
10	I .20	Q .05	X .005	M 0	B .01	U .20	P .02	B .05	C .12	C .08	E .20	Q .10	G .09	G .13	G .9
11	J .20	W .05	B 0	X 0	H .01	B 0	W .02	X .05	M .009	X .04	G .20	W .07	X .06	M .009	X .04
12	O .20	I 0	G 0	G 0	F .005	E 0	B 0	C .04	X .009	Q .01	J .20	B .05	B .05	X .009	B .04
13	U .20	L 0			G .005	G 0	V 0			W .01	O .20	L .05	F 0	B 0	H .02
14	P 0				J .005	J 0				F .005	P .20	F 0	H 0	F 0	Q .02
15	Q 0				O .005	O 0				H .005	Q .20	G 0	J 0	H 0	F .01
16					Q .005					L .005	L 0	H 0	L 0	J 0	W .01
17					W .005					M .004	M 0	M 0	M 0	L 0	O .005
18					X .003					B 0	N 0	N 0	N 0	N 0	J .005
19					M 0					J 0	R 0	O 0	O 0	O 0	L .005
20										O 0	S 0	R 0	Q 0	Q 0	M .004
21											V 0	S 0	R 0	R 0	N 0
22											W 0	X 0	S 0	S 0	R 0
23											X 0		W 0	W 0	S 0

*Figures represent the avorage number of lots per family per visited month of the designated bean.

TABLE 35: RANK ORDERING BASED ON MONTHLY INCIDENCE OF TYPES ACROSS ALL FAMILIES*--RUMPHI

	Single					Mixed					Single/Mixed				
Rank	1982	1984	1985	1986	All 4 Years	1982	1984	1985	1986	All 4 Years	1982	1984	1985	1986	All 4 Years
1	A .62	A .50	A .40	U .32	A .41	P .50	A 1.25	A 1.08	A 1.09	A 1.15	A .87	A 1.75	A 1.48	A 1.38	A 1.57
2	P .37	P .38	P .36	A .30	P .33	U .50	P .79	U .74	P .68	U .67	P .87	P 1.17	U 1.07	P .97	U 1.01
3	F .25	U .29	U .34	P .28	U .33	A .25	U .78	D .60	F .59	P .65	U .62	U 1.07	P .91	F .83	P .98
4	V .25	K .12	F .26	F .24	F .25	F .25	D .77	K .56	K .59	D .64	F .50	D .85	F .80	U .81	F .84
5	B .12	D .08	K .13	M .15	K .11	C .12	F .68	P .55	D .53	F .59	D .25	F .76	K .68	K .68	D .67
6	D .12	F .08	M .11	K .09	M .07	D .12	B .52	F .54	U .49	K .56	L .25	K .64	D .60	D .54	K .67
7	G .12	O .06	X .11	B .06	O .07	H .12	K .51	B .49	B .46	B .47	V .25	B .55	B .49	B .51	B .48
8	J .12	C .04	O .08	J .06	D .04	K .12	C .33	C .27	C .37	C .31	X .25	C .37	X .34	M .47	C .32
9	L .12	B .03	E .06	O .04	X .04	L .12	J .26	X .23	M .32	M .24	B .12	J .26	O .29	C .37	M .31
10	O .12	H 0	I .05	I .03	I .02	Q .12	M .25	O .21	O .18	X .18	C .12	M .25	C .27	O .22	O .24
11	U .12	J 0	S .02	X .03	V .02	X .12	W .25	V .21	J .12	O .17	G .12	W .25	M .24	J .18	X .22
12	X .12	L 0	V .01	D .01	B .01	B 0	V .21	J .15	V .12	V .16	H .12	O .22	V .21	X .15	V .17
13	C 0	M 0	B 0	W .01	C .01	G 0	O .17	M .13	X .12	J .15	J .12	V .21	J .15	V .12	J .16
14	H 0	R 0	C 0	C 0	E .01	H 0	X .08	S .12	S .10	W .11	K .12	X .08	S .14	S .10	W .11
15	K 0	S 0	D 0	G 0	G .01	O 0	R .07	R .11	G .06	R .08	O .12	R .07	R .11	W .07	R .08
16	Q 0	V 0	J 0	L 0	J .01	V 0	H .04	L .07	R .06	S .07	Q .12	H .04	E .10	I .06	S .08
17		W 0	L 0	R 0	L .01		S .04	W .04	W .06	L .06	E 0	S .04	I .07	G .06	L .07
18		X 0	R 0	S 0	S .005		L .03	E .04	I .03	E .01	I 0	L .03	L .07	R .06	I .03
19			W 0	V 0	W .002			I .01	L .03	G .01	M 0	E 0	W .04	L .03	E .02
20					H 0					H .01	N 0	G 0	G 0	E 0	G .01
21					Q 0					I .01	R 0	I 0	H 0	H 0	H .01
22					R 0					Q .01	S 0	N 0	N 0	N 0	Q .01
23											W 0	Q 0	Q 0	Q 0	N 0

*Figures represent the average number of lots per family per visited month of the designated bean.

In Chitipa across all years, the major variety found in single variety form was D, followed in descending order by A, P, E, U and K. Within mixed lots across all years, the number one bean was K, followed in descending order by E, U, A, D and P. Thus, the dominant beans found as singles were also the beans that dominated as components of mixtures.

Taken together, the single/mixed total ranking in Chitipa across all years was D, A, E, K, U and P. Per family, per visited month, the average number of lots, either single or mixed, which had these beans were .92, .87, .85, .84, .81 and .74 respectively. Thus, most of the time the recorders visited any Chitipa family, these six beans were a part of the family's larder.

The single versus mixed state of several of the beans is worth special attention. For example, the preference for K in mixtures did not preclude its expression in single variety lots although to a more limited, but still respectable, degree. Further, anticipating a similar review of Rumphi varieties, it is worthwhile considering here the relative importance of E in Chitipa. Although stronger in mixed lots, E also appears to be popular in single form. It enjoys a more balanced position than K, which falls to eighth place among single varieties in 1985, struggling only to seventh place in 1986. Clearly, K's somewhat limited showing among single variety lots is offset by its very strong presence among mixtures. Except for 1982, E is more uniformly appreciated.

In Rumphi across all years, the major varieties found in single variety lots in descending order were A, P, U, F, K and M. Within mixed lots across all years, the major beans were A, U, P, D, F and K. Less balanced than in Chitipa, the distribution includes M among the top six only in single variety lots and D among the top six in mixtures. Clearly dominating among both single variety lots and mixtures, A and, to a lesser extent, U and P are the top varieties in both forms. Among singles, the next three in rank (F, K and M) are so much lower in their incidence as to suggest they do not warrant further attention. However, among these three is K which, as we have seen, is very popular in Chitipa albeit mostly in mixtures.

Taken together, the single/mixed total ranking in Rumphi across all years was A, U, P, F, D, K. Per family, per visited month, the average number of lots, either single or mixed, which had these beans were 1.57, 1.01, .98, .84, .67 and .67, respectively. The range is much wider than Chitipa, as the leader in Rumphi (A) is seen in many more lots than the Chitipa leader (D). At the lower level, Rumphi again supports the wider range by having the lower incidence of the sixth place bean (K) in comparison to Chitipa's bean in sixth place (P). Overall in Rumphi, A, U, P and to a lesser extent F were among the families' beans nearly every month that the recorders visited.

Among the Rumphi beans, K is ranked higher among the single lots than the mixtures, but its average score shows it to be much more prevalent among mixtures. Bean category E, which was among the popular varieties in Chitipa, was not observed in Rumphi at all. While it may have been present, its numbers were apparently not significant enough to attract the recorders' attention. Such number would not need to be large as this is a highly visible

bean, large and white with bold dark stripes. Interestingly, bean H however, which carries the zebra stripe of E (brown on brown), was in fact observed in Rumphi district but only in 1982 and 1984 and then only in mixtures.

Finally, F is a bean category that is by design the most heterogeneous of the top six which emerged. As indicated in the previous section of this report, F includes some beans which may in fact belong in category U. As such, it is less reliable. Further information on the beans named in category F is needed in order to clarify this issue.

Across both Chitipa and Rumphi Districts, a review of the top six bean categories has determined A, D, E, K, P and U as the major ones. Beans in these six categories will be the focus of attention for the remainder of this report, although others will be referred to as appropriate.

4. *Characteristics of the Categories*

Through questionnaires and casual conversations over time, characteristics of the beans observed were recorded. First are the reported characteristics of the top six bean categories as discussed in the previous section. This will be followed by brief mention of a few other beans where there is information of special interest. The production and post-production characteristics are those generally given for the beans classified in that category but may not hold for all beans included there. When there are contradictions, both points of view are given with the most frequent position given first. Where there is strong support among the women an asterisk is placed next to the response. No response was included unless at least two people supported it.

Category A

Production Characteristics
- *High yielding
- *Matures early
- *Good for dimba
- Good for dry season
- Resists too much rain
- *Doesn't climb

Non-Production Characteristics
- Shatters in field
- *Hard in storage
- Does not weevil fast
- Stores well
- Diseased--shrivels in storage
- Seeds crack in threshing
- Good appearance
- Sweet
- Tastes good/not good
- Tasty leaves/leaves not tasty
- Cooks fast

Comments

Any type of beans available she says she can plant. She won't stop planting Saaba (A) because she likes it because of its sweetness. Saaba is the only variety she has now. She planted dimba beans but finished eating much of them while fresh. She harvested them in January but only one bundle. She had Nyauzembe (P) and Sugar beans (U) but they didn't grow much. Saaba (A) did well where they were planted. She sold Saaba (A) because of poverty (2/7/84--PN9).

Saaba does not give high yield. She finished eating them while fresh because they look nice when cooked as if somebody had added oil therefore she can't keep them til harvest (2/9/84 GQ--N2).

She plants Saaba first because she wants to have for relish as they give bean leaves quickly. Then she sells Saaba because she doesn't like the beans (7/10/84--PN7).

Leaves of Saaba taste bitter when plant is podding. She eats all leaves but Saaba (8/4/84--PN4).

She has a mixture of Mzaza (F) and Saaba (A). She said they have good taste and nice smell (6/3/85--P10).

She plants A only for selling not eating because the whole family does not favor these beans but A mixed with P (9/13/85--M15).

She bought 20 cups of Mwikala for planting in dimba (10/2/85--M12).

Visitors looking to buy beans said they like Saaba because of its sweetness and gravy (11/20/85--PN6).

She used to plant a lot of different kinds of beans but now she has chosen the best two types Chikamboui (A) and Saaba Chimwera (F) because its high yielding, good taste, matures early, a lot of leaves in Chikamboui and are dwarf (12/4/85--P8).

She planted Saaba (A) and Nasaka (M) because they withstand heavy rains (1/13/86--PN1).

Mshisha (A--dark red) causes stomach problems (M6).

She does not like Mwikala (A) gives them to relatives and produces them for sale (1/4/85 GQ--M12).

Occasionally she gets Mwikala (A) in Mangulungulu (E) which she sells or gives to relatives (1/4/85 GQ--M12).

It's good for dimba because it doesn't climb so that stalks are not needed (6/7/84--M33).

Category D

Production Characteristics
- *High yielding
- Resistant to too much rain
- Early maturing
- Climber

Non-Production Characteristics
- *Shatters in field
- *Spoils in storage
- Hard in storage
- Seeds crack in threshing
- *Favorite for eating
- Best for children
- Does not cause health problems
- Tasty leaves
- Sours fast

Comments

Kayera (D) climbs and does not mature quickly so she says she will plant first (2/9/84 Q--N2).

When I visited one of her gardens I found the Kabaya was scattered here and there because they were very dry. Plenty of beans were lost in the field (7/22/85--M11).

She plucked bean leaves. She knows Kayera (D), Nyauzembe (P) and Chibeti (B) and others by their leaves but not Sugar beans (U) and Saaba (A) because their leaves look the same (11/8/85--PN6).

Doctor from Livingstonia wanted only white beans. She thinks that may be because the beans were for sick people in the hospital (11/8/85--PN6).

She had bought Kayera and planted them in a very small field. The rest of the beans have been reserved for March planting (2/4/86--PN8).

Category E

Production Characteristics
- ***High yielding**
- **Good for dry season**

Non-Production Characteristics
- ***Hard in storage**
- **Good appearance**
- **Cooks quickly**
- **Tastes good**
- **Good for children**

Comments

She will plant Mwikala (A) first because it is in small quantity but Mangulungulu (E) is the only plant that has yielded best (3/12/84 YQ--M22).

The beans were growing well especially Mangulungulu (E)(6/10/85--M5).

Alusha (E) is easily cooked (3/16/84 YQ--M25)

She is starting to plant Mwasipengile (U). She said she cannot plant Mangulungulu (E) earlier because there are too much rain so they don't grow well (4/7/86--M3).

She was planting 20 cups Mangulungulu (E) and 18 cups of Mabupula (V) (4/11/86--M7).

In storage only 25 cups of Mangulungulu remained while the others (including some E) were all planted (4/23/86--M7).

All beans planted except 5 cups of mixture (with Mangulungulu (E) included)(4/25/86--M1).

Occasionally gets Mwikala (A) in Mangulungulu (E) which she sells or gives to relatives (1/4/85 GQ--M12).

Category K

Production Characteristics	Non-Production Characteristics
*High yielding	Good appearance
*Early maturing	Favorite for eating
Does not climb	Cooks well
*Good for dimba	Good smell
Pest resistant	Liked by buyers
Easy to weed	Sours fast

Comments

She exchanged her Nyauzembe beans (P) for Ndozi (K). She said these beans yield more and are very tasty when cooked. She said they have the same taste as green peas (5/7/85--P2).

She got a lot more Sugar beans (U) and Ndozi (K) this year than last (6/10/86--P2).

Characterized in pilot study as fast cooking with good flavor, high yielding, disease resistant, early maturing and good for children.

Category P

Production Characteristics	Non-Production Characteristics
High yielding	Hard in storage
*Early maturing	Spoils in storage
*Good for dimba	Heavy when weighed at ADMARC
Dwarf	Tasty leaves
	Favorite for eating
	Cooks well
	Sweet

Comments

Nyauzembe does well whether too much rain or little (7/10/84 Q--PN7).

She said she likes leaves of Nyauzembe (P) best and she likes Mzimba (I) and Nyauzembe (P) because they are sweet (8/1/84--PN1).

She likes Nyauzembe (P) best because they are easily cooked, taste good, do well in storage and have weight (8/4/84--PN7).

She said she likes Nyauzembe (P) because they are so sweet and have even more weight at the market than Sugar beans (U)(8/4/84--PN2).

She planted Sugar beans (U) and Nyauzembe (P) given her by her married daughter when her beans were stolen (1/15/85--P2).

While helping her shell beans I have learned that some beans are harder than others when shelling e.g., Busale is harder than Kabaya (2/18/85--M12).

Beans they are planting now are the ones they harvested last year because these can stand too much rains (Busale) (4/22/85--M11).

She was sorting them out from a mixture (9/26/85--M7).

She has planted Saaba (A) and Nyauzembe (P) now growing with maize (planted two beans per station). She did not plant to get more beans in December but only for leaves to be eaten as vegetables (10/16/85--PN6).

She knows Nyauzembe by its leaves (11/8/85--PN6).

Her Busale (P) were uprooted by monkeys (12/12/85--M14).

Her maize garden is mixed with Chikamboui (A) and Nyauzembe (P)(1/22/86--P7).

She likes Nyauzembe (P) because of its high yield, nice taste and it keeps long although it takes a long time to cook (9/5/84--PN2).

She said some varieties do better even if there can be little rain. One of these varieties is Nyauzembe (P) (3/6/85--PN3).

Category U

Production Characteristics

- *High yielding
- Does not climb/climbers
- Early maturing
- Pest resistant
- *Good for dimba

Non-Production Characteristics

- Hard in storage
- Spoils in storage
- Gets diseased and shriveled
- Weevils
- Seeds crack in threshing
- Does not cause health problems
- Best for children
- Sweet
- *Good for eating
- Cooks well
- Sours fast
- Heavy when weighed at ADMARC

Comments

She said she likes sugar beans (U) for sale because they have more weight on scales at ADMARC (8/1/84--PN1).

She had a better bean harvest this year over last because the soil where she planted this year was more suitable for this variety (Sugar beans--U) which also needs medium rainfall but last year had a lot more rain than this year (8/15/84--PN3).

She knows (her other beans) by their leaves but not Sugar beans (U) and Saaba (A) because their leaves look the same (11/8/85--PN6).

She has Sugar beans (U). They are for eating and for sale. The first plot is for leaves only. Her second plot of Sugar beans (U) will be eaten while green (1/15/85--P2).

She planted Sugar beans (U) and Nyauzembe (P) given her by her married daughter when hers were stolen (1/15/85--P2).

Other bean categories

Mzimba (I)

She likes Mzimba (I) because they are sweet. Her Mzimba beans were seriously attacked by weevils she said because they had stayed in the field for a long time after maturity. This had not happened so quickly in the past. She had a much higher yield of them this year than last (8/1/84--PN1).

Chibeti (B)

One interesting thing was that all the varieties (Nyauzembe--P, Sugar beans--U, Saaba--A, white Saaba--C, Kayera--C, small Kayera--D and others) were mature and dry but Chibeti (P) which was still growing with leaves plucked heavily. She told us that leaves of Chibeti (B) are soft and sweet even if the plant can start pods but not leaves of other varieties like Saaba (A)(8/4/84--PN7).

Chimzimba (B)

Chimzimba are not tasty and have a bad smell. They are not for selling, she throws them away if they turn up or leaves them in the field (6/4/85 GQ--P3).

When beans that she doesn't like show up like Chimzimba she eats them (12/17/84 GQ--P5).

Masumbi ghaholo (W)

She likes these medium, white black-spotted beans because they cook quickly and taste sweet however they are readily attacked by weevils. She has selected them from her mixtures to plant in her dimba garden because of their growth habit (8/24/84-PN5).

5. *Crop Management*

The farmers in this research sample were quite sophisticated in their orientation to bean crop management. They sort their seed carefully, establishing that grower preference has a strong impact. When asked about this directly, the conversation initially centers on sorting for bean quality.

She sorts to remove the rotten ones which cannot grow (Q--M2).

She selects that they should all grow well and produce high yield. For if they just plant without selecting, some may not produce anything which will lead to low yields (8/21/84 GQ--M3).

She selects for good and health ones for planting and leaves the bad or rotten ones (2/1/85 GQ--M9).

She selects because poor beans don't produce, poor seeds bring poor yield (6/7/85 GQ--PN4).

There is also discussion of the mechanics of sorting.

> *In the afternoon she was sorting her bean mixture of Chikamboui and Saaba mwela. She was putting each in a different container to make it easy for planting. So she has two containers instead of one only (4/12/85--P8).*

> *She is sorting her mixtures (BA) for planting putting each in a different container. She will plant mid-December when the ridges are ready. She has three methods: (1) maize with beans in the same station, (2) maize and beans in the same garden but different planting stations--this gives high yield and easy harvesting she said, and (3) beans in their own garden in pure stand. She added that in pure stands beans change colors and shape (12/4/85--P2).*

> *She sorts beans--the best for storage and selling (and sometimes she cooks some--boiling only). The second grade she cooks--boils then removes the coats and mashes. The third grade she throws to the birds (6/18/85--P3).*

Gradually, the women come to the bases on which they sort for bean characteristics. They discuss the various reasons for post-harvest sorting.

> *She sorts her beans after harvest because some types are easily attacked by weevils so she is afraid that they can be transferred from that type to another one because they are not hard (2/28/85 GQ--M4).*

> *She sorts beans after harvest because some do not eat mixtures due to stomach problems (1/1/85 GQ--M1).*

They also discuss the bases of selecting planting stock.

> *She selects beans for planting in order to remove the climbers which are easily eaten by rats (1/2/85 GQ--M1).*

> *She selects planting seeds because some need to be in gardens which have got a lot of water. Some mature quicker than others. Some keep the vegetables (bean leaves) a long time without getting hard (2/5/85 GQ--M3).*

> *They select only the bush beans for dimbas because they are not eaten by rats (1/4/85 GQ--M12).*

> *She says she selects particular varieties for planting (1/7/85 GQ--M13).*

> *She selects beans for planting to find whether the bean variety is yield high or low (4/4/85 GQ--P1).*

> *When selecting beans for planting she looks for the ones which give her the best yield and have nice colors (11/29/85--M5).*

> *She sorts so that the beans that climb will be separated from those that don't (3/15/84--N9).*

Selects beans for good taste, easy harvesting and for selling (6/4/85--P1).

She selects beans that are high yielding and mature quickly (6/17/85 GQ--P2).

Some of the beans are climbers and some are not so when planted while it is mixed the beans that are climbers will strangle the non-climbers which will then reduce the yield (12/4/84 GQ--P2).

Selects planting beans to reduce labor and time (1/18/85 GQ--P3).

She is used to one kind only and they are easy to harvest (6/18/85 GQ--P3).

She selected Masumbi ghaholo from her mixtures to plant in her dimba garden because of its growth habit (8/24/84--PN3).

She planted the first plot of Sugar beans (U) for leaves only. The other plots of Sugar beans (U) are for eating and for sale. They have good taste and bring a good price at the market. Her second plot of U will be eaten while green (12/14-17/84--P5).

She said for upland planting she selects the type which she knows will provide her with high yield while in dimba gardens she plants the ones which provide her with a lot of vegetables with a good taste and not for yield (12/3/85--M7).

In the upland area she said she looks to the beans which give her high yield, size, which cook fast with good taste. In the dimba, she said she looks to the ones which give her a lot of vegetables with good taste (11/25/85--M1).

The sorting work may be quickly undone however by post-harvest handling necessitating a repeat of the process at the next planting season. Apparently the women feel the benefits are worth the effort.

She says she planted the different varieties separately but they got mixed in threshing (8/24/84--PN5).

When carrying her beans home they mix them together to save time (YQ--P4).

She said she usually sorts her beans each variety separately but they get mixed when harvesting. She told us she does not have enough power to have a big field of beans so where she has prepared her bean garden she plants each variety in about 10-15 ridges and when harvesting she forgets (or is not concerned with or cannot be bothered with) *that she had planted different varieties (8/15/84--PN2).*

Grading and sorting are among an array of bean management activities observed over the course of this study. Tables 36 (Chitipa) and 37 (Rumphi) list these activities and present the average percent months visited families were observed to be engaged in them. There was a district difference.

TABLE 36: AVERAGE PERCENT MONTHS VISITED FAMILIES WERE OBSERVED TO HAVE BEANS IN THE DESIGNATED CONDITIONS—CHITIPA 1984-1986

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grading/Sorting	0	0	7	3	0	0	0	0	6	0	0	0
Planting	0	0	7	45	6	0	0	0	11	0	25	19
Weeding	0	0	0	0	3	0	0	0	0	0	0	0
Growing	96	80	31	64	100	100	97	47	28	47	56	94
Harvesting	3	47	14	0	0	0	9	21	6	0	0	0
Drying	3	47	28	3	0	0	9	58	22	0	0	0
Threshing/Shelling	3	13	7	0	0	0	0	5	0	0	0	0
Storage	27	77	100	97	22	6	6	89	94	93	94	25
Holding	17	0	0	3	6	19	15	0	0	0	0	19
Cooking/Eating	20	43	21	12	3	8	15	37	39	27	31	31
Selling/Exchanging	0	3	3	3	0	0	0	5	6	0	0	0
Giving Away	3	3	0	0	0	0	0	0	0	0	6	0
Buying	0	7	0	0	0	0	0	5	17	13	6	0
Receiving	0	0	3	0	0	0	0	0	0	0	0	0
Family Observation Months in Designated Period—All Years	30	30	29	33	32	36	33	19	18	15	16	16

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TABLE 37: AVERAGE PERCENT OF MONTHS VISITED FAMILIES WERE OBSERVED TO HAVE BEANS IN THE DESIGNATED CONDITIONS—RUMPHI 1984-1986

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grading/Sorting	0	0	0	3	3	2	0	0	0	0	0	7
Planting	0	0	3	20	0	0	0	0	0	0	0	27
Weeding	0	0	0	0	0	0	0	0	0	0	0	0
Growing	100	100	77	74	72	65	42	40	8	9	12	33
Harvesting	0	5	19	14	6	10	18	15	8	0	0	0
Drying	5	5	32	51	33	30	55	45	15	9	0	0
Threshing/Shelling	0	0	3	9	6	0	3	5	0	0	0	7
Storage	37	21	52	54	19	32	48	80	69	82	87	87
Holding	11	5	3	0	14	2	3	0	0	0	0	0
Cooking/Eating	5	16	29	14	19	5	24	25	15	9	12	13
Selling/Exchanging	0	0	0	11	25	12	9	0	23	9	12	0
Giving Away	0	0	0	0	0	0	0	0	0	0	12	0
Buying	0	0	0	0	0	0	0	0	0	0	0	0
Receiving	0	0	0	3	3	0	0	0	0	0	0	0
Family Observation Months in Designated Period—All Years	19	19	31	35	36	40	33	20	13	11	8	15

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In Chitipa, bean grading and sorting as a post-harvest/pre-planting maneuver was observed heaviest in March, tailing off in April. This appropriately comes between the peak bean harvesting month, February, and the peak bean planting month, April. There is also grading and sorting in September, which is a month away from the rainy season planting period but right at the end of the second season harvesting. Unlike the earlier period when harvesting and planting are back-to-back or overlapping, the second season's activities demonstrate that the grading and sorting is more a post-harvest than a pre-planting phenomenon. Overlapping with the September dimba planting, which is generally the smallest planting period, the September sorting suggests there may be at least some minimal relationship between these two.

A similar, although more extended, picture is shown in the data from Rumphi. It should be remembered that these are averages of actual sightings of family activities and, as such, may have many gaps in their reflection of what actually happened. They are only a minimum, i.e., at least, there was this level of activity. Thus, the sparse reporting of planting in relation to harvesting likely reflects some of those gaps although it is also likely that it reflects the extent to which there is delayed harvesting in Rumphi.

Although in May some bean weeding is reported in Chitipa, both districts' observations verify the women's earlier reports that they can only weed beans which are planted together with maize (rainy season crop). They apparently do not, for the most part, weed second-season beans planted alone.

In both districts there were peak bean-growing seasons but some families in these districts were able to have beans growing across all twelve months. Especially during the dimba these bean sightings likely do not always represent sizeable potential harvests but instead family consumption opportunities. That is, during periods when reputable yields may not be possible, the families may still get enough fresh beans and/or bean leaves to provide for their need for relish. The data on bean growing also suggest more limited dimba activity (September, October, November) in Rumphi than in Chitipa, a finding likely reflective of the difference in terrain.

Drying is a problem for the first season crop that matures before the end of the rains. The district differences in these numbers may reflect the extent to which the rainy season crop provides the seed for the second season. Looked at another way, perhaps it is the extent to which the grain cannot be held easily during the moist period but instead can be kept viable in some stage of production. Thus, in Chitipa rather than remaining in a state of being dried for a period of time, e.g., in piles on the veranda, they must be dried as quickly as possible either in the pod or shelled and then promptly planted again. Perhaps in Rumphi there is less urgency and the process can be extended over a longer period.

The previous point is supported by the amount of threshing/shelling seen in Chitipa in the month of February, the high drying month for that season. In Rumphi, there was almost no threshing/shelling in March even though the drying for that district increased then considerably. The second season threshing/shelling was essentially the same for both districts. For the end of the dimba season, however, the high level of this activity seen in December in

Rumphi in comparison to the level seen in Chitipa is interesting considering that the planting and growing figures suggest Chitipa had more dimba gardens. The explanation of this phenomenon may come from the conversations with the women in which they indicate that they eat from their dimba during this sparse period and thus there is little left to harvest, let alone dry and thresh. Apparently this is more so for Chitipa than for Rumphi. The amount of storage seen in Rumphi in December versus the amount seen then in Chitipa reinforce this point. The Rumphi women may also have stored their seeds in the pods and are finally threshing them just prior to immediate planting.

There is likely some confounding of data between drying and storage. While no lots were counted twice, the designation of their condition was sometimes quite difficult and eventually arbitrary. For example, beans left on the plants in the ground long after maturity one might code as no longer growing but drying. Beans harvested but left piled in the field for an extended period could also be called drying. When eventually picked up and carried back to the homestead where they were left for some time on the veranda until someone could thresh them could still be called drying. However, in either of these cases, they may actually have been very dry for some time. While waiting for planting, some beans were never really stored in the formal sense of the term. This was especially true of those dried as shelled beans in the kitchens and shortly replanted again before the end of the rains. Thus the coding decision was made—left on the plant a month past maturity was coded as drying (the recorders noted a certain amount of disturbance at seeing matured beans continually still in the field). Piled in the field, it was clear that harvesting was started but not completed and therefore the condition was coded as harvesting. Storage was the code used wherever the beans were after apparently dry and in their relatively permanent resting place before planting. Thus, storage was the least mutually exclusive of all the categories assessed. Nonetheless, the district figures show somewhat more variability in beans observed in storage in Chitipa (6 percent to 100 percent) than in Rumphi (19 percent to 87 percent).

Holding was a term decided upon for the amounts too small to call storage. Frequently the recorders indicated no beans in the household (except those growing in the field) but during the day the farmer went to the field and collected just enough to cook. These beans were no longer growing but, until cooked, it would be misleading to say the beans were in storage. Thus, where the amount was less than 10 cups, the condition was coded as holding. This category was not meant to imply ultimate destination (or origin) of the lots, only the relative amount was small enough that they were likely temporary. The co-variation between holding and storage reflects the increasing amounts in the lots as the harvests come in and, conversely, the return to small batches as the larder is depleted.

Observations of cooking/eating beans and/or bean leaves, as might be expected, generally follow the harvests in both Chitipa and Rumphi, the exception being during the months of October, November and December when there is no formal bean harvest in either region. As has been noted in Rumphi, they are likely eating from storage. In Chitipa, on the other hand, where they were observed to be doing more bean cooking/eating, they were likely doing so straight from their dimba gardens, a kind of *in vivo* storage.

Peak observations of selling or exchanging occurred following the harvesting seasons as might be anticipated, with more observed in Rumphi than Chitipa.

No buying was observed in Rumphi. Buying observed in Chitipa was heaviest in September and October. Again, this might well have been as much for the purpose of acquiring good quality and cheap planting seed from the recent harvest on the market as for eating.

Similarly, a few families were observed to have received gifts of beans in both districts. However, even though the beans are received during the planting periods, the numbers are quite small and could well have been related to family events such as funerals which, as earlier reported, were common in those months.

The families appear to have specific ideas about the most appropriate bean for the season. For the dimba or residual moisture season, the families had a strong consensus regarding the most appropriate beans (Table 38). Both the Chitipa and the Rumphi respondents felt the bean most preferred was the large red kidney (A).

TABLE 38: BEAN GROUPS PREFERRED FOR DIMBA GARDENS

District	A	B	D	F	K	P	U	V	Total
Chitipa	16	0	0	0	11	2	11	0	40
Rumphi	8	3	1	2	0	5	1	1	21
Total	24	3	1	2	11	7	12	1	61

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The criteria used in Chitipa for choosing a dimba bean was recorded as: doesn't climb to other plants (8), ripens quickly (7) and high yielding (6). In Rumphi the responses that emerged were: suits the soil (3), high yielding (1), nice taste (1) and produces leaves (1). The two most critical characteristics seem to be growth habit that will not strangle the other vegetables also grown in the dimba garden and early maturing to provide food quickly and beat early rains which can flood the bottom land and make the way going down to the garden and back extremely treacherous. Those of the top six in the dimba-preferred group generally fit that bill. The exception is D, a climber, which is rated very low. E, which is neither early nor bush type, is conspicuous by its absence from the Chitipa list. B, D, F and V were of interest to no one in Chitipa for dimba gardens and K was of interest to no one in Rumphi.

As was indicated, most of the families who have them, eat directly from their dimbas, harvesting as needed.

She is cooking fresh beans from her dimba. The yield is good although some are eaten by rats (1/7/86--P4).

She is harvesting dimba maize for nsima (2/6/86--PN2).

However, most expect very little in the way of dimba grain yield. They frequently, therefore, concentrate on generating leaves as a spinach-type vegetable which will make a tasty relish or sauce for nsima. Frequently these plants, harvested regularly, must get them through until the rainy season crop can be harvested fresh.

In January her harvest (dimba) *was poor because of trouble with too much rain when drying them so as a result they started germinating. Earlier there was too much sunshine so as a result the dimba where they were grown was very dry (GQ--M12).*

She has planted Saaba (A) and Nyauzembe (P) now growing with maize (planted two beans per station). She did not plant to get more beans in December but only for leaves to be eaten as vegetables. She plants always during this season provided she has beans (10/16/85--PN6).

She says this time of year she has no relish problem because she has bean leaves, local rape and pumpkin leaves (1/10/86--P7).

She picks one leaf from each plant, the top one and says she can pick again after one week (Q--M6).

Some beans are in storage kept for eating and planting in the next rainy season while others are growing in dimba gardens ready for eating bean leaves (9/25/85--M7).

She will plant beans and maize in dimba, the beans for leaves eaten as vegetable (11/16/85--PN6).

She is eating dimba leaves (11/20/85--M6).

Dividing the seed beans between the dimba planting and the next rainy season planting is a critical task in crop management.

Beans are still being planted in dimba gardens and others are in storage kept for eating and for planting next season (9/19/85--M3).

She has reserved two plates full of dimba planted beans for planting in March. She did not harvest enough beans in the dimba garden (1/9/86--PN7).

Beans are in storage for rainy season planting others are in dimba (11/4/85--M2).

The farmers were asked their favorite bean varieties for the rainy season (Table 39).

TABLE 39: BEAN GROUPS PREFERRED FOR RAINY SEASON

District	A	B	D	E	F	K	P	U	V	Total
Chitipa	7	0	8	6	0	5	6	4	2	38
Rumphi	8	3	3	0	2	1	6	8	0	31
Total	15	3	11	6	2	6	12	12	2	69

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Again, the large red kidney (A) is the favorite as could be expected. Next in rank are the old favorites P, U, D and K but now E has been added in Chitipa. D and V (but not B and F) have found interest in Chitipa for this season. In Rumphi, K attracted limited interest but V was not mentioned this time.

As earlier reported, beans during this rainy season are frequently intercropped with maize. The women have developed appropriate techniques for managing these two crops when grown in association.

> *She says planting too many climbers* (more than 3) *on the same ridge makes them easily attacked by rats and difficult to weed. They are also difficult to stake (12/12/85--M14).*

> *She has planted all of her beans--2 seeds per station. This time she has planted both dwarfs and climbers (1/13/86--P8).*

The association with maize not only makes multiple use of valuable land, it also is important for the beans to have an associated crop that can help take up the excess water of the rainy season. The farmer who was low on beans and tried to increase her supply for the March planting by planting in pure stand in December found it did not work.

> *With the rains she will plant in pure stand. She did not get much beans* (before). *After giving some to her children she will have only a few to plant in December and March. So she'll plant pure and some together with maize in order to have seed in March. She was planting maize but not beans in dimba (9/10/85--PN4).*

> *She told us that she had not found much beans in her maize garden because there had been a lot of rain this season (3/17/86--PN4).*

In addition to generating a new long-awaited food supply, this crop also must be managed so as to provide seed for the March/April planting if the storage from the previous year is insufficient. Apparently, yield from this season in some cases is also expected to provide seed for planting a year later, i.e., the next December. Seed management is a very important component of the cropping effort.

> *She separated the harvests (grown in the different plots) in storage to dry separately, one in shed, one on veranda. She would have dried*

them in the sun if there had been no rain. She will be checking on them there. When they are completely dry she will thresh them for selling and for storing for December/January planting (4/16/85--P2).

She plants in December so that she should find seeds to plant in April and after she has harvested these she keeps some in order to plant in December (3/15/84--N5).

She planted only Saaba (A) and Nasaka (M) reserving the others for March planting (1/15/86--PN3).

She bought Kayera (D) and planted them in a small field saving the others for March planting (2/4/86--PN8).

She is planting now and will be planting the sorted beans up to January (12/11/84--P4).

The second planting season, March/April (and, in some cases, May), is the most important. The yield may have to supply the family food through to the next February or March harvest a year later, provide seed for perhaps two planting periods (dimba and rainy season) and, if possible, generate a surplus for sale. It is frequent that the planting of this season's beans overlap with the harvesting of beans grown the previous season.

She has started harvesting her beans and already planted this season's beans and they are growing well (4/10/86--P6).

The beans that the women identified for this season are shown below (Table 40).

TABLE 40: BEAN GROUPS PREFERRED FOR SECOND SEASON

District	A	B	D	E	F	I	J	K	M	O	P	U	V	W	Total
Chitipa	11	0	15	11	0	1	0	13	0	0	5	12	2	1	71
Rumphi	15	6	8	0	3	0	2	3	5	2	11	12	3	1	71
Total	26	6	23	11	3	1	2	16	5	2	16	24	5	2	142

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The dominance of A has not changed nor has the more limited interest in U, D, P, K and E. In Chitipa, B and F are still not preferred. Nor are newly added J, M and O, although I and W have garnered a little interest. In Rumphi, J, M, V and W have found favor, but not E or I. It appears that across the seasons, with a growing number of bean categories preferred, there is greater support for increased heterogeneity. Apparently, from the dry residual moisture period through the heavy rains period to the somewhat mixed second season, the farmers have increasing degrees of freedom and can, therefore, consider more variables in their planting stock. As in the previous periods, seed management is critical.

She called us to see the beans she had kept and we were amazed to see that she was still keeping a number of bags. It is during the rainy season and nobody can expect such amounts. At this time they have started planting again but still they have plenty to eat (3/12/84--PN3).

The appropriateness of discussing bean production with representatives of the Traditional Authorities did not occur to the author until the analysis of these data. Issues concerning length of land assignments, fallow cycles and other topics related to land and soils management may well be relevant. Such discussions could generate important information for understanding Malawi's bean diversity. For example, as was shown, the northern Malawi families have a strong sense of community which includes mutual support among adults and especially among persons of the same gender. They were shown to share labor. They were shown to share yields. Is it possible that they also share land? If so, the question of who last planted beans on a particular plot, when and what types, might well fit another piece in the diversity puzzle.

6. *The Categories as Tools in Crop Management*

The major bean categories previously identified (A, D, E, K, P and U) are presented in Table 41 in a format compatible with Tables 36 and 37 that reviewed their condition (previous section). Consideration of these tables together will shed light on a number of questions.

In general, Table 41 shows that the six major bean groupings are found more in single lots in Chitipa than in Rumphi. That is to say, even though there are more single-variety lots in both districts as discussed and shown previously in Table 33, across those lots a given popular bean is more likely in Rumphi to be found in mixed than single-variety form. For example, a family may have three lots of beans, two of which are single-variety lots, say D and A. However, within the one mixed lot there are also P, E, U, K as well as D and A. The D and A single-versus-mixed ratio is even at 1:1 and the others are observed more in mixed than single form.

By referring concurrently to Tables 36 and 37, attention to the monthly columns in Table 41 down through the bean groups will suggest the relative involvement of specific bean groups in the production cycle. A summary of the data in Table 41 is provided for ease of comparing the two data sets (Table 42). For example, in 1984 in Chitipa, during the bean growing month of January, A and K were the most prevalent bean groups in single variety form and E the most prevalent in mixtures. For the heavy harvesting and drying month of February, the same was true. In March, however, perhaps as a result of some of the sorting going on that month according to Tables 36 and 37, D became the most prevalent single. The possibility of the role of sorting in this change is supported by the single/mixed distribution of D in February (.6 and .4 respectively) versus the comparable distribution in March (1.0 and 0). If, indeed, this is what happened, the question of why D was sorted out of the mixtures is answered by the next month's data.

In April the leading activities are planting and selling, and D is still the strongest single bean observed, K is the strongest bean in mixtures. In May, when the dominant condition for beans is growing, D is still observed as the

TABLE 41: AVERAGE MONTHLY INCIDENCE OF MAJOR BEANS (A, D, E, K, P, U) BY DISTRICT

Average Monthly Observations (Within A Family) of Major Beans by District, Month and Year

	1984												1985												1986						
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J
A--CHITIPA DISTRICT																															
Single	.8	.8	.6	.3	.2	.7	.6	.4	.3				.4	.6	.6	.4	.5	.5	.5	.4	.4	.5	.4	.4	.5	.5	.3	.3	.3	.3	.3
Mixed	.4	.4	.4	.4	.3	.2	.0	.2	.3				.2	.3	.4	.2	.2	.2	.2	.4	.5	.6	.6	.4	.6	.6	.4	.4	.4	.4	.4
Total	1.2	1.2	1.0	.7	.5	.9	.6	.6	.6				.6	.9	1.0	.6	.7	.7	.7	.8	.9	1.1	1.0	.8	1.1	1.1	.7	.7	.7	.7	.7
A--RUMPHI DISTRICT																															
Single	.2	.4	.7	.7	.8	.9	.7	.5	.2	.2		.4	.4	.2	.4	.3	.3	.3	.4	.3	.4	.4	.4	.5	.5	.5	.3	.4	.3	.2	.3
Mixed	1.2	1.2	2.0	1.7	1.3	1.2	1.4	3.2	2.6	2.5		1.8	2.0	1.2	1.6	1.4	1.6	1.2	1.2	1.2	1.2	.9	1.0	1.0	.9	.9	1.1	1.2	1.2	1.1	.7
Total	1.4	1.6	2.7	2.4	2.1	2.1	2.1	3.7	2.8	2.7		2.2	2.4	1.4	2.0	1.7	1.9	1.5	1.6	1.5	1.6	1.3	1.4	1.5	1.4	1.4	1.4	1.6	1.5	1.3	1.0
D--CHITIPA DISTRICT																															
Single	.6	.6	1.0	1.0	.7	1.3	1.2	.6	.7				.3	.4	.7	.5	.8	.7	.6	.6	.4	.4	.4	.4	.4	.5	.5	.4	.4	.4	.4
Mixed	.4	.4	.0	.1	.0	.0	.0	.0	.0				.5	.7	.8	.5	.4	.4	.4	.5	.5	.5	.5	.4	.4	.6	.4	.4	.4	.4	.4
Total	1.0	1.0	1.0	1.1	.7	1.3	1.2	.6	.7				.8	1.1	1.5	1.0	1.2	1.1	1.0	1.1	.9	.9	.9	.8	.8	1.1	.9	.8	.8	.8	.8
D--RUMPHI DISTRICT																															
Single	.0	.2	.1	.1	.2	.1	.1	.0	.0	.0		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0
Mixed	1.0	.8	.9	.9	.7	.7	.8	1.7	1.4	1.2		1.2	1.1	.8	1.1	.9	1.1	.7	.7	.6	.4	.3	.4	.3	.4	.4	.5	.6	.6	.6	.3
Total	1.0	1.0	1.0	1.0	.9	.8	.9	1.7	1.4	1.2		1.2	1.1	.8	1.1	.9	1.1	.7	.7	.6	.4	.3	.4	.3	.4	.4	.6	.6	.6	.6	.3
E--CHITIPA DISTRICT																															
Single	.4	.4	.6	.6	.5	.7	.8	.8	.7				.3	.2	.4	.4	.4	.4	.4	.3	.3	.3	.3	.2	.3	.4	.3	.3	.3	.3	.3
Mixed	.6	.6	.2	.1	.0	.0	.0	.2	.3				.4	.9	.9	.9	.7	.7	.7	.8	.7	.7	1.1	.7	.8	.9	.5	.7	.6	.7	.6
Total	1.0	1.0	.8	.7	.5	.7	.8	1.0	1.0				.7	1.1	1.3	1.3	1.1	1.1	1.1	1.1	1.0	1.0	1.4	.9	1.1	1.3	.8	1.0	.9	1.0	.9
E--RUMPHI DISTRICT																															
None observed																															
K--CHITIPA DISTRICT																															
Single	.8	.8	.4	.6	.3	.3	.2	.2	.0				.0	.0	.3	.2	.2	.3	.3	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2
Mixed	.2	.2	.4	.7	.3	.0	.0	.4	.7				.8	.9	1.3	1.0	.8	.6	.7	.6	.6	.6	.7	.6	.6	.7	.5	.6	.6	.7	.6
Total	1.0	1.0	.8	1.3	.6	.3	.2	.6	.7				.8	.9	1.6	1.2	1.0	.9	1.0	.7	.8	.7	.8	.7	.7	.8	.6	.7	.7	.8	.8
K--RUMPHI DISTRICT																															
Single	.0	.2	.2	.2	.3	.2	.2	.2	.2	.2		.0	.1	.0	.3	.2	.2	.2	.1	.1	.0	.0	.0	.2	.0	.0	.2	.2	.1	.1	.0
Mixed	.7	.8	1.1	.8	.6	.6	.6	1.7	1.8	1.2		.4	.9	.3	.7	.6	.7	.5	.6	.6	.5	.6	.5	.6	.5	.5	.5	.6	.7	.7	.6
Total	.7	1.0	1.3	1.0	.9	.8	.8	1.9	2.0	1.4		.4	1.0	.3	1.0	.8	.9	.7	.7	.7	.5	.6	.5	.8	.5	.5	.7	.8	.8	.8	.6
P--CHITIPA DISTRICT																															
Single	.0	.0	.4	.2	.3	.5	.6	.2	.0				.4	.6	.6	.3	.4	.5	.5	.4	.4	.4	.4	.4	.4	.4	.5	.4	.4	.4	.4
Mixed	.2	.2	.0	.0	.0	.0	.0	.0	.0				.2	.1	.2	.4	.3	.2	.2	.4	.3	.4	.5	.4	.5	.4	.3	.4	.4	.4	.4
Total	.2	.2	.4	.2	.3	.5	.6	.2	.0				.6	.7	.8	.7	.7	.7	.7	.8	.7	.8	.9	.8	.9	.8	.8	.8	.8	.8	.8
P--RUMPHI DISTRICT																															
Single	.0	.2	.4	.3	.7	.9	.8	.7	.2	.2		.2	.1	.0	.3	.2	.2	.5	.3	.3	.2	.3	.2	.5	.2	.2	.4	.2	.3	.2	.3
Mixed	1.5	1.4	1.2	1.3	.8	.7	.7	1.7	1.8	1.2		.8	1.0	.7	.9	1.0	.9	.6	.6	.4	.2	.3	.2	.4	.2	.2	.7	.8	.7	.7	.3
Total	1.5	1.6	1.6	1.6	1.5	1.6	1.5	2.4	2.0	1.4		1.0	1.1	.7	1.2	1.2	1.1	1.1	.9	.7	.4	.6	.4	.9	.4	.4	1.1	1.0	1.0	.9	.6
U--CHITIPA DISTRICT																															
Single	.4	.4	.2	.2	.3	1.0	1.0	.6	.3				.2	.3	.4	.5	.3	.2	.2	.1	.2	.3	.3	.2	.3	.2	.4	.4	.4	.4	.4
Mixed	.4	.4	.2	.6	.5	.2	.0	.4	.7				.7	.7	.7	.5	.5	.4	.4	.6	.7	.5	.6	.6	.6	.9	.3	.4	.4	.5	.6
Total	.8	.8	.4	.8	.8	1.2	1.0	1.0	1.0				.9	1.0	1.1	1.0	.8	.6	.6	.7	.9	.8	.9	.8	.9	1.1	.7	.8	.8	.9	1.0
U--RUMPHI DISTRICT																															
Single	.2	.0	.2	.2	.3	.3	.3	.2	.2	.2		.6	.3	.3	.6	.4	.4	.4	.4	.4	.5	.4	.5	.5	.5	.5	.4	.4	.3	.3	.4
Mixed	1.0	.8	.9	1.0	.8	.7	.7	1.5	1.8	1.5		1.0	1.1	1.0	.9	1.1	1.2	.9	.9	.7	.4	.4	.4	.5	.4	.4	.6	.6	.5	.4	.4
Total	1.2	.8	1.1	1.2	1.1	1.0	1.0	1.7	2.0	1.7		1.6	1.4	1.3	1.5	1.5	1.6	1.3	1.3	1.1	.9	.8	.9	1.0	.9	.9	1.0	1.0	.8	.7	.8

NOTE: These figures represent average lots per family per visited month.

TABLE 42: AVERAGE MONTHLY INCIDENCE OF MAJOR BEANS
SUMMARY SHEET LEADING BEAN CATEGORIES
1984-1986

		Chitipa			Rumphi		
		1984	1985	1986	1984	1985	1986
JAN	Single	AK	AP	A	AU	A	A
	Mixed	E	K	E	P	A	A
FEB	Single	AK	AP	AD	A	U	A
	Mixed	E	EK	EU	P	A	A
MAR	Single	D	D	DP	A	U	P
	Mixed	AK	K	EK	A	A	A
APR	Single	D	DU	DPU	A	U	A
	Mixed	K	K	E	A	A	A
MAY	Single	D	D	DPU	A	U	A
	Mixed	U	K	EK	A	A	A
JUNE	Single	D	D	DPU	A	P	U
	Mixed	AU	E	EK	A	A	A
JULY	Single	D	D		P	A	U
	Mixed	—	E		A	A	A
AUG	Single	E	D		P	U	
	Mixed	KU	E		A	A	
SEPT	Single	DE	ADP		AKPU	U	
	Mixed	KU	EU		A	A	
OCT	Single		A		AKPU	A	
	Mixed		E		A	A	
NOV	Single		AD			U	
	Mixed		K			A	
DEC	Single		ADP		U	A	
	Mixed		E		A	A	

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most prevalent single, and U is now the most prevalent bean in mixtures. The presence of U, a favorite for eating, may be reflective of the increase in holding (by definition, small quantities). These small lots may be beans collected for cooking. By this month of May, the planted beans may be advanced enough to provide fresh shell beans for immediate consumption. This possibility is supported by the leading beans from mixtures observed the next month, June, when holding increases considerably as do cooking and eating increase somewhat over the month before. The June beans are again D in single form, undoubtedly continuing to grow, and from within mixtures U and A--both well liked for eating. In July the leading position of D begins to decrease (down from 1.3 to 1.2) as does the condition score of growing. It is interesting that none of the six major beans were observed in mixtures during this month.

In August, a harvesting, drying and storage month, E becomes the most observed single and U and K the most observed beans from mixtures. Cooking and eating peak this month and next as U and K continue to be the leading bean of mixtures into September. D and E share first place among single lots then as buying and selling activities are initiated. Unfortunately, the data gathering ended for a few months at this point.

The 1985 and 1986 patterns for Chitipa were quite similar to 1984. Fortunately, in 1985 observations were made in the months of November and December (the rainy season planting months). From them one can see the beginning of the January pattern, just reviewed from 1984, in the prevalence of A and D as the leading singles in those months and, correspondingly, K and (in December) E as the leading mixed beans. Generally, year-to-year continuity is observed among the families.

The relationship of the Rumphi incidence data (Table 41) to the Rumphi conditions data (Table 37) is much less demonstrative because of the dominance of A in that district. For many months across the 1984-86 period, A is both the leading single and the leading mixed bean. While U and P (and on a couple of occasions, K) sometimes share the limelight, A is clearly an overwhelming presence among the families' bean lots in Rumphi.

A final set of reflections from Table 41 is worth attention, i.e., the average of the averages for singles/mixed each year. Table 43 shows that in Rumphi, a district which has demonstrated a propensity for mixtures, the total number of mixed lots, and therefore mixtures *per se*, is decreasing. At least this is true for mixtures with these bean groups in the sample for this time period. It is not possible to tell if this trend is real or only one part of a cycle. However, because of the importance of diversity, it is an issue worth watching carefully. Interestingly enough, the Chitipa trend is in the other direction, showing a move from greater single variety lots of the six beans to increasing representation of them among mixtures. As shown in Figures 12 through 23, pages 120 through 125, the single/mixed condition for the leading bean groups in both Chitipa and Rumphi is definitely dynamic.

> *I was surprised to see that most of her beans were mixtures this time. Last year Nyauzembe (P) and Saaba (A) were stored separately but this year Nyauzembe (P) has some Saaba (A) and Sugar beans (U) in it. And also her Saaba (A) has some Kayera (D), Sugar beans (U), Nyauzembe (P) and Choshi in it (8/13/85--PN3).*

TABLE 43: YEARLY AVERAGES OF MONTHLY BEAN INCIDENCE—1984-1986

			1984	1985	1986	Note
A	Chitipa	Single	.52	.47	.36	
		Mixed	.29	.35	.46	Changed more single to more mixed
		Total	.81	.82	.82	Total average lots same
	Rumphi	Single	.52	.36	.36	
		Mixed	1.83	1.29	1.01	Mixtures decreased
		Total	2.35	1.65	1.37	Total average lots decreased
D	Chitipa	Single	.86	.52	.43	
		Mixed	.10	.51	.43	Changed more single to balance
		Total	.96	1.03	.86	Total average lots fluctuate somewhat
	Rumphi	Single	.07	.00	.01	
		Mixed	1.03	.70	.49	Mixtures decreased
		Total	1.10	.70	.50	Total average lots decreased
E	Chitipa	Single	.61	.32	.31	
		Mixed	.22	.77	.69	Changed more single to more mixed
		Total	.83	1.09	1.00	Total average lots increase a little
	Rumphi	Single				
		Mixed	No E beans observed			
		Total				
K	Chitipa	Single	.40	.16	.11	
		Mixed	.32	.77	.61	Changed more single to more mixed
		Total	.72	.93	.72	Total average lots fluctuated
	Rumphi	Single	.17	.12	.09	
		Mixed	.94	.59	.59	Mixtures decreased
		Total	1.11	.71	.68	Total average lots decreased
P	Chitipa	Single	.24	.44	.41	
		Mixed	.04	.30	.40	Changed more single to balance
		Total	.28	.74	.81	Total average lots increased
	Rumphi	Single	.42	.26	.26	
		Mixed	1.19	.60	.51	Mixtures decreased
		Total	1.61	.86	.77	Total average lots decreased
U	Chitipa	Single	.49	.27	.36	
		Mixed	.38	.57	.53	Changed more single to more mixed
		Total	.87	.84	.89	Total average lots the same
	Rumphi	Single	.25	.42	.40	Singles increased
		Mixed	1.06	.79	.47	Mixtures decreased
		Total	1.31	1.21	.87	Total average lots decreased

FIGURE 12: CATEGORY A DISTRIBUTION IN SINGLE/MIXED FORM--CHITIPA DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984--July 1986

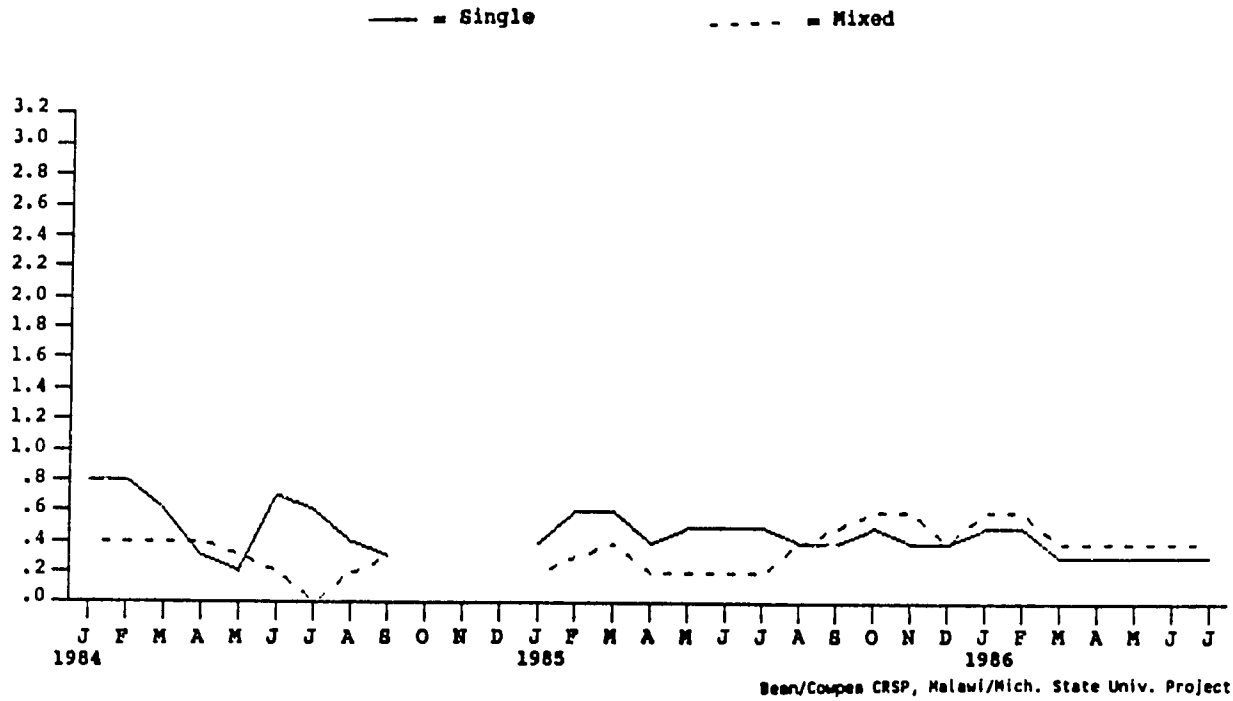


FIGURE 13: CATEGORY A DISTRIBUTION IN SINGLE/MIXED FORM--RUMPHI DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984--July 1986

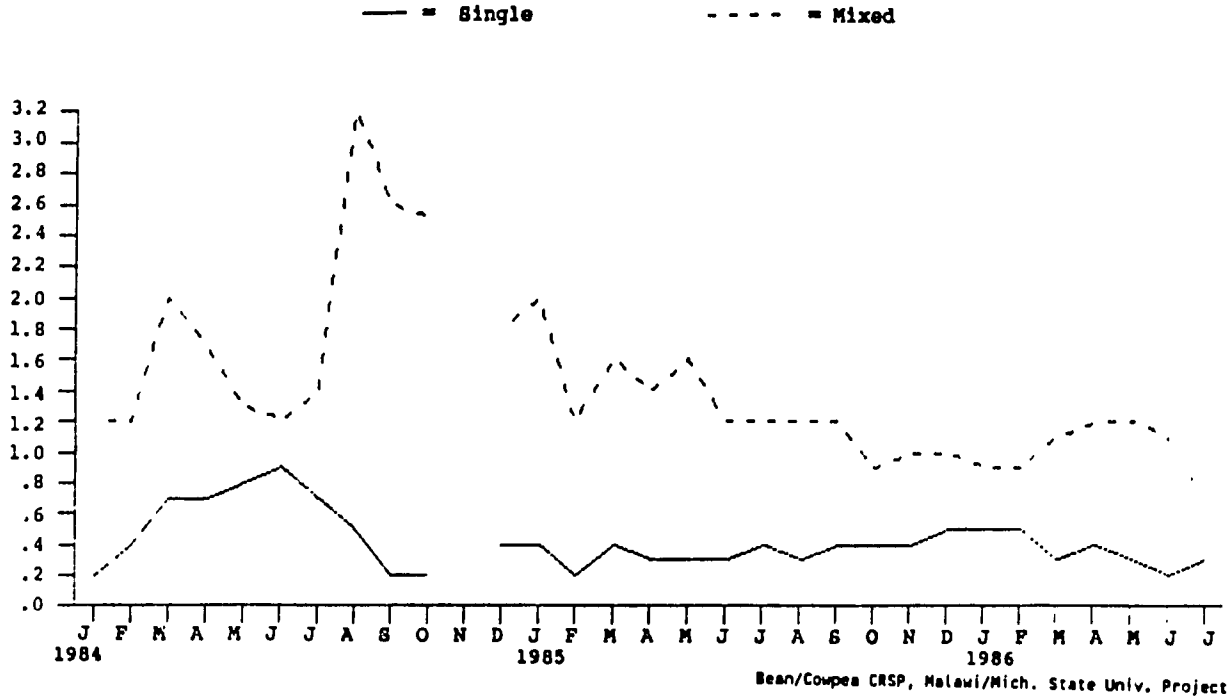


FIGURE 14: CATEGORY D DISTRIBUTION IN SINGLE/MIXED FORM--CHITIPA DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984--July 1986

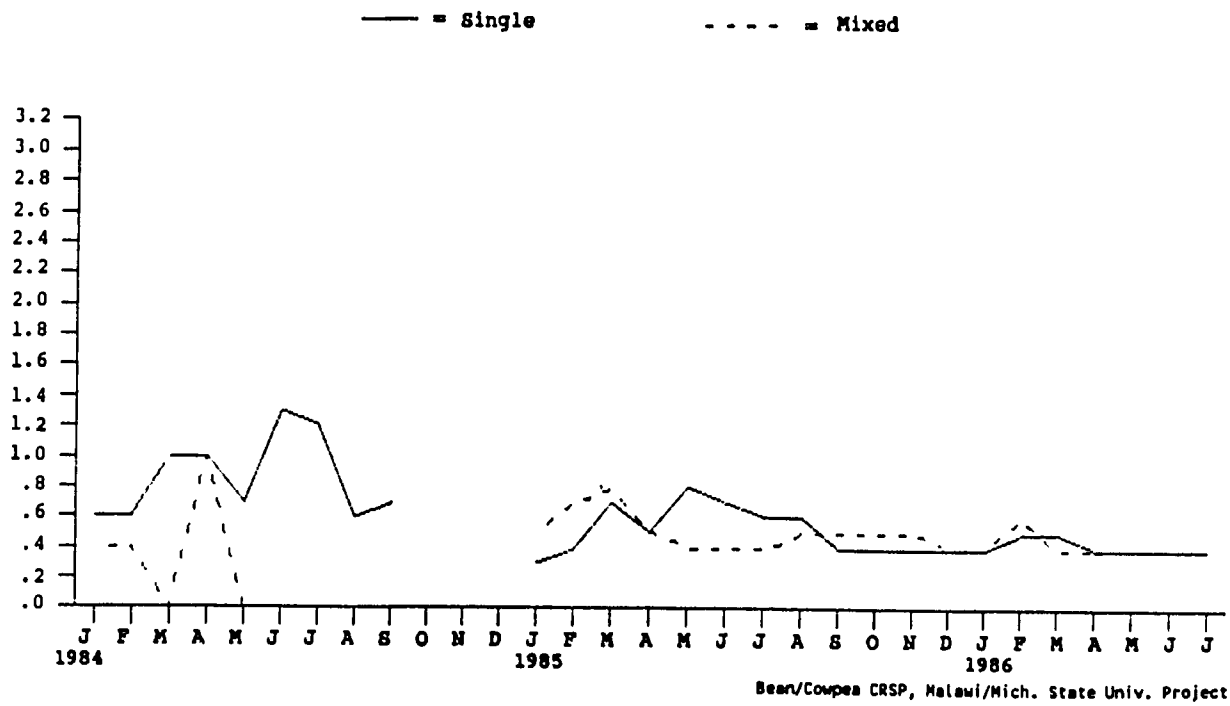


FIGURE 15: CATEGORY D DISTRIBUTION IN SINGLE/MIXED FORM--RUMPHI DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984--July 1986

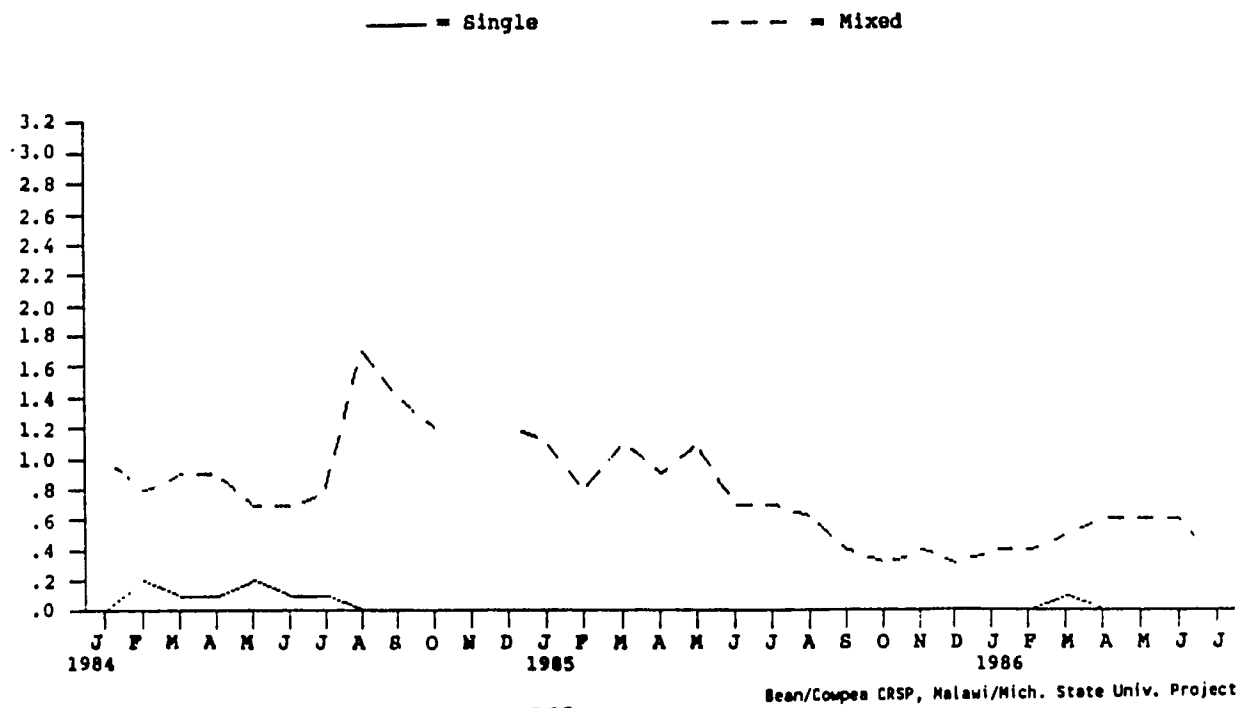


FIGURE 16: CATEGORY E DISTRIBUTION IN SINGLE/MIXED FORM—CHITIPA DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984—July 1986

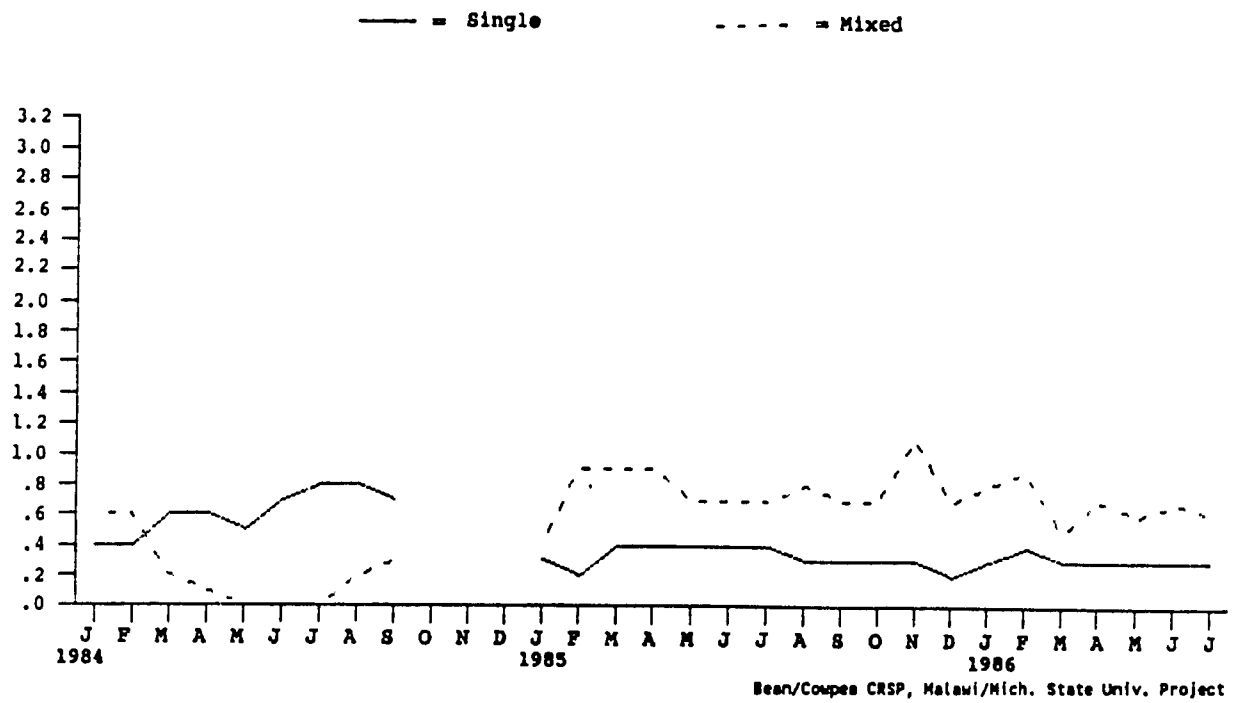


FIGURE 17: CATEGORY E DISTRIBUTION IN SINGLE/MIXED FORM—RUMPHI DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984—July 1986

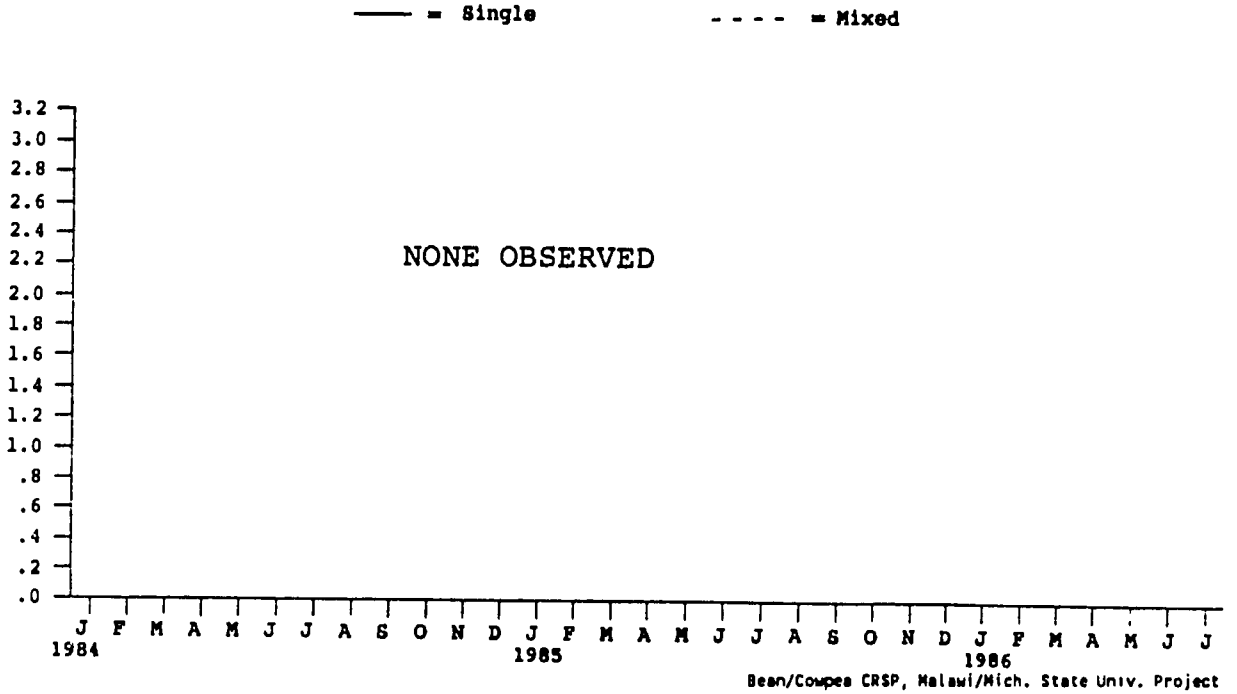


FIGURE 18: CATEGORY K DISTRIBUTION IN SINGLE/MIXED FORM--CHITIPA DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984—July 1986

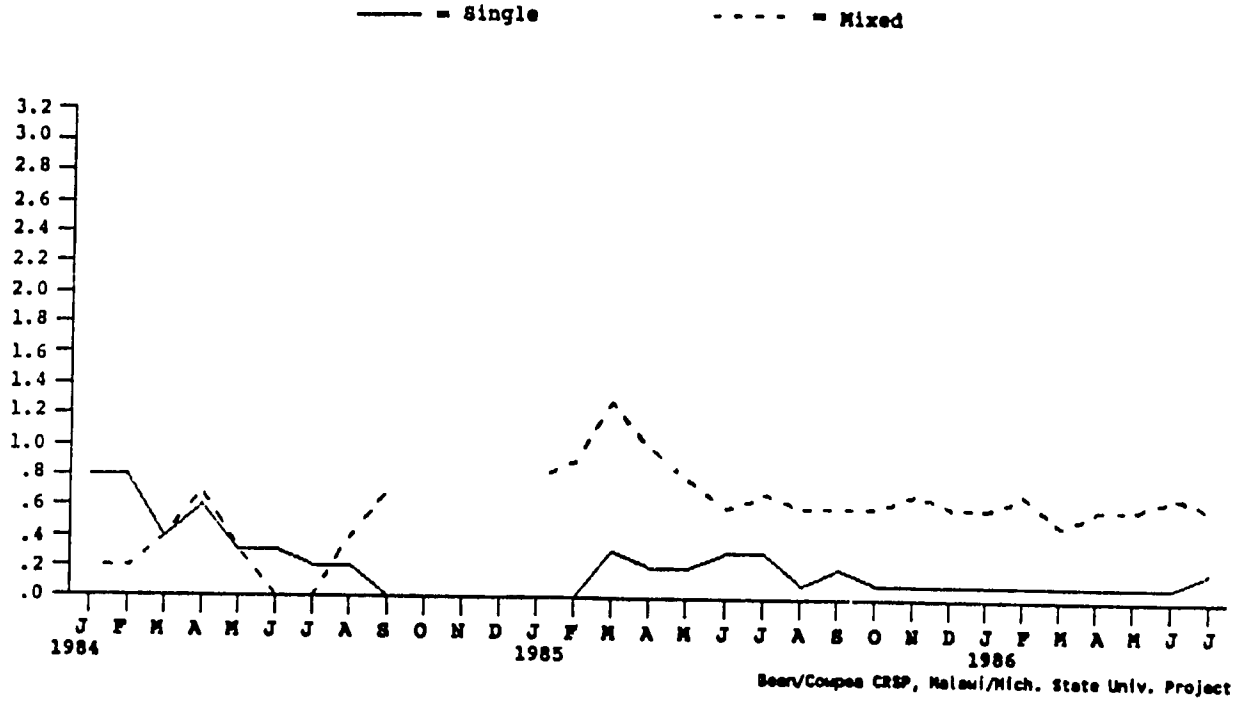


FIGURE 19: CATEGORY K DISTRIBUTION IN SINGLE/MIXED FORM--RUMPHI DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984—July 1986

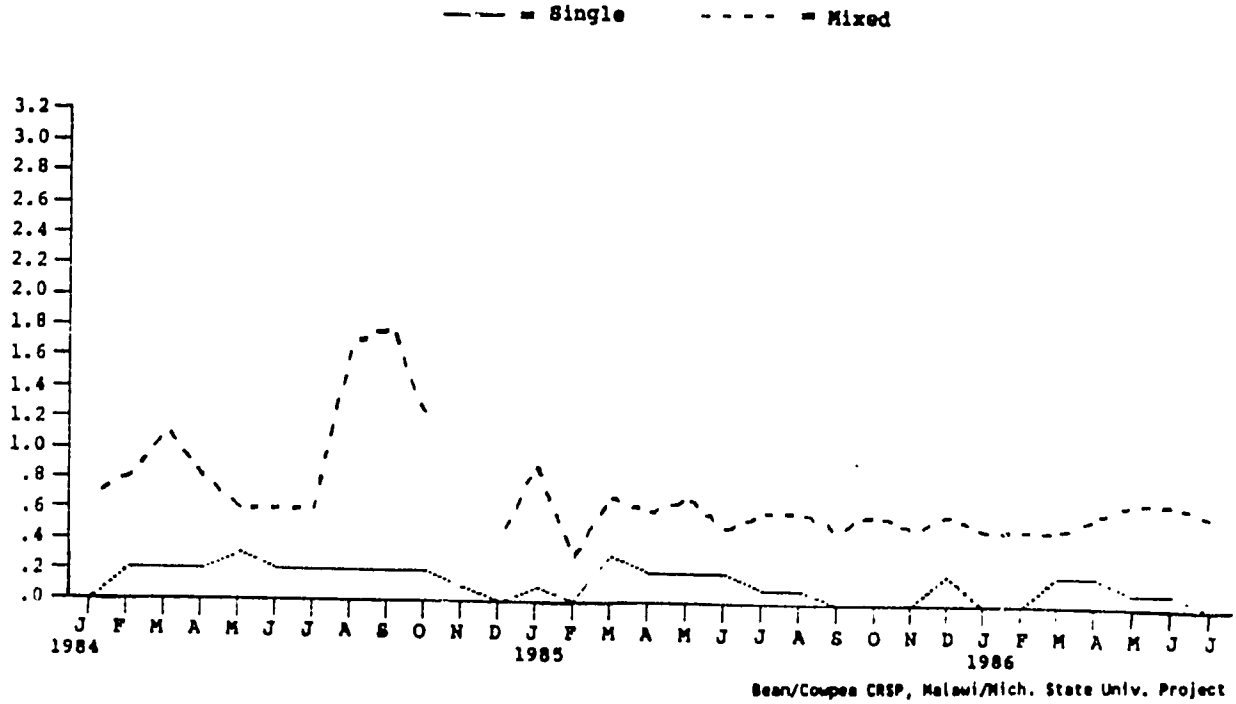


FIGURE 20: CATEGORY P DISTRIBUTION IN SINGLE/MIXED FORM--CHITIPA DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984--July 1986

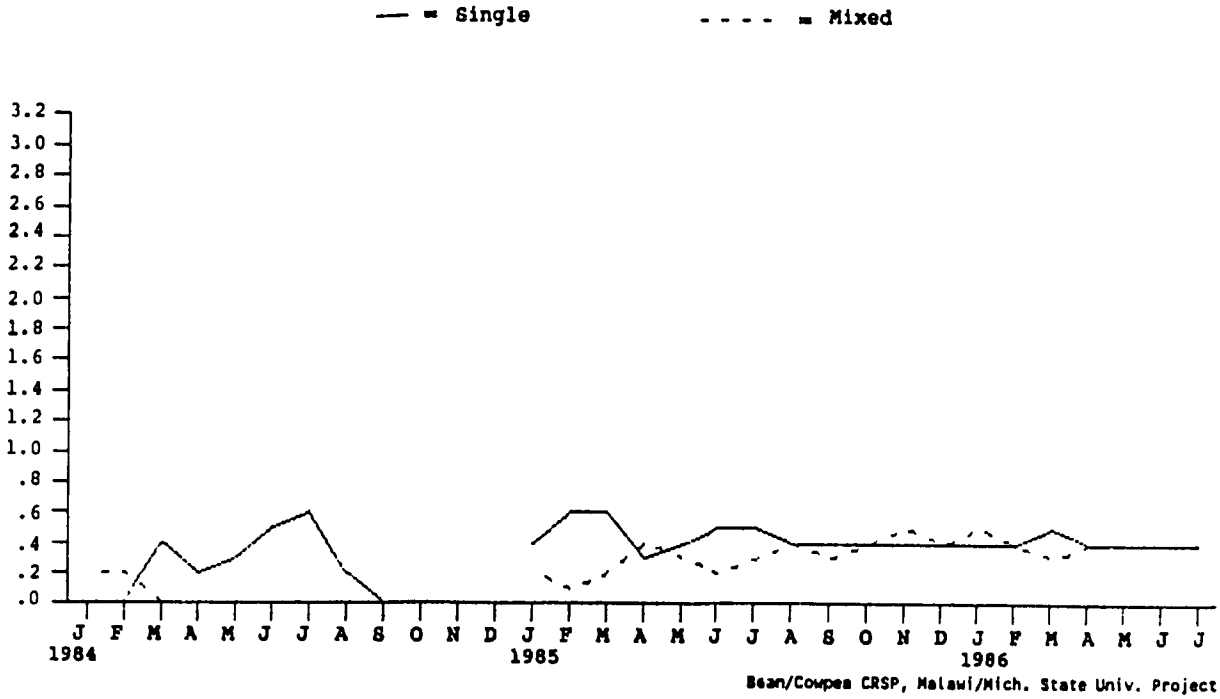


FIGURE 21: CATEGORY P DISTRIBUTION IN SINGLE/MIXED FORM--RUMPHI DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984--July 1986

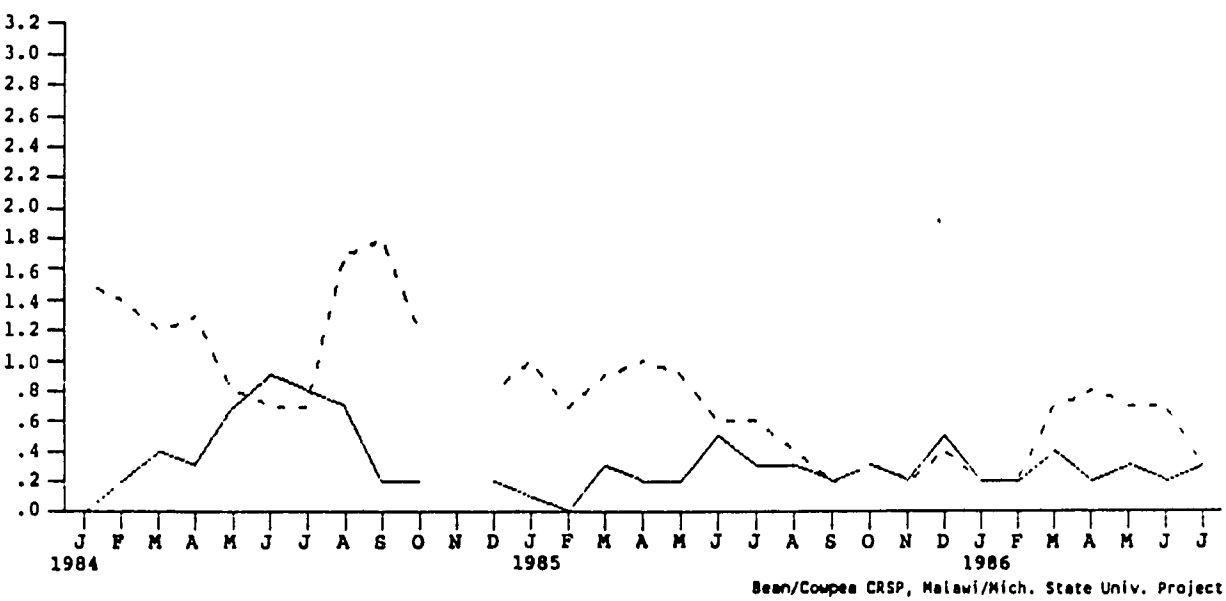


FIGURE 22: CATEGORY U DISTRIBUTION IN SINGLE/MIXED FORM--CHITIPA DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984--July 1986

——— = Single - - - - = Mixed

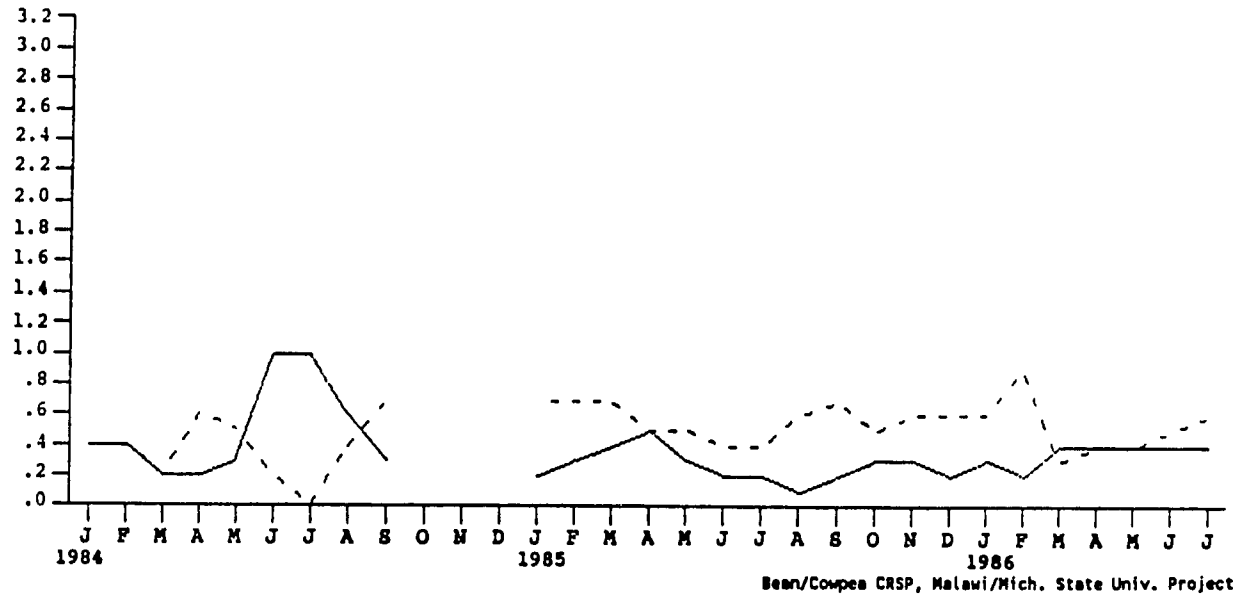
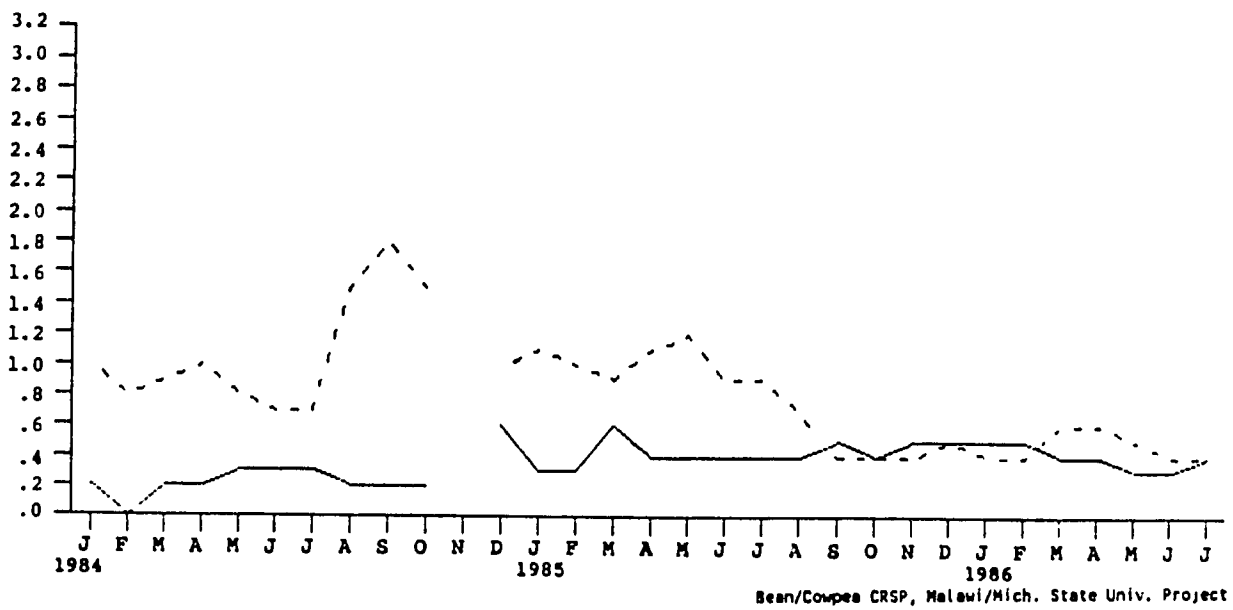


FIGURE 23: CATEGORY U DISTRIBUTION IN SINGLE/MIXED FORM--RUMPHI DISTRICT
Average Number of Lots Containing This Category per
Visited Family Each Month January 1984--July 1986

——— = Single - - - - = Mixed



The farmers have arranged their lives and activities to meet the demands of the seasons. As has been shown, providing for the family requires successful crop management that seizes every opportunity to optimize chances of strong yields across the production system.

> *She has planted Mzaza (F) with maize. They are weeding for the first time. She is planning to fertilize when the maize is knee high. This will be after the second weeding (1/21/86--P6).*
>
> *The family is always busy. They have no time to waste. Since it is a holiday all the children were busy for the whole day. She produced a high yield this season. She is a business woman. She produces a high yield every season but last season the yield was low because of the rains (5/5/86--M15).*
>
> *They are happy coz the rains have started. Soon they will start making ridges and expect to plant in mid-December (11/12/85--P8).*

7. *Prevalent Pairs*

Although single variety bean lots dominate among the families' beans observed, mixtures are also important. Across nearly all families, an average of one such lot was continually observed. A review of the bean catalog (Appendix 4) shows a wealth of combinations observed in mixtures. These mixtures, described and recorded, were made up of from two to sixteen varieties. Although the recorders did not document beyond 16 types in one lot, the full research team found mixtures with many more during earlier field assessment trips to the north. Following encounters with so many mixtures, eventually the question of randomness comes up and one is stimulated to ask if there could be any discernible patterns to the mixtures.

To answer the question of random vs pattern, an analysis of all possible paired combinations was run. The results of this effort, giving the top twenty pairs across the months with years collapsed, are shown in Tables 44 (Chitipa), 45 (Rumphi) and 46 (Chitipa/Rumphi together). YY in these tables refers to the number of bean combinations that do not exist in these data. This figure, which is quite high in the paired rankings (third overall), gives strong support to the likelihood that the pairs are not random. That is, the high percentage of YY cases means there were many possible combinations among the twenty-four bean categories that were not made.

Among the top twenty pairs, as could be anticipated, their composition was dominated by the six major bean groups previously identified. Their ranking as well as the percent of visited months in which the pairs were observed are presented. It is important to realize that frequently positions in ranking go in opposite directions from changes in percent since the rankings are only a statement of relative standing and the percentages refer to distribution. Across both districts (Table 46) and all months, the most frequently observed pair in the mixtures was UA recorded in 36 percent of all families per visited month. This pair was followed closely by UK, which was observed in the homes 35 percent of the visited months. These two pairs dominated the top two

TABLE 44: PAIRED BEAN COMBINATIONS MOST FREQUENTLY OBSERVED IN MIXTURES BY MONTH AND DISTRICT AND THE PERCENT OF FAMILY-VISITED MONTHS THE PAIRS WERE OBSERVED

Chitipa--Monthly Totals Across Years 1984-1986

JAN		FEB		MAR		APR		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV		DEC		TOTAL	
Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%
UK	43	ED	47	YY	34	UK	33	UK	38	YY	41	YY	36	UK	42	UK	44	UK	47	UK	44	UK	38	UK	37
ED	37	UK	37	ED	34	ED	30	ED	31	UK	30	UK	33	YY	37	UA	44	ED	40	ED	44	ED	38	ED	36
YY	30	UA	27	UK	28	YY	27	YY	25	ED	30	ED	33	UA	37	ED	39	UA	33	UA	38	YY	31	YY	31
UA	27	KE	27	KE	21	UA	21	UA	22	UA	22	UA	21	ED	37	YY	33	KA	33	KA	38	UA	31	UA	26
UP	20	KD	27	UA	17	PE	21	PE	22	KE	22	KE	21	KE	32	KA	33	YY	27	YY	31	PE	25	KE	22
KE	20	UD	23	KD	17	KA	21	KE	22	PE	19	PE	18	PE	26	PK	22	PE	27	PE	31	KE	25	PE	20
KA	20	UE	20	KA	17	KE	18	KD	22	KD	16	KD	15	KD	26	PE	22	PA	27	PK	25	KA	25	KA	20
PE	17	YY	17	PE	14	UE	15	PK	16	PK	14	KA	15	KA	26	KE	22	UE	20	PA	25	IE	19	KD	18
KD	17	PE	17	KG	14	KD	15	KA	16	KA	14	UE	12	UE	21	UE	17	PD	20	KE	25	VP	13	PK	15
UE	13	UP	13	UE	10	PK	12	UD	13	UE	11	PK	12	PK	21	PD	17	KE	20	UE	19	UP	13	UE	14
UD	13	PK	13	PK	10	VP	9	PD	13	PD	11	EA	12	PD	21	PA	17	DA	20	PD	19	UE	13	PD	12
PK	13	PD	13	KC	10	VE	9	KG	13	KG	11	VE	9	UP	16	KD	17	UP	13	KD	19	PK	13	PA	12
IE	13	PA	13	GE	10	UP	9	VE	9	EA	11	UP	9	UD	16	IE	17	UD	13	IE	19	PD	13	UD	12
PD	10	KA	13	VP	7	UD	9	UP	9	VE	8	UD	9	PA	16	UP	11	PK	13	VP	13	PA	13	UP	11
PA	10	IE	13	VK	7	PD	9	UE	9	UP	8	PD	9	EA	16	UD	11	KD	13	UP	13	KD	13	IE	10
ID	10	VP	10	VE	7	PA	9	PA	9	UD	8	PA	9	DA	16	ID	11	IE	13	UD	13	ID	13	EA	9
VP	7	VE	10	VA	7	KG	9	KC	9	PA	8	KG	9	UI	11	EA	11	ID	13	ID	13	VE	6	DA	9
DA	7	KG	10	UP	7	KC	9	GE	9	KC	8	KC	9	KI	11	DA	11	EA	13	EA	13	VA	6	KG	8
XB	3	ID	10	UD	7	EA	9	EA	9	GE	8	DA	9	XG	11	XB	5	XB	7	DA	13	UD	6	ID	8
WA	3	GE	10	PD	7	DA	9	DA	9	DA	8	VP	6	IE	11	VE	6	XA	7	VE	6	PI	6	VF	7

TABLE 45: PAIRED BEAN COMBINATIONS MOST FREQUENTLY OBSERVED IN MIXTURES BY MONTH AND DISTRICT AND THE PERCENT OF FAMILY-VISITED MONTHS THE PAIRS WERE OBSERVED

Rumphi--Monthly Totals Across Years 1984-1986

JAN		FEB		MAR		APR		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV		DEC		TOTAL	
Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%
DA	63	UA	47	DA	55	UA	57	DA	58	DA	48	DA	47	DA	60	UD	54	UD	45	YY	50	DA	50	DA	52
UA	58	FA	47	UA	52	PA	54	PA	50	PA	40	UD	44	UD	55	UA	54	UA	45	FA	50	YY	44	UA	47
UD	53	DA	47	PA	52	DA	54	UD	47	BA	40	UA	44	UA	55	DA	54	DA	45	DA	38	FA	44	PA	45
FA	47	YY	42	UD	45	UP	51	UA	47	YY	38	PA	44	PA	50	PA	46	YY	36	XU	25	UD	38	UD	44
DB	47	UP	42	PD	42	UD	49	UP	44	UD	36	FA	44	KA	50	FA	46	PA	36	XF	25	UA	38	FA	43
UP	42	UB	42	BA	42	PD	49	PD	44	UA	36	BA	44	FA	50	UP	38	KA	36	XD	25	VA	31	BA	40
PA	42	PB	42	UP	39	FA	46	DB	44	PD	36	YY	38	UP	45	UB	38	FA	36	XB	25	UP	31	UP	39
UF	37	PA	42	UB	39	KA	43	BA	44	DB	36	UP	38	UK	45	PD	38	AA	36	XA	25	PD	31	PD	39
UB	37	DB	42	KA	39	UF	40	KA	42	UP	33	KA	38	PK	45	KA	38	XU	27	VF	25	PA	31	DB	38
PD	37	BA	42	FA	39	PK	40	FA	42	PB	33	UK	34	PD	45	DB	38	XF	27	VA	25	XU	25	KA	37
FD	37	UF	37	DB	39	PB	40	UK	39	KA	33	UF	34	KD	45	BA	38	XD	27	UF	25	XF	25	YY	35
FB	37	UD	37	YY	35	DB	40	PK	39	FA	33	UB	34	BA	45	AA	38	XA	27	UD	25	XA	25	UB	35
BA	37	PD	37	PK	35	BA	40	PB	39	PK	31	PF	34	UB	40	UK	31	UP	27	UB	25	VF	25	PB	33
YY	32	FB	37	PB	35	UK	37	KD	39	KD	31	PD	34	PF	40	UF	31	UK	27	UA	25	UK	25	UK	33
UK	32	UK	32	UF	32	UB	37	UB	36	UK	29	PB	34	DB	40	PK	31	UF	27	FD	25	UF	25	UF	32
KA	32	UC	32	UK	29	PF	34	UF	33	UB	29	KD	34	UF	35	PB	31	UB	27	FB	25	UB	25	PK	32
XU	26	PF	32	PF	29	KD	31	YY	31	UF	24	DB	34	PB	35	KD	31	PK	27	DB	25	KD	25	KD	32
XF	26	KB	32	KD	29	YY	29	PF	31	PO	24	PK	31	KF	35	FD	31	PD	27	BA	25	KA	25	PF	29
XD	26	KA	32	FD	29	KF	29	KB	31	PF	24	FB	31	KB	35	YY	23	KD	27	AA	25	DB	25	FD	28
XA	26	FD	32	FB	26	FD	29	FD	31	OK	24	FD	28	YY	30	XU	23	FD	27	XV	13	BA	25	FB	27

TABLE 46: PAIRED BEAN COMBINATIONS MOST FREQUENTLY OBSERVED IN MIXTURES BY MONTH AND DISTRICT AND THE PERCENT OF FAMILY-VISITED MONTHS THE PAIRS WERE OBSERVED

Chitipa/Rumphi--Monthly Totals Across Years 1984-1986

JAN		FEB		MAR		APR		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV		DEC		TOTAL	
Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%	Pair	%
UK	39	UK	35	YY	35	UA	40	UK	38	YY	39	YY	37	UA	46	UA	48	UK	38	YY	38	YY	38	UA	36
UA	39	UA	35	UA	35	UK	35	UA	35	UK	29	UK	34	UK	44	UK	39	UA	38	UK	33	UA	34	UK	35
YY	31	UD	29	DA	32	PA	32	DA	35	UA	29	UA	32	KA	38	KA	35	KA	35	UA	33	UK	31	YY	33
UP	29	ED	29	PA	30	KA	32	UD	31	DA	29	DA	28	DA	38	YY	29	YY	31	KA	29	DA	28	DA	30
UD	29	YY	27	UK	28	DA	32	PA	31	PA	25	UD	26	UD	36	UD	29	PA	31	ED	29	KA	25	KA	28
DA	29	KD	27	KA	28	UP	31	KD	31	PD	24	PA	26	KD	36	PA	29	DA	31	PE	21	UP	22	PA	28
KA	24	UP	24	UD	27	UD	29	PD	29	KD	24	KA	26	YY	33	DA	29	UD	27	PA	21	UD	22	UD	27
PA	22	PA	24	PD	25	PD	29	KA	29	KA	24	KD	25	PK	33	PK	26	PD	23	DA	21	PD	22	PD	25
ED	22	PD	22	UP	23	YY	28	YY	28	UD	23	UP	23	PD	33	PD	26	ED	23	UD	17	PA	22	UP	25
PD	20	DA	22	PK	23	PK	26	UP	28	PK	23	PK	22	PA	33	UP	23	UP	19	PK	17	FA	22	KD	25
KD	20	KA	20	KD	23	KD	24	PK	28	UP	22	PD	22	UP	31	KD	23	PK	19	PD	17	VA	19	PK	23
PK	18	FA	18	BA	22	FA	24	DB	24	BA	22	FA	22	FA	26	ED	23	KD	19	KE	17	KD	19	FA	21
FA	18	UB	16	UB	20	UF	21	BA	24	DB	19	BA	22	BA	23	FA	19	XA	15	KD	17	ED	19	BA	19
DB	18	PK	16	FA	20	PB	21	FA	22	PB	18	ED	18	UB	21	UB	16	PE	15	FA	17	PK	16	ED	19
UF	14	PB	16	DB	20	DB	21	PB	21	FA	18	UF	17	PF	21	DB	16	FA	15	VA	13	XU	13	DB	18
UB	14	KE	16	PB	18	BA	21	UB	19	UB	15	UB	17	ED	21	BA	16	BA	15	UP	13	XF	13	UB	17
FD	14	DB	16	UF	17	UB	19	UF	18	ED	14	PF	17	DB	21	AA	16	AA	15	UE	13	XA	13	PB	16
FB	14	BA	16	ED	17	PF	18	PF	16	UF	13	PB	17	UF	18	UF	13	XU	12	IE	13	VP	13	UF	15
BA	14	VA	14	PF	15	KF	15	KC	16	PO	13	DB	17	PB	18	PE	13	XF	12	XU	8	VF	13	PF	14
KE	12	UF	14	KD	15	KC	15	KB	16	PF	13	FB	15	KF	18	PB	13	XD	12	XF	8	UF	13	FD	13

positions across the twelve months, except in March when UK fell to fourth place. UA, however, maintained the lead. This fall from grace in March and the high position of ED in February, even though not seen in Rumphi at all, suggests the need to look more closely at the individual district distributions.

In Chitipa (Table 44), the pairs UK and ED alternated with each other and led the pair rankings all months except August and September. For these two months UA edged out ED for second place. This happened even though the percentage of visited months for ED was higher than it had ever been during the year. It is not therefore that ED went down in popularity, in fact it went up. The phenomenon was the sudden rise in popularity of UA from 21 percent in July to 37 percent in August and on to 44 percent in September.

Throughout the Chitipa table, all possible paired combinations among the top six bean categories were present, although EA as the lowest frequently fell off the bottom. We should not, however, dismiss this pair too quickly. This combination is of interest because it represents extremes. That is, E is characterized by the farmers as not liking too much rain. On the other hand, A has been described as able to "withstand much rain." The pair also represents opposites on growth habit and length to maturity. Do the farmers deliberately put these two together? EA, which prior to April had not been on the chart at all, suddenly in June, July and August took giant steps up the family percentages even more than up the ranking ladder. It does not get near the top, of course, but this is still an interesting move, followed gradually by a return to its previous innocuous position. A glance at the conditions (Table 36) shows this to be the time of the second seasons' harvests coming in. It is difficult to see how their individual and opposite characteristics would be relevant and fuel a move at this time. Is one of the women's observations that "occasionally she gets Mwikala (A) in Mangulungulu (E) which she sells or gives to relatives (1/4/85 GQ--M12)" a clue here? If so and if it is common, she and her colleagues must quickly get it out since it falls of the bottom of the chart again by December. Further, why was this occurrence not noted in Rumphi, a district more enamored of A than Chitipa? Questions as to accidental, incidental or perhaps deliberate appearance of certain pairs on the chart must be examined both by biological and social scientists in later studies, perhaps in districts where incidence of pairings is higher and the reasons more obvious.

In Chitipa, no pairs were seen in 50 percent or more of the families in the combined years. However, not counting YY, at least one of the pairs does emerge in eleven of the twelve months, above the one-third level. That is, except for June, at least 33 percent of the families visited each month across years had a minimum of one pair in common in their mixtures. There was an average of 2.2 such common pairs per month with a range of 0 to 4 (Table 47).

TABLE 47: MOST COMMON PAIRS IN MIXTURES (YY OMITTED), CHITIPA, 1984-86

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Number at 33% and above	2	2	1	1	1	0	2	3	4	4	4	2
Pairs	UK	ED	ED	UK	UK	—	UK	UK	UK	UK	UK	UK
	ED	UK	—	—	—	—	ED	UA	UA	ED	ED	ED
	—	—	—	—	—	—	—	ED	ED	UA	UA	—
	—	—	—	—	—	—	—	—	KA	KA	KA	—

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

Three features emerged from this distribution. First, pairs held in common across families are extremely limited or non-existent March through June. Secondly, from transition months July and August there is an increase in the pairs held in common, with a high of four—the same four, in fact, for the months September, October and November. December, January and February are the transition months back to the previously mentioned low. Third, the increase in September, October and November, the dimba period, appears to be a reflection of the addition of A to the lots having UK and not the lots having ED, the two mutually exclusive pairs that dominate across the months. This is apparent because A with UK gives the pairs K with A and U with A seen in September, October and November. A quick reference back to Table 44 shows, during this same period, the ED/A matches (E with A, and D with A) down at seventeenth place or below. The exception here is DA which makes it up to eleventh place in October only, its high for the year. But that is another story.

The dimba increase in A is not unexpected given previous reports of its appropriateness for dimba gardens. It resists too much rain, perhaps late rains from the previous period percolating down into the dimba land. We know that beans characteristically do not like wet feet. It matures early, allowing the farmer to get in and out of that area in which it is very difficult to work and providing the family with relish quickly. It does not spread all over the other vegetables. The characteristics of U and K are somewhat similar, although apparently not as strong. Their paired association however brings to the union the additional features of digestibility and taste (some reported their families do not care for the taste of A). Matching A with D and E in the dimba garden is much less appropriate because the women say that E does not like too much rain and that it and D are not bush types.

Turning to Rumphi (Table 48), the picture is quite different. In Rumphi the paired combinations frequently reach 50 percent and, in two months, reach the 60s (January and August), the highest pair, DA, having an average over the months of 52 percent. On the other hand, four months lack pairs that reach the 50 percent level (February, June, July and October). It is interesting that contiguous to a month when there is low consensus is a month with the second highest consensus across the Rumphi families (July to August). The 33 percent level used in Chitipa is almost always exceeded in Rumphi. This wide distribution across pairs likely reflects the greater mixtures in Rumphi over Chitipa presented in Table 33. YY as an indicator of missing combinations, while on the chart, is much less prominent in Rumphi than in Chitipa.

TABLE 48: MOST COMMON PAIRS IN MIXTURES (YY OMITTED), RUMPHI, 1984-86

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Number at 33% and above	13	14	14	16	16	12	17	19	12	8	3	5
Number at 50% and above	3	0	3	4	2	0	0	6	3	0	2	1
Pairs at 50%	DA	—	DA	UA	DA	—	—	DA	UD	—	FA	DA
	UA	—	UA	PA	PA	—	—	UD	UA	—	—	
	UD	—	PA	DA		—	—	UA	DA	—	—	
	—	—	—	UP		—	—	PA		—	—	
	—	—	—	—		—	—	KA		—	—	
	—	—	—	—		—	—	FA		—	—	

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

The previously discussed dominance of A in Rumphi is apparent in this table. The only pair exclusive of A is UD in January and even then A is paired with each partner more often than the pair itself is observed.

The leading pair in Rumphi, DA, never fell below third place in the ranking although it obviously did fall below 50 percent in the distribution across families. UA, the second place pair, fluctuates much more, falling to fourteenth place in the month of November. Overall, there is quite a bit of variability in the rankings across the months, much more so than in Chitipa. The third place pair, PA, even falls off the table the month of November, a month in which many previously less significant pairs pushed their way to high positions.

These data for the month of November in Rumphi are interesting although they represent only one year (1985) and thus suggest the need for caution. According to Table 37, in November there is a small increase in growing (likely from the first families to begin their rainy season planting) and a small increase in storage (likely any dimba crop left which was finally harvested plus any beans that may have been purchased for planting as shown in Chitipa but unobserved in Rumphi). However, these occurrences seem too minimal to generate such turmoil among the November Rumphi pairs, but there is also the movement of beans among persons. Table 37 shows giving away (and likely receiving although this was not observed) and selling or exchanging during this month. If there were beans new to the receiving families or new components within newly received lots of mixtures basically thought to be common, this could influence the overall pattern.

The first X in Table 45 appears in twentieth place in September, matched with U in 23 percent of the families. In October a group of four (X with U, F, D and A) move up to 27 percent of the families. By November, the group of four has become a group of five (X with U, F, D, B and A) and moved down to 25 percent of the families, although up in ranking as most of the other pairs move down. In December, X in three pairs (U, F and A) has moved down, with two of the former X pairs not seen at all (X with D and B). They likely have not gone far down in the rankings below 20 however, as the group of four are seen again at the bottom of the chart in January. Because X is actually a

miscellaneous grouping of the less common small beans, it is surprising to see them so significant in November, a month that however also has 50 percent of the paired combinations not in existence (YY). The most likely interpretation of these data is that even though grading and sorting is not shown in Table 37 until December, sorting or unpairing was actually taking place earlier than that month. This interpretation is supported by the move of YY (the unpaired combinations) from 23 percent of the families in September to 36 percent and then 50 percent of the families in October and November, respectively. This rise in the unpaired to first place in November suggests that even though Rumphi has more mixed lots than single-variety lots (Table 33), some of the families may be either storing for March planting or planting in November at least a few of their beans as a single-variety crop.

The complex data in this section require statistical analysis and from it, a focus on the underlying biological and social factors which govern the trends observed.

VI. CONCLUSIONS

The potential for understanding bean diversity in northern Malawi has been greatly advanced by the contributions of the families there who participated in this research. By opening their homes to the research team and sharing their daily lives, they demonstrated the significance of beans as a savory food, vital in the consumption of the staple--maize, as a social currency and as a contributor to family income.

Virtually every section of this report speaks to the issue of selection, deliberate or inadvertent, and its role in the maintenance of genetic diversity. For example, within the complex farming system there were shown to be many ecological, social and agronomic variables to which the farmers had to respond. Each production decision required weighing a range of ecological variables such as soil quality, sunshine duration, daylengths, winds, heat and cold extremes, humidity potential and precipitation that might be expected. All of these elements often made significant demands on the plants. The farmer's role was to intervene on behalf of the crop through appropriate management. One tool in this management was shown repeatedly to be her attention to varietal selection in relation to season, location and timing of production activity.

Many social variables contributed to diversity. Beans were not just bought and sold. They were also used as a medium of exchange in bartering. They were contributed to church gatherings and agricultural shows. They were shared continually among relatives and friends. Their role as social currency was demonstrated often. Beans given to relatives were like money in the bank when one woman's harvest was stolen and her planting seed was replaced by her daughter. Beans given to a daughter-in-law were like an insurance policy for her old age when another woman's daughters all married and left, and her eventual hospital care was left to her son's wife. Beans were like an investment for the woman who, before selling her harvest, gave some to her neighbors "to taste." The value earned from these "tastes" became resources on which she could draw for family emergencies, e.g., communal work crews, support in times of ill health. Such sharing represented the dispersal of genetic material throughout the community.

The ability of certain varieties to withstand inadequate weeding, delayed harvesting or questionable storage technology was shown to be considered by the farmer in the selection process. These characteristics were especially important in the all too frequent circumstances of ill health, or even death, of members of the farming family.

The importance of domestic maintenance issues (e.g., long term quality in storage, ease of cooking, keeping quality as leftovers) were reported to have been a concern of some farmers. Because family consumption was the first priority for most of the families, considerable attention was given to varieties that could perform well. Nearly all of the families indicated that they sold beans if they produced enough and that the income from these sales was important to the family. Thus, selection as driven by market demands was also shown to be significant.

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Even though the farmers were fully aware of the many ecological constraints with which they had to work and the bean varieties they preferred, a range of agronomic variables also had to be considered. The integrated production cycles of each farmer's cash and food crops required land preparation, planting, crop maintenance and harvesting tasks for each of them. Varieties chosen were the most helpful if their characteristics fit within those requirements or if they could wait their turn for attention.

The women participating in the research indicated that, for the most part, their seed comes from their own harvests. This is more than just an economic gambit. By keeping her own seed stock, the farmer comes to understand thoroughly what can be expected from it. Over the years she has seen its performance in a number of circumstances. Undoubtedly she is also aware of its performance in the hands of neighbors and relatives to whom she has given it as gifts. Armed with this understanding of her seed and a best-guess judgment of how the elements will perform, she makes a long series of production decisions which she hopes will result in a successful harvest for the family.

Selection did not appear to be a matter of rejecting varieties; this happened naturally by default or by failure to thrive when selections were inappropriate. It appeared to be more a matter of multiple acceptance that supported the extensive diversity. No one variety performs uniformly well under all conditions nor, obviously, is everyone's culinary taste the same. Diversity in beans was shown to be an inexpensive investment. It was demonstrated to be an essential and flexible component in the limited resource system where family survival rests on the ability of the farmers to provide for their own needs.

A message that emerged from these data, not new but newly documented, was the insufficiency of single characteristics in bean selection, e.g., high yield. As was reported regarding the most popular varieties, they are all relatively high yielding but each under different circumstances. Like their high-tech hybrid cousins, these beans give their best performance under a particular set of conditions. The most common varieties also give a reasonably acceptable performance under conditions that are less than optimal. This secondary level of performance may be a major reason why the families have so many varieties. For families who often plant single variety lots, varieties coming together in mixtures was reported to be an artifact of harvesting and post-harvest handling. The likelihood of their being maintained as mixtures in such cases was as much a result of circumstances (i.e., time, energy, health) as it was of choice.

Early in this report the farmers' need for contingency plans was documented. Throughout the analysis, the contingency resource shown to be the most effective was the strong sense of community that exists among the farmers. The families vigorously nurtured this resource, often doing so at considerable expense to themselves individually. In the limited resource, rural setting, the potential for imminent reciprocity if one were to turn one's back on one's neighbors was a strong deterrent to selfishness.

An earlier draft of this report was shared with the former US Principal Investigator of the Malawi project, Dr. M. W. Adams. His comments as listed below and the author's responses (*) should help to continue discussions among biological and social scientists on factors which promote bean diversity in Malawi.

1. We found, in our 1982 trip in the North, a preponderance of mixtures as compared to singles. This might have been due to the fact that we were seeing beans harvested from the rainy season (December-March), inasmuch as we were there in March.

   *Yes, the women's reports that beans get mixed in harvesting even when they planted in single variety lots reinforces the likelihood of seeing mixtures at that time. However, Table 33 on page 95 shows that phenomenon only for Rumphi's PN families and for that season only in January and February. I am not bothered by the exact month which could be off a bit from one year to another because of the vagaries of weather. Why this phenomenon does not show up for other families is a bit of a mystery, especially since as was noted in the main text, it does show up quite strongly in Rumphi in September. Perhaps this picture would be clarified by consideration of the years individually rather than combined as in this table. This issue will be explored at a later time.

2. Apparently, the women bean growers actively intervene in the selection process. This, also apparently, takes two forms: (1) removing shriveled, diseased and weathered seeds before planting and (2) deciding to plant so much of U, A, D, E, etc.

   *Yes, but our level of understanding as presented in these data is still quite general. The challenge of devising a research design that generates more specific details regarding planting decisions is yet to be met. The project's research in the Central Region should further this effort.

3. The likes and dislikes are plainly felt by the respondents, but it is interesting that they continue to grow varieties that they, for one or more reasons, dislike. It seems that the opportunity of selling on the local market may override one's personal dislike and that use as a green vegetable (leaves) overrides dislikes.

   *I think dislike may be too strong a word in cases where there are other uses and eating the grain is the only thing a farmer does not do.

4. In nearly all cases, the respondent would say "yield" was a major reason for liking a particular type, and this overrode the disadvantages.

   *Yes, yield does seem to override many disadvantages but my sense from these data is that yield alone would be insufficient.

5. Selection was also often practiced for types that could withstand "too much rain" or, conversely, against types that could not stand "too much rain." One wonders what is really involved in this respect. Is it the disease factor associated with excess rain?

*It would have been useful, I think, to have added to the recorders' training program a section on sensitivity to disease problems and disease awareness among the farmers. It is possible that the farmers were more knowledgeable and concerned about disease than came through in these data. At least at a general level, this issue may be addressed through questionnaires. Perhaps again, the Central Region work can shed additional light.

6. One doesn't see any farmer perception that mixtures confer greater yields or greater stability, i.e., risk reduction.

   *As yet there is little to suggest farmer perception of risk reduction in mixtures *per se* over multiple single variety lots some of which are planted close to one another. However, there is more to be done with these data.

7. The occurrence of mixtures like DA in 33 percent or more households at certain times is puzzling. This represents a small white-seeded vine with a large red-seeded bush bean--not compatible plant or seed types and not types found together in Martin's 15 collections.

   *Not compatible plant or seed types but perhaps compatible or even complementary storage, taste or market types. Frankly, I also was expecting to see more pairs combined on the basis of compatible plant characteristics such as you mention. Further analysis of these data can show specific conditions for particular pairs which may help us unravel this issue.

8. Apparently, each woman, in making up her planting stock, although generally using the more common seed/plant types, has her own individual conception as to what makes the best mixture for her purposes and these purposes can be complex or multiple.

   *Yes, and it certainly impresses one with the need to clearly delineate the role of researchers in such a setting and the need to carefully define the appropriate research questions.

In view of both the complexity and the importance of bean growing, one becomes very circumspect in addressing the topic of appropriate intervention. The women are always looking for improved varieties for their respective needs. The Malawi bean improvement program has been strengthened by the return of Malawian scientists, some of whom were trained by the Bean/Cowpea CRSP. The social scientists and the agricultural scientists are talking with the farmers and with each other. One thing above all is clear. There is a serious difference between government-engineered programs and programs that are government-assisted. Across the world, models of the former have often missed their mark because those who have nothing to lose by failure work in isolation without knowledge of the consequences of their decisions. The latter requires a prominent role for its ultimate beneficiaries, collaboration between representatives of government programs and those whose voices are traditionally unheard. It is the hope of the author that this report will strengthen the continuation of that dialogue in Malawi.

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APPENDIX 1: RESEARCH PARTICIPANTS

Gratitude is expressed to the women who participated in this study as follows:

Mrs. Flora Chavinga
Mrs. Giveness Chavinga
Mrs. Anes Chibona
Mrs. Elasi Chilembo
Mrs. Enesi Chiona
Mrs. Eddie Chirambo
Mrs. Finest Gondwe
Mrs. Flora Gondwe
Mrs. Mary Gondwe
Mrs. Mernala Gondwe
Mrs. Misozi Gondwe
Mrs. Molice Gondwe
Mrs. Doreen Harawa
Mrs. Flainess Harawa
Mrs. Rose Harawa
Mrs. Flora Kamanga
Mrs. Juness Kandonga
Mrs. Ketelina Kanyenda
Mrs. Kettinasi Kanyenda
Mrs. Maria Kanyenda
Mrs. Chrissie Kanyika
Mrs. Elezia Kasanga
Mrs. Mitiness Kasanga
Mrs. Jestina Kayange
Mrs. Lillie Kayange
Mrs. Victoria Kayange
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Mrs. Merina Nyauhango
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APPENDIX 2:
SOCIAL SCIENCE PILOT STUDY IN NORTHERN MALAWI— PRELIMINARY FINDINGS

Kaveh Abani, M.S.[1]
Pat Barnes-McConnell, Ph.D.[2]

This is an initial report of the outcome of the social science pilot study conducted among limited resource farm families in northern Malawi in September of 1982 as part of a major international collaborative research project. The project entitled Genetic, Agronomic and Socio-cultural Analysis of Diversity Among Bean Land-Races in Malawi is directed by Dr. M. W. Adams (MSU) and Dr. Todo Edje (Bunda College). It is one of eighteen projects which presently make up the Bean/-Cowpea Collaborative Research Support Program (CRSP) funded under Title XII of the U.S. Foreign Assistance Act through the Agency for International Development (AID). The legislation, entitled "Famine Prevention and Freedom from Hunger," encourages U.S. universities to work with AID in support of research carried out jointly with developing country research institutions. Such efforts address specific constraints to increased food production and consumption. Beans, when available, are frequently the major source of protein and some vitamins in the diets of many persons in the developing world and thus bean production/consumption research is a significant activity under this legislation.

The Malawi project concentrates on evolving a methodology which allows both production agriculture and social science perspectives, firmly anchored in the Host Country setting, to contribute to an understanding of small farm family subsistence. These two perspectives are developed in the research design by the appropriate professionals with specific attention to complementarity and comparability. The social science component has evolved to give attention to the family farming systems context in understanding the maintenance of the wide bean diversity which exists in the country. Of particular interest is understanding the relationship of such bean diversity to family health and welfare.

In March of 1982 during the harvest season the principal agricultural and social science researchers spent three weeks in northern Malawi on a site selection trip. In a Land Rover or on foot, the team of scientists travelled through the mountains and across the plains of this area stopping at both remote and accessible homesteads where beans were seen to be drying, or where there were other indications that the family likely had beans (i.e., appropriate elevation for bean growing, mature bean fields visible in the area, etc.). Samples were taken from each of the bean collections available within each family. Every collection was assigned a code number, the first one of which became the dominant label (Code #) by which that family was known. This code number was written at the designated spot on all documents and forms related to that family in the subsequent research. The scientists took

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[1]Abani is a Ph.D. student in computer science at MSU assigned to this project for the past two years.

[2]Barnes-McConnell is Director of the Bean/Cowpea CRSP and an associate professor at Michigan State University. She is the principal U. S. social science collaborator on this project.

extensive field notes, describing each family and farming system, noting grid references on the topological road maps of the area and recording all other geographical, and political designations which would help in finding that family again later. The very helpful extension agents, who were familiar with the often obscure terrain, frequently travelled with the team and assisted in making the appropriate notations.

The next stage was a more in-depth pilot socio-cultural study of the chosen farm families in that area which would contribute to an understanding of the constraints to bean production and consumption and an understanding of the great bean diversity that exists there. This stage took place in August and September of 1982.

The methodology for this pilot study was reported in Technical Report No. 1 which included the research training procedures, the pre-pilot training study, and the research instruments used. Following a training period, the team of nine female students from Bunda College of Agriculture, University of Malawi, travelled to the north to carry out the pilot study. A tenth, who was trained, had to drop out early in this study; the case loads of the others were adjusted accordingly. These young women, whose homes were in the north, spoke the language of that area and were quite adept at making their way around the mountainous region.*

This pilot study was carried out in homes selected from among those where bean and soil samples had been taken by the primary research team on the earlier germplasm collecting and site selection trip some months before. Findings presented in this report are the preliminary results of that pilot work and come both from family reports to questionnaires administered directly by the nine enumerators and simultaneously from timed observations recorded by them during the day over a five-day period.

GENERAL

Twenty-five families, made up of 168 people, comprised the research population of this study. These families consisted of 82 males and 86 females including the children living at the home site at the time of the study, 45 male children and 45 female children. Some of the children were adults. The age distribution of the family members by gender is reported below (Table 1).

*Dr. Julia Miller from Virginia State University was the field supervisor for this effort. The young women from Malawi participating as recorders in this project were Wanangwa Banda, Kupingani Gondwe, Lonely Gondwe, Filly Kamanga, Caroline Mhango, Ndindasi Mkandawire, Estere Moyo, Emmie Nyirenda, Flora Zulu. Augustine Mwamukamgama, a former Bunda student who had accompanied the team in March and was a technical officer on this trip, was the interpreter for the field supervisor and the liaison with local extension agents.

Table 1. Age and Family Member by Gender

Age Range (Years)	Number		
	Male	Female	Total
0-9	28	24	52
10-19	17	21	38
20-34	22	24	46
35 +	15	17	32
Total	82	86	168

Bean/Cowpea CRSP, Malawi Project, 1982

Family, for the purposes of this study, was defined as all persons living in the same dwelling and, in some cases, included hired laborers who lived in but were not a part of the immediate family. However, since they contributed to both production and consumption, they were counted as part of the dwelling's producing-consuming unit.

Although most families could be described as limited resource families, there were clear status differences among them. Status of a family was determined based on family resources:

1. One or more persons working off the farm.

2. Possession of income-generating animals above medium number.

3. Existence of a corrugated iron roof and/or cement floor.

4. Average adult years of schooling 8 years or above.

There were 9 least-limited resource families (richest) having two or more of the above resources, 8 average-limited resource families having one of the above resources, and 8 most-limited (poorest) resource families having none of them.

PRODUCTION

In this study beans were frequently discussed in terms of pounds. These are converted on the basis of 4 cups to the pound and 600 cups or 150 pounds to the acre (amount observed from harvested acres intercropped with maize). Beans were found in an assortment of states and when observed were recorded by lots. A lot was any relatively stable grouping of beans—for example, stored in a container such as a basin, drying loose, stacked in a pile, or growing together in a field. Sub-groupings of these lots were observed over the five-day observation period carrying the primary lot number—for example, twenty cups of a primary lot in a clay pot soaking, cooking or being eaten, or wrapped in a scarf being taken to market to be sold. A lot could be made up of one seed type or many.

Among the families in this study, all had beans at the time of this research. Most of the families, given the average rate of consumption, had produced and stored enough beans to last until the next harvest. The seed type reported to have out-performed the others was the large red kidney seed type (Saaba 23% and Marikala 7%). The families indicated a preference for these large (72%) and red (53%) beans although they were able to name a total of 32 others they grew at the same time. One respondent indicated that the large red ones usually produce even when others do not. Green (17%) and yellow (10%) were also mentioned as preferred colors.

Ninety-two percent of the families indicated their intent to plant from their own seed stock. However, when they have had to eat their planting seed, 40% said they would buy from the government (ADMARC) while 30% would acquire their seed from friends, neighbors, or relatives. Thirty percent indicated they never eat their planting seed.

At the next planting season, 21% indicated they would first plant Saaba (large, red kidney) and 12% would first plant Nyauzembe (round, green). Twenty-one other varieties were listed by the remaining families as bean types they would plant first at the next planting season.

Eighty-eight percent of the families plant other crops with beans (maize 67%). Of those that intercrop maize and beans, 68% plant beans and maize in the same planting hole. Forty-eight percent of the families use some kind of fertilizer (of these 46% used 20-20-0, 36% used sulfate of ammonia, 13% used calcium ammonimum nitrate, and 5% used urea).

Crops per year ranged from one to three with 80% having two crops per year. The last total crop harvested reportedly yielded for the family, on the average, approximately 190 pounds of beans. At the homesites, however, 5 of the families had less than 50 pounds of beans in stock, 13 families had 50-200 pounds, while 6 families had 200-600 pounds. One family, defined as an average-limited resource family, was unique with an estimated 1800 pounds of beans at the time of the study. This family reported having had approximately 11 acres (which could mean 11 different plots) in beans growing at that time plus additional beans in storage from the last harvest. While this family reported never buying beans, they do sell them. Among the families of the study the average stock was 217 pounds of beans. The average storehouse of beans was just over 142 pounds when this one family was removed from the calculations.

Of the 25 families, 18 had 4 or fewer lots (groups, batches) of beans and 7 families had 5 or more lots. In addition, among their lots 5 families were observed to have a total of 5 or fewer seed types, 5 had a total of 6-14 seed types, and 15 had a total number of seed types in excess of 15. Because it is likely that all seed types in a lot were not seen (dark storeroom, not every pod opened), it is likely that there was even greater variability in the beans in all the homes than indicated here.

Within a given household, lots were found stored as only single seed types (in 7 homes), mixed seed types (in 12 homes), and mixed and single seed types (in 6 homes). On the average, those with the smaller numbers of lots tended to have them as mixed lots and those lots tended to have greater numbers of seed types in their mixture than those from homes with a larger number of lots.

Those with the greater number of lots, on the other hand, tended to have them as single seed types. This suggested the families might be separating the mixed seed types into lots of single seed types after harvest, an economically advantageous move for the families, the vast majority of whom do sell beans at some time. At this time lots of monocolored beans brought a higher return than mixed in the marketplace and from the government.

In addition, the households with the greatest amount of beans tended to have them in single seed type lots, although most of them also had a few mixed lots with a range of seed types.

For the 80% of the families without a third crop from a dimba garden (residual moisture or bottom land), the average of 142 pounds would have to last until the next harvest (approximately late February). Assuming 22 weeks to go, with average family size of 7 eating beans 3 times a week at the rate of 1/2 cup per person per meal, the amount required would be approximately 231 cups or 58 pounds. Nine of the 25 families were observed to have less than 58 pounds of beans, 90% of those reporting having only two crops per year (apparently no dimba garden).

Although those families with a dimba crop were just harvesting or still had beans in the field, one-fourth of all the families reported, in answer to a direct question, that they did not harvest enough beans at their last harvest to last them until the next crop was in. These twenty-five percent of the families reporting too limited a yield did not overlap completely with or were not completely within the 36% appearing to have too few beans on the basis of observed stored amounts. Nevertheless, 100% of both groups had only two crops a year, the extent of insufficiency likely being influenced by family size. The major problem of the last crop was reported to have been too much rain (30% of the families) which affected fruiting and made weeding, harvesting, and drying difficult. Additionally, insect problems (20%) were cited as well as too little or too late rains (20%). Ninety-six percent of the families indicated their desire to have grown more beans, but 85% of these reported they did not have enough land to do so, which undoubtedly, for most, meant dimba garden land. Time and labor were also given as important constraints to growing more beans.

Bean production is a family affair although some of the families hire laborers to help when needed. Of the 25 families, 9 reported that <u>this year</u> they have hired laborers for weeding, 6 hired them for plowing, and 4 hired them for making ridges. Another 4 hired for harvesting maize. At this point it is unclear about the ages of the laborers or how much in-kind payment may be involved. For example, in the case of weeding, older children may be involved or, in the case of ridge making, neighbors may exchange services.

Among the family members, gender and age roles supported the production cycle. Bean production among the families of this study was the major responsibility of the women although all family members, including the male and female children and live-in laborers, had a role to play (Table 2). They report that, for the most part, the land was cleared and the ridging was done by the mother and father together. The planting and weeding were reported to be the work of the mother who also took care of watering, harvesting, threshing, putting to dry, and storing. Children were reported to assist in most of the work.

When there is no family male around to do the production work usually contributed to by males, most of the women indicated they would hire laborers, perhaps paying them in local beer which is commonly brewed by women. A small percentage of the women (8%) indicated they, or they with their children, would do all the work themselves. Even though 84% of the women indicated agricultural field work was the hardest work for them to do, it involves factors other than strength. Of the women who cited the difficulty of field work, when asked why this work was such a problem, 33% responded because it is a lot of work (a combination of time and energy—"many processes are done"), 26% responded time was the factor ("must spend the whole day"), 26% responded strength was the factor ("soil is hard, needs a lot of power"), and 15% responded health was the factor ("causes backache afterwards"). While strength is commonly considered the main constraint to women's assuming agricultural chores commonly thought to be performed by males, time is clearly a companion factor.

The time pressure on women is discussed in an earlier unpublished paper from these data (Barnes-McConnell and Goduka, 1983). The analysis of the timed observations of the family members suggested that women do up to six things at a time (requiring an average of 48 minutes each) while men do only one (requiring an average of 4.4 hours each, such as rethatching a roof, furniture making, or plowing). The phenomenon of required time is likely a significant factor in the distribution of production responsibilities by gender and one explanation for the resistance in the exchange of gender roles. That is to say, with many critical but shorter chores to perform simultaneously, women have difficulty fitting in another work activity which demands more time than her normal complex of responsibilities. This appeared true because agricultural work time was less than 15% of the total observed time among adult females during this dimba harvest period.

The women's roles and constraints such as time and energy hold important implications for production research. The bean varieties preferred for growing under residual moisture or for use in bottom lands have reported problems which research in plant architecture may address ("the gardens are near streams where there are reeds"—"it's so difficult to remove them from the reeds"). Further, among the drought-resistant plants, lines bred with long, strong root systems may be unacceptable because of the time and energy required to pull them at harvest. Over 90% of the women interviewed reported that when harvesting they pull the entire plant, especially when the beans are dry (which is also when the soil is likely to be dry). Thirty-one percent indicated they pull the whole plant because of the ease in transporting the harvest when it is tied up in bundles. Additional reasons cited were (1) reduced labor, (2) to get the plant to burn for the ash which will be used in bean seed storage, (3) easier to harvest whole plant than removing pods when dry—saves time.

During this relatively slack period in the agricultural production cycle at the time of this study, percent time spent in agricultural tasks for women and men 20 and over were 12% and 9% respectively (Table 3). The interaction of time, labor, production, and ecology demands in the maintenance of genetic diversity will be explored more systematically in the subsequent longer-term study.

Table 2. Percent of Families in Northern Malawi Reporting Member Contributions to Bean Production (N = 25)

Family Member	Selecting Planting Site	Clearing Land	Plowing	Planting	Watering	Weeding	Harvesting	Drying	Threshing	Putting into Storage
Mother	96	72	72	88	28	96	100	96	92	100
Father	20	68	68	48	12	64	24	8	8	4
Girl	20	24	24	40	16	40	36	28	44	8
Boy	12	32	36	32	16	36	20	8	28	8
Laborer		12	36	4	4	44	16			
Communal Work			4	8		4	1			

Bean/Cowpea CRSP, Malawi Project, 1982

Table 3. Percent Time Spent in Categories of Activities by Age and Gender

Tasks	0-4		5-9		10-19		Ages 20 and Over	
	F	M	F	M	F	M	F	M
Agriculture	0.9	3.2	1.7	7.1	9.0	10.6	12.1	9.0
Childcare	0.0	2.3	1.0	.4	8.0	.4	4.4	.5
Domestic	1.7	3.0	9.6	4.0	30.8	12.7	33.9	8.7
Economic	0.0	0.5	0.1	1.3	6.9	9.9	4.2	25.3
Personal	48.3	48.0	35.4	27.8	26.9	27.8	24.5	25.5
Social	49.1	43.0	52.3	59.4	18.4	38.6	20.8	31.0
	100.0	100.0	100.1	100.0	100.0	100.0	99.9	100.0

Bean/Cowpea CRSP, Malawi Project, 1982

ECONOMIC

Within the last year, seventeen of the twenty-five families sold beans but only four bought them. Only two reported they never sell beans, while nine indicated they never buy them. The beans sold included twenty different seed types including some mixed lots, the predominant beans being sugar beans (16%), Saaba--large, red kidney (13%), and mixtures (10%). Those buying purchased varying lots of nine single seed types and one mixture made up of sixty seed types. The predominant ones bought were Saaba (24%), sugar beans (24%), and Nyauzembe (12%). The average number of beans purchased was approximately 25 pounds, although the range was from less than 1 pound to 135 pounds. Of the 25 families, 48% reported buying beans for seed, 8% buying them to eat, and 4% buying them for both purposes. Forty-four percent indicated that beans were expensive at the time of the study, costing on the average 10t per cup (1/4 of a pound; 10t = 8¢ US).

The women interviewed indicated that they earn money by selling maize (24%), selling vegetables other than beans (20%), selling beans (15%), and selling fruit (11%). Other income-generating activities include brewing beer, operating a grinding mill, and, one woman indicated, selling cattle and sheep.

Sixty percent of the families had at least one person working off the farm, thirty-six percent had at least two people, and twelve percent had at least three people doing so. Of the people employed off the farm, nine were female and nineteen were male. In one family there were five people (three daughters and two sons) engaged in off-farm employment.

Beans require very little in the way of financial investment. The most frequent item purchased for bean production was fertilizer (16%), although several indicated the fertilizer was really put on the maize and the intercropped beans use it as well. Other items mentioned were seed, hoes and hoe handles, and laborers. The most prevalent item purchased for bean storage was

chemicals (40%) with DDT, sevin, and actellic mentioned. Other purchases include clay pots, tins, and baskets, all for storage. Of the 25 families, 12 reported purchasing salt and oil for cooking beans with vegetables also mentioned, such as onions (8), tomatoes (8), and groundnuts (2) as well. Cooking pots, mostly clay but one person mentioned metal, were also purchased as needed.

While this study did not include a systematic assessment of general family finances, it was clear that bean production and utilization made limited financial demands on the farm family system at the time of this investigation. Research which seeks to increase the availability of beans through introduction of new inputs will have to seriously consider this issue in the context of the limited resource family and the buy/sell/consumption pattern.

STORAGE

The families in this study reported an average of approximately ten pounds of beans lost in the field and another ten pounds lost in post-harvest handling. In the field the most serious problem reported by the families (60%) was beans' spoiling through germination and rotting from heavy rains or morning dew. Also mentioned were problems of insects (9%) and animals (rats, baboons, chickens, birds) eating the seed. Before, during, and after harvest, pod shattering was mentioned as a serious source of loss (56%). Responses also included "not all collected," "lost in carrying home," and "some left from threshing." Some noted that seeds broke during handling and threshing which was another source of loss.

Over 80% of the families spread the beans on the ground to dry in the sun although several also mentioned hanging the tied plants with pods at one stage in the drying process. During the dry season harvest (July/August) the beans were reported to be completely dry when harvested or they will take only a day or two more to complete drying. During the raining season harvest (February/-March) they are reported to take longer to dry, up to as much as a week depending on the amount of sun. While still in the pod, the beans may be hung in the shade or in mud barns. After shelling, most of the families stored the beans in clay pots and used fertilizer bags or sacks. They also mentioned gourds and baskets as likely receptacles for the beans.

Sixty-eight percent of the families reported using chemicals in storing the beans (DDT, actellic, sevin). Nearly as many reported using ash from the burned bean plants or from the cooking area. A few indicated preferring this latter method for their eating beans and the former for their planting seed. Also mentioned as additives for storage were whole groundnuts and sand.

On the average, it was reported that beans were stored up to six to seven months before they were completely consumed. Fifty-four percent of the families reported insect damage occurred during this time when some also rot or are eaten by rats. The beans reported to be the most susceptible to insects by these families were sugar beans (22%). The beans reported to be the most susceptible to becoming hard in storage were the small round whites and Nyauzembe--the small, round greens.

These problems of hard seed coat and susceptibility to insects in storage are widespread and have important implications for production science research.

This project will be alert to varieties which suggest superior genetic potential for addressing these problems.

PREPARATION

The families in this study reported cooking beans an average of twice a week, eating them an average of three times. When questioned, the women indicated they prepared an average of four cups of dry beans when they cooked them for their families (average size of seven), making an average of 1/2 cup of dry beans per person. The observation data concurred with this finding, demonstrating an average number of beans observed cooking at 4.4 cups with a range observed of 2 to 8 cups. From these observation data, an average of .35 cups of dry beans per person per meal is calculated with a range of .21 to 1.6 cups (adjusted for family size). The families rinse their beans (96%) one to five times (average twice) before cooking depending on whether or not they had been treated with a chemical. Only 38% reported soaking their beans before cooking.

The nearest source of the water necessary for bean preparation comes from a well (44%), underground spring (20%), piped system (16%), river or stream (16%), or bore hole (4%). Females are responsible for transporting this water approximately five times a day which, on the average, was 238 feet from the door of the homestead (range 21-639 feet). Nothing was done to purify this water for 60% of the respondents beyond its boiling in normal use during regular cooking.

Traditionally served as a companion to nsima (dough-like food from maize flour), the respondents indicated vegetables—such as tomatoes, onions, groundnuts—were sometimes added to the beans during cooking. Cooking oil was another frequent addition. Other items mentioned included sweet potatoes, Irish potatoes, bananas, flying ants (termites), cassava, pumpkins, pepper, and pigeon peas. Most of the bean dishes were variations on boiled beans, with some persons reporting liking mashed boiled beans and others liking their boiled beans to remain intact. Several indicated they remove the seed coat. Other bean foods eaten were fresh beans cooked in the pod (cooked pods sometimes eaten, sometimes discarded) or boiled with the leaf as vegetable.

Twenty percent of the respondents reported that the large red kidney bean kept the best for more than a day or so after cooking without becoming sour. On the other hand, over 26% agreed that the small round whites did not keep at all well after cooking.

When the women were asked about cooking time, the responses suggested that the beans requiring the longest time were sugar beans (13%). They also mentioned the small round whites and the black beans.

The major reasons given for producing the difficult beans were to sell (28%), to get a high yield (14%), they taste good (17%), and sometimes they just turn up in the mixture and are hard to separate (10%).

The observation data were analyzed to see if, during cooking time, there was any interaction among temperature (average cooking temperature 190.3°F), time (average cooking time four hours), and elevation (average elevation 4753 feet). These data showed that there was no significant interaction among temperature, elevation, and cooking time. The highest correlation was .44

between elevation and temperature. Since most of the cooking was done outside over a three-stone wood fire, the variation throughout the cooking time was considerable as the fire would sometimes go out before more wood was added. Temperatures were recorded as low as 166.25°F and as high as 200.66°F. For this reason, it was felt that cooking time and temperature studies would have to be done some place other than in the field where assured constant temperatures as well as controlled variability in temperatures can document variety performance.

CONSUMPTION AND HEALTH

Families in this study reported they ate beans three times a week at the time of this study, more often as mixed beans (52%) rather than separated (32%). The favorite beans for eating were Nyauzembe—the round greens (18%), the large red kidney beans (12%), and sugar beans (12%). The two characteristics mentioned as most important in choosing these beans were good flavor (38%) and cooking fast (19%). When asked why they generally preferred to have beans which were red (green second most popular color), the respondents cited two things as important. They liked the thick, red (or perhaps brown) gravy which made an attractive relish and pleasing soup. They also indicated that these red beans usually produced even at times when, for various reasons, the other varieties did not.

Saaba (large red kidneys) and sugar beans were the beans most often given to children whose diet included nsima as the staple and sweet potato and banana. There were reported to be no differences in the diet of male and female children. On the average, children began eating beans (or at least bean soup) at thirteen months old (range 2-24 months). Twenty-four percent indicated that there were various forms of digestive problems when their babies were first given beans. Of this group, the age range when their children were first fed beans or bean soup was 5-24 months.

Among the adults, it was reported that 12% have stomach problems from eating beans. Some of these bean-related problems, for both adults and children, may be exaggerated by malabsorption of other origins such as parasites and various infections. These latter problems were reported at all ages although the most numerous and most serious were associated with children.

General health of the family members was observed on each day of the 5-day observation period. Of the persons whose general health was observed by the researchers, the females (32%) demonstrated generally twice as many days of health problems as males (17%), with the dominant symptoms being runny nose and cough. The age group distribution is shown in Table 4.

Table 4. Percent Person Days of Health Problems by Gender and Age (168 Persons in Observation Periods of 5 Days Each)

	Ages			
Gender	0-4	5-9	10-19	20 and above
Male	50%	19%	5%	10%
Female	67%	43%	25%	21%

Bean/Cowpea CRSP, Malawi Project, 1982

In light of the other data, it was somewhat difficult to interpret the very low figure recorded for males 10-19 years old. It may be that this particular category was confounded by the fact that the surveyors were all female around the same age as the older boys in this age group. The relatively small number of persons also contributes to the percent variability. Nonetheless it is quite clear that females of all ages generally had more health problems than their male peers. In addition, among the 25 families the women reported having had a total of 166 children, 26% of whom were deceased--all before the end of their fifth year (miscarriages included).

CONCLUSION

Although the data reported here are from a pilot study carried out in only 25 homes (168 people) surveyed for a total of 5 days each, they are most suggestive, especially when the agricultural reports from this project are also considered.

All of the families reported that women have the major responsibility for bean production which together with their other agricultural work was computed from the observations to make up only 12% of their total time allocations. Observed to be engaged in up to six things at a time and demonstrating twice as many health problems as males, the women report that agricultural field work is among the hardest work they have to do. The women's tenuous health status is further demonstrated by the high rate of miscarriages and infant deaths reported among these limited resource families. Further, the observation data suggest that frequently work overload unmanageable by the women is passed to the older female children, a group whose nutritional needs for growth and for preparation for upcoming reproductive years are particularly acute. Thus, the labor force on whom bean production is highly dependent is heavily constrained by questionable health and limited time and energy. A vicious cycle perpetuates itself as the bean protein, vitamins and calories which would be so helpful in raising the level of health and energy of this labor force is in limited supply because of the limited health, time, and energy available to put into their production.

What is the relevance of this tight production system to the maintenance of the great diversity of beans, the major focus of this project? Concurrent studies being conducted by the agricultural team on this project have demonstrated the genetic diversity that exists in the favored beans of this region: the whites, the red kidneys, the round greens, the mottled sugar beans, and the yellows or tans. Several experiments have been run to date in which the first generation hybrid from a cross of two of the above resulted in second and subsequent generations producing a plethora of different seed types, in some cases more than eighty. In the 1983 Annual Report, this project reports:

> From several standpoints one gets the impression that particular kinds of beans (Saabas, sugar beans, Nyauzembes, etc.), not mixtures, are preferred. Many families maintain two or more of these particular kinds. When planted in adjacent fields, natural crosses will occur between them, resulting in the development of 'hybrid' types within the initially homogeneous stocks. Unless these 'hybrid' types are continually removed by hand sorting, the homogeneous character of the basic stock will be lost and in time, a complex mixture will replace it.

There is economic advantage to separating the seed types because the preferred varieties usually bring a better price when sold separately. However, this is yet another task which the female producer may not feel is worth the effort on any real systematic basis. While the data suggest that there may be considerable sorting after harvest, we have not yet determined what the farmer does with her non-preferred types and thus how much they are around to re-establish themselves in the system.

This issue poses a serious dilemma for the breeders. If they were to concentrate on increasing the yield potential of the 3 to 5 preferred seed types, they would simultaneously have to address the family farming system components which would support the integrity of those varieties. Otherwise in a few short seasons the new seed might well be lost and its components reclaimed back into the vast diverse genetic pool, an occurrence easily facilitated through the use by these limited resource farm women of their own saved seed stock.

Conversely, even though there appears to be more of a preference for identified single types over the mixtures, all of the families had an array of seed types in their possession. One cannot discount the potential importance of maintaining this complex genetic pool. Interventions will have to address this issue which is as crucial over the long term for the breeders as for the families themselves.

These ideas suggested by the pilot data are yet to be confirmed by the longer-term study which should also identify critical points in the family farming system where there may be a few degrees of freedom. A more thorough analysis must await those data to be gathered in this same region of Malawi across several growing cycles over the course of a full year.

As pointed out by the External Reviewer of this project, the bridge between agricultural and social sciences must be painstakingly evolved in a way that the latter can articulate significant and important insights useful to the former.

> . . . the project is in fact breaking ground which is new in detail; and to develop multidisciplinary cooperation into interdisciplinary thought and action for all participants takes time and is seldom easy.

The exceptional cooperation and esprit among the multidisciplinary U. S. and Host Country participants of this project and the respective Governments promise the success of the team in analyzing the research problem and utilizing this understanding to make a positive impact on bean production and consumption in Malawi, and perhaps, beyond.

Reference

Barnes-McConnell, P., and Goduka, I., "The Acquisition of Sex Role Behavior in Subsistence Farm Families in Northern Malawi." Research Display Presentation. Annual Meeting of Society for Research in Child Development, 1983.

APPENDIX 3:
TRAINING REPORT OF THE INITIAL AGRO-SOCIAL SURVEY METHODOLOGY FOR THE BEAN/COWPEA CRSP MALAWI PROJECT

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Julia Miller, Ph.D.[2]
Todo Edje, Ph.D.[3]

INTRODUCTION

The training methodology presented here was developed as part of a major international collaborative research project. The project (Genetic, Agronomic and Socio-cultural Analysis of Diversity Among Bean Landraces in Malawi) is one of eighteen which presently make up the Bean/Cowpea Collaborative Research Support Program (CRSP) funded under Title XII of the U.S. Foreign Assistance Act through the Agency for International Development (A.I.D.). The legislation, entitled "Famine Prevention and Freedom from Hunger," encourages U.S. universities to work with A.I.D. in support of research carried out jointly with developing country research institutions. Such efforts address specific constraints to increased food production and consumption. Beans, when available, are frequently the major source of protein and some vitamins in the diets of many persons in the developing world and thus bean production/consumption research is a significant activity under this legislation.

The Malawi project concentrates on evolving a methodology which allows both production agriculture and social science perspectives, firmly anchored in the Host Country setting, to contribute to an understanding of small farm family subsistence. Both of these perspectives are developed in the research design by the appropriate professionals with specific attention to complementarity and comparability. The social science component has evolved with particular attention placed on the farming systems context and the relationship of beans to the family survival pattern.

In March of 1982 during the harvest season the principal agricultural and social science researchers spent three weeks in northern Malawi on a site selection trip. In a Land Rover or on foot, the team of scientists travelled through the mountains and across the plains of this area stopping at both remote and accessible homesteads where beans were seen to be drying, or where there were other indications that the family likely had beans (i.e., appropriate elevation for bean growing, mature bean fields visible in the area). Samples were taken from each of the bean collections available within each family. Every collection was assigned a code number, the first one of which became the dominant label (Code #) by which that family was known. This code number was written at the designated spot on all documents and forms related to that family in the subsequent research. The scientists took

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[2]Miller is Associate Professor and Chairperson, Department of Human Ecology, Virginia State University. She is the project field supervisor.

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extensive field notes, describing each family and farming system, noting grid references on the topological road maps of the area and recording all other geographical, and political designations which would help in finding that family again later. The very helpful extension agents, who were familiar with the often obscure terrain, frequently travelled with the team and assisted in making the appropriate notations.

The next stage was the in-depth socio-cultural research of the chosen farm families in that area which would contribute to an understanding of the constraints to bean production and consumption and begin to explain the great bean diversity that exists there. The obvious need for comprehensive understanding of the Host Country cultures required Host Country nationals to conduct the primary interviews and record observations. By July of 1982, the Host Country research collaborators had identified ten young female students from Bunda College of Agriculture, University of Malawi, to act as research recorders.[4] They were all originally from the northern area to be researched and thus spoke the principal language of the north Chitumbuka, hereafter referred to as Tumbuka. They also spoke, at varying degrees of proficiency, Chichewa, the language spoken in the central/southern area of Malawi, especially around Bunda College where the pilot work had to be done. Finally all ten were very fluent in English, the language of the school system. The training was done in English, the pilot in Chichewa, the research in Tumbuka. Thus, the research and the preparatory training methodologies had to reflect the unique requirements of the tri-lingual, multi-cultural, agro-social international research.

This report describes the training methodology used to prepare these young recorders to carry out the research designed.

MATERIALS AND METHODS

Materials were prepared, the student recorders trained in their use, and the materials pilot-tested for two weeks. These materials were concurrently modified as appropriate. Materials included:

1. A four-sheet (eight page) farm/household questionnaire;

2. A two-sheet farm/household observation form — one sheet for bean observations, one sheet for family observations. Several such forms were typically used during an observation day.

3. A farm/household/health assessment sheet.

4. A recorder diary of events and reactions.

All forms and documents carried standard places for recording the name of the farm family, the farm family's code number, the recorder's name and the date.

[4]The young women from Malawi participating as recorders in this project were Wanangwa Banda, Kupingani Gondwe, Lonely Gondwe, Ellen Jenda, Filly Kamanga, Caroline Mhango, Ndindasi Mkandawire, Estere Moyo, Emmie Nyirenda, Flora Zulu. Augustine Mwamukamgama, who had accompanied the team in March and was also a Bunda student, was the interpreter for the field supervisor and the liaison with local extension agents.

The farm/household questionnaire was developed from discussions between the agricultural and social science researchers on this project,[5] consideration of the survey instruments being used by other projects in this CRSP, and a review of the social science literature on the topic. The sheets of the questionnaire, with questions distributed on both sides for ease of recording, were coded in different colors with the questions divided by category (i.e., General, Demographic, Production, Preparation, Consumption, Storage, Economic). The recorders were discouraged from administering the total questionnaire (all four sheets) in any one day—a brief glance at a family's data set showed which parts of the questionnaire were yet to be done. It was suggested that only one sheet be administered per day with the most sensitive administered last. The young recorders suggested that for the Malawi farm women the most sensitive questions would be those concerned with age and cause of death of deceased children. The questionnaire was checked by making sure that each line had been filled in with information appropriate to the question.

Observations of both family activity and activity related to beans were recorded throughout the day on the half-hour. Appropriate information was recorded on both observation sheets consecutively within each half-hour period and the time labelled so that for any given time segment one could tell not only what was happening to all of the beans belonging to the family but what each of the family members was doing. Beans were coded as having some state within one of two conditions: (1) being held in some relatively still or resting state (i.e., growing, drying, storage) vs. (2) being manipulated somehow (i.e., planting, cooking, eating). Both amount and method were indicated within each condition. Bean observation sheets were checked by adding up the Amount/cells for each half hour. The amounts should always have been the same unless some were removed from the system (e.g., sold or eaten) or added to it (e.g., harvested or bought).

Family members on the other hand were coded as displaying some behavior or activity within six principal categories: (1) agriculture (e.g., animal care, plowing, harvesting); (2) childcare (e.g., bathing, carrying, feeding); (3) domestic (e.g., collecting wood, preparing food, repairing); (4) economic (e.g., selling, wage work, buying); (5) personal (e.g., eating, grooming, travelling); (6) social (e.g., playing, visiting, at a bar). Family Observation Sheets were checked by looking across the row for each half-hour. Everyone in the family, that is, everyone's number or letter code, should have appeared in every half-hour period. Identically set digital watches were provided for each recorder to assist in the recording and in the reliability of evaluations.

There were several individual assessments to be made for each family.

1. Health assessment: health status was assessed daily on each member of the family and recorded including all apparent symptoms and reported difficulties. Location on the body (for such conditions as sores or swelling) and severity (mild, serious, extreme) were also indicated.

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[5]Members of this research team also include M. Wayne Adams, Professor, Crop and Soil Sciences, Michigan State University, who is the U.S. Project Leader and Senior agricultural collaborator, and David Greenberg, Lecturer, Bunda College of Agriculture, collaborating agricultural scientist.

2. Cooking temperature: every time beans were recorded as cooking, (every half-hour), the recorders took the temperature of the cooking medium with a candy thermometer provided them.

3. When units of measure were indicated by the family (a pot, a bowl, a pan), the recorders, using the metal cup provided, measured the amount indicated converting all to multiples of this standard.

4. When distance was given (i.e., to water source, to latrine, between water source and nearest latrine), the recorders paced the distance using a regular walking gait to get a crude estimate.

5. Recorders obtained a small sample of each collection of beans which the family had and assigned it a code number, recording this number and writing it on a label which was inserted into a small seed bag with the sample.

Finally, recorders were provided separate notebooks to use for diary keeping. Using standard social science diary keeping procedures, recorders were encouraged to record the specifics of the day's happenings each evening before retiring, including their reactions to them.

Each recorder, in order to carry out the assignments above, was outfitted with a water-resistant case which contained a legal-size clipboard, a supply of legal-length observation forms, a supply of the regular length, color-coded questionnaire forms, a digital wristwatch, a candy thermometer, a supply of pencils, a razor pencil sharpener, several erasable ink pens, small cloth seed bags and bag labels, a large plastic zip-lock bag, and a small container of premoistened paper towels. The field supervisor carried an extra supply of these items for emergencies.

Observing in pairs, the recorders were prepared to work in homes of a single family for approximately 5 days. It was anticipated that, using this method, a total of 25 homes in the northern part of Malawi would be researched during this stage of the Project.

TRAINING METHOD

Multiple 1-1/2 hour classroom sessions were conducted daily for four days. At the end of each day student recorders were assigned the responsibility of committing to memory the material presented that day. Every evening following the session on diary-keeping, the student recorders were expected to write up the day's events in their diaries. At the conclusion of this four-day period, six days of pilot work in the villages around Bunda College were held, followed by a summary wrap-up session on the eleventh day. The recorders in the field worked in pairs, each team assigned to one of the village families for a day. Local extension agents had given each family a kilo of beans prior to the pilot (this was not a major bean growing area) and had requested that whatever is normally done with beans be done the day the recorders were to come.

Lesson plans for the training are presented below.

Day 1 - Orientation:

1. Introduction of professional and student participants to one another, brief orientation to the project.

2. Administration of the farm/household questionnaire to the student recorders who were instructed to respond from the perspective of their own home households. All were from bean-growing families. This exercise became the teaching tool for the introduction of the student recorders to the questions. The responses were thus available to compare with later data generated by each recorder for purposes of assessing recorder bias.

3. Presentation of CRSP overview, its international significance and the role of beans internationally in subsistence farming and family survival.

4. Presentation of an overview of the Malawi project, its goals and research design, the significance of the role to be played by the recorders in project success, its importance to the Government of Malawi, its potential contribution to their own professional development.

Day 2 - Session 1

1. Identification and discussion of problems and issues in bean production and utilization in Malawi from the perspective of the recorders. This included discussion of their responses to the farm/household questionnaire.

2. Discussion of personal and professional backgrounds and goals including an exploration of how the project activity could make a contribution to those goals. A discussion of the role, goals and aspirations of women in Malawi, their responsibilities and resources.

Day 2 - Session 2

Presentation of the philosophy of research and the scientific method, definition of terms, issues and problems, requirements, constraints, rewards, the importance of commitment and the definition of expected sacrifice, the meaning and consequences of investigator bias and the confounding of data.

Day 2 - Session 3

Presentation of critical issues in the interviewing process, purpose, probing without biasing, maintaining attention, avoiding judgmental responses, atmosphere, recording and editing, discussion of verbal and non-verbal information in cross-cultural settings, recorder prejudice.

Day 2 - Session 4

The elements of diary keeping, sharing of diary material, group contribution to blackboard construction of a sample, the importance of recorder reactions and the subjective perspective. Notebooks were distributed to be used for the training period diary. As an exercise, recorders wrote up their activities of the previous day, sharing these write-ups with one another.

Day 3 - Session 1

Question by question review of a blank first questionnaire sheet with discussion of meaning. The recorders roleplayed the questionnaire administration with one playing the female in a village family (roleplaying done totally in Tumbuka) and one of the students taking the recorder's role, all others recording without intervention. Discussions were held of the results, question by question.

Day 3 - Session 2
Repeat for second questionnaire sheet.

Day 3 - Session 3
Repeat for third questionnaire sheet.

Day 3 - Session 4
Repeat for fourth questionnaire sheet.

Day 4 - Session 1
Questionnaire test--roleplay in Tumbuka as before but with no discussion. Answers recorded, compared and scored against a standard derived from a composite of all recorded answers.

Day 4 - Session 2
Presentation of family observation methodology--Adults listed beside a Roman numeral which thereafter became the designation for each. Likewise each child listed beside a capital letter (with the capital I omitted so as not to confuse with the first adult). For each half-hour, each and every adult was to be listed within all categories which described his/her activities at that time with a subscript letter showing the specific behavior. The recorders chose to make all the fathers = I, the mothers = II, other adults = III, etc. For the designation of children, A was the oldest living child, B the second oldest, etc. Marking within the appropriate activity category (e.g., Personal), the subscript of the specific activity was recorded following the person designation (i.e., a-praying, b-eating, c-grooming, d-travelling, e-transporting, f-schooling, g-other personal, h-resting/sleeping, i-riding, j-drinking, k-alone). Thus, if at 11:30 the mother were carrying child B asleep on her back while feeding child A (the oldest living child) and herself, the column under Personal for 11:30 would show IIb, Ab, Bh,i. Whenever the designation for "other" is used, the explanation is given under the last column (Other/notes). All members of that household (not of that family, which could live in several closely-situated households), whether there or away, should show at every half-hour. For practice, the instructors wrote a narrative out on the board in timed segments. Recorders wrote down their coded observations on the forms. The results were discussed.

Day 4 - Session 3
Presentation of the bean observation sheet. Up to three collections of beans (homogeneous or mixed) could be monitored and the observations recorded for each half-hour period (up to six collections if two half-hour rows were condensed). Collections were to be given a code number beginning with the code number of the household to which was added a subscript letter for each collection. Bean observations were recorded in the a cells or b cells of the forms if the beans were in a resting condition (e.g., a-growing, b-drying, cooling), or in the c cells or d cells if being manipulated in some way (e.g., c-harvesting, d-cooking). Thus, within a given half-hour, a particular collection could be described in up to four conditions including amount and specific method. For example, for the collection indicated on the first line, the a cells might indicate three large sacks were in storage mixed with an insecticide. The b cells might indicate that there were five cups of this same collection put aside as leftovers in a pot. The c cells might indicate that one cup of this collection was being carried around in a saucer by a child eating them as a snack, while the d cells might indicate that a basket

(perhaps 25 cups) was being sold at the local market. Thus when all the amount cells were totalled (3 sacks, 31 cups) at the end of each of the subsequent half-hour periods, the total should be the same (3 sacks, 31 cups) minus what was eaten or sold (the latter carried forward in each half hour until the seller returns and the appropriate adjustment made). Thus all the collections should be followed over the course of the observation. As before, a story written out in timed segments provided practice in bean observation assessment before the initiation of the pilot.

Day 4 - Session 4

Presentation of assessment techniques: using the candy thermometer, bagging and labelling the bean samples, becoming familiar with the watches, using the health assessment form. To be recorded on the health forms were symptoms and reports, not diagnoses. Thus the investigator might write, for example, red hair and listless but not kwashiorkor. Finally there was an overall description and practice of the daily research procedure, the most crucial aspect of which was commenced by establishing the whereabouts of all of the bean collections in the household and the whereabouts of all the household members.

Day 5--Day 10 - Pilot

Early on Day 5 the recorders and the instructors convened to go to the villages identified previously by the extension agents. The two-person teams were introduced to their respective families, who usually cordially set out chairs, woven mats, or flattened boxes for their guests to sit on. The recorders, who were encouraged to move around the homestead, generally stayed in the homes from approximately 8:30 until about 5:00 with 1/2 hour off for lunch (they were told in the north they should stagger their lunch breaks so as to cover the whole period). See Appendix C for sample selections from diaries giving information on this experience.

The authors circulated among the groups to identify potential problems and make suggestions. The last two days of the pilot work, one of the instructors, the principal researcher, recorded her own independent half-hour observations simultaneously with each recorder team for a period of one hour and subsequently calculated the percentage of agreement between each recorder and herself. The average level of agreement on bean or family observations reached between the principal researcher and the recorders was .6-.7. The agreement between the two instructors was .8. Agreement among questionnaires filled out by the recorders monitoring an interview role played in Tumbuka was .7-.8, using the standard derived from the composite of all the recorded answers.

Day 11

This final day extensive discussions of the experience were held and suggestions for methodology improvement were offered by all. With this experience, the group went back through the questionnaire, question by question, and discussed the appropriate Tumbuka words to use to get at the desired meaning. Phrasing was agreed to by the group. The health assessment form was reviewed with the recorders contributing ideas of local words which might be reported by the families to mean particular illnesses. These illnesses were discussed to suggest their English equivalency. Twenty-one common terms were shared and discussed.

By the end it was apparent that the group had built up quite an esprit de corps and pride in their work. A request for a group picture brought requests that they be allowed to carry their cases and wear their watches for the picture.

It should also be reported that the major agricultural professor of these students, the Host Country Principal Investigator, spoke to the group on two occasions to reinforce the seriousness of the mission. His professional contributions, his encouragement of the young recorders and the critical moral and logistical support provided were critical to the process and minimized distractions from the training activity.

In retrospect, one of the most difficult problems for the U.S. collaborators to deal with was the cultural orientation of the recorders toward authority. Socialized to soft, respectful voices, with dissension restrained, these students were very different from the typical American college students with which these instructors were familiar. This was especially noticeable when the instructors felt required to rebuke several of them for tardiness. Rather than explanantions or even excuses, such as American students typically give, the Malawian students displayed persistent, possibly hostile, silence with downcast eyes. The U.S. instructors could get no audible response even though, as was later discovered for at least one of them, the reason for the tardiness was legitimate. This situation could have been most destructive, but patience, humor and repeated encouragement of candor eventually resulted in greater trust and a feeling of closeness by the time the training period was over.

The recorders were sharp and alert, a tribute to their screening and selection by their major professor. Interdisciplinary research, especially between agricultural and social scientists, demands the highest caliber of professional training and support. The success of their portion of the Malawi project undoubtedly depends upon the commitment and skills of these young people. This experience has given added support to the potential contribution of cross-cultural research with cross-cultural participants, as a methodology in collaborative research with developing country institutions, and, in fact, may be the most appropriate approach in addressing worldwide of famine prevention and freedom from hunger.

APPENDIX 4: BEAN CATALOG*

Single Varieties

Bean Category	Code No.	Variety	Description
A	94	Blantyre	large, kidney, red
J	121	Bunda	medium, kidney, white with red spot
C	122	Bunda	large, kidney, cream white
P	25	Busale	large, oval, green, solid
Q	86	Busale	medium, kidney, black, long
K	87	Busale	medium, round, yellow
P	104	Busale	big, kidney, blackish, long
P	185	Busale	(no description given)
J	16	Chandazulu	white with red specks, red part on hilum
A	2	Chazgama(Chizgama)	big, round, red
A	7	Chazgama(Chizgama)	medium, oval, red
B	77	Chibeti	small, round, red
X	342	Chihoke	small, round, red/white spots
F	475	Chihowe	large, kidney, white, red striped
A	21	Chikamboui	large, round kidney shaped, red
A	125	Chikamboui	medium, round, red, solid
A	133	Chikamboui	medium, kidney, red, solid
X	147	Chimukwezulu	small, round, gray spotted
G	164	Chimukwezulu	large/medium, kidney, black and yellow (green) striped
R	199	Chimukwezulu	small, round, black
B	15	Chimzimba	small, round (oval), red
B	167	Chimzimba	small, kidney, red, solid
K	98	Choshi	medium, kidney, yellow
K	144	Choshi	large, kidney, yellow, solid
K	153	Chosi	medium, round, dark yellow
I	26	Chula	large, oval, pink
I	102	Chula	round, red with whitish spots
I	150	Chula	large, kidney shaped, pink with cream specks
I	162	Chula	medium, round, pink (violet), solid
I	173	Chula	medium, kidney, pink, solid
I	196	Chula	large, kidney, violet, solid
O	57	Coffee	big, oval
R	9	Fipa	small, oval, black, small type
Q	10	Fipa	medium, kidney shaped, purple, large type
K	33	Ghoshi	medium, round, dark yellow
I	8	Jandalala	large, kidney shaped, pink with cream specks

*The following codes are duplicates: 24/48, 215/219, 417/503, 430/494

Bean Category	Code No.	Variety	Description
K	120	Jandalala	large, kidney shaped, yellow, solid
G	128	Jandalala	medium, round, yellow, zebra pattern
E	176	Jandalala	medium, kidney, white black green striped
K	528	Jandalala	medium/small, kidney, yellow solid
D	37	Kabaghe	small, round, white
D	158	Kabaya	small, round, white
D	99	Kabaye/Kabaya	small, round, white
K	79	Kambuchuli	large, kidney, yellow
A	88	Kambuchuli	medium, round, red
X	126	Kambulumia	small, oval, cream white variegated
F	30	Kanutauzgani	medium, round, red spotted
B	3	Katolika	small/medium, round, red
F	67	Kaumtauzgani	medium, round, orange (pink)/red stripes
C	18	Kayera	large, round/oval, white
D	24	Kayera	small, round, white
D	48	Kayera	small, round, white
D	134	Kayera	small, kidney, white, solid
C	198	Kayera	medium, kidney, white
B	424	Kayera	small, round, red
V	12	Kazengamuzi	medium, kidney, red khakish
D	83	Kwayiti	small, roundish, white
K	139	Lusaka	medium, round, yellow
M	112	Lusaka/Zambia	medium, round, khaki
V	95	Mabupula	long, kidney, khakish with red spots
V	28	Mabupula/Maupula	kidney, red/white variegated
V	154	Mabupula/Maupula	long, kidney, khakish with red spots
V	186	Mabupula/Maupula	large, kidney, red white variegated
V	39	Maloko	long, kidney, white with red stripe along hilum edge
E	29	Mangulungulu	large, kidney, green/white zebra
H	32	Mangulungulu	kidney, brown with dark brown stripes
E	80	Mangulungulu	long, kidney, white with black stripes
E	131	Mangulungulu	white
E	149	Mangulungulu	long, kidney, white with black or red stripe
P	171	Mangulungulu	large, kidney, green, solid
E	179	Mangulungulu	medium, kidney, green/white, zebra
V	85	Mashabala	red with black spots
A	156	Mashimikila	(no description given)
W	70	Masumbighaholo	medium, round, green white speckled
O	71	Masumbiyaholo	medium, oval, dark brown
B	72	Masumbiyaholo	small, oval, red
I	73	Masumbiyaholo	medium, oval, pink
D	74	Masumbiyaholo	small, round, white
D	75	Masumbiyaholo	small, round, cream
W	160	Masumbiyaholo	medium, square, black white spotted

Bean Category	Code No.	Variety	Description
W	445	Masumbiyaholo	medium, round, white brown (white black) spotted
X	343	Masumbi ghanchwali	small, round, blue with black/white spots
M	84	Masusu	long, kidney, khakish
P	151	Masusu	long/medium, kidney, gunmetal (blackish green)
K	107	Mayini	large, yellow
K	141	Mayini	medium, oval, yellow, solid
K	161	Mayini	large, oval, yellow, solid
K	163	Mayini	large, kidney, yellow, solid
G	170	Mayini	medium, kidney, yellow/green zebra
G	181	Mayini	large, kidney, yellow/green zebra
J	189	Mbosi	large, kidney, white with black spot
W	5	Mbosi(Mbisi)	medium, oval, yellow with pink specks
C	31	Mbosi	large, kidney, white
E	36	Mbisi	large, white with black khakish stripes
L	197	Mine	small, pale yellow with raised hilum
A	11	Mkhalasonga	medium, oval, purple
E	97	Mlusha	long, kidney, whitish with khakish stripes
K	114	Mngomani	large, square, yellow
C	106	Moshi	large, kidney, white
E	142	Moshi	large, kidney, green/white, zebra
E	172	Moshi	large, kidney, white/black, zebra
A	35	Mshisha	large, kidney shaped, red
K	49	Mungomano	large, kidney, yellow
K	93	Musaka	medium, round, yellow
X	193	Mutifi	small, pepper
U	34	Mwasipengile	medium, oval, beige with red specks
U	96	Mwasipengile	long, kidney, whitish with red spots
U	143	Mwasipengile	large, kidney, red/white
U	157	Mwasipengile	long, kidney, whitish with red spots
A	81	Mwikala	long, kidney, red
C	82	Mwikala	long, kidney shaped, white
A	152	Mwikala	long, kidney, red
F	19	Mzaza	large, (white) cream with (red) gray stripes
F	132	Mzaza	medium, kidney, zebra pattern
F	138	Mzaza	large, kidney, white and red striped
F	187	Mzaza	large, kidney, zebra pattern
J	509	Mzaza	large, white with spotted dots
I	108	Mzimba	medium, round, pink/white
I	136	Mzimba	medium, round, blue/white
M	112	Mzimba	medium, round, khaki
M	190	Nalusaka	(no description given)
B	103	Nambotwa	small, round, red
E	100	Nanjole	big, long, kidney, white with black stripes
M	90	Nasaka	large, kidney, khaki

Bean Category	Code No.	Variety	Description
M	426	Nasaka	small, round, khaki
K	130	Ndozi	medium/small, round, yellow, solid
P	23	Nyakamutauzganga	round, green
X	551	Nyakamutauzganga	small, round, reddish brown, striped
N	50	Nyauhango	small/medium, round, khaki
K	51	Nyauhango	medium, kidney, yellow
C	52	Nyauhango	medium, kidney, white
F	53	Nyauhango	medium, oval, white red spotted
F	54	Nyauhango	large, oval, red khaki striped
O	65	Nyauhango	large, kidney, greenish brown
C	123	Nyauhango	large, kidney, cream white
O	135	Nyauhango	large, kidney, brown
O	200	Nyauhango	large, oval, grey
O	427	Nyauhango	medium, grey beans
P	13	Nyauzembe	small, round, green
P	64	Nyauzembe	medium, round, green
P	66	Nyauzembe	large, kidney, green
P	60	Nyauzembe	small, oval, solid green
A	17	Saaba	medium, kidney, red
A	63	Saaba	large, kidney, red
A	159	Saaba	medium, round, red
C	180	Saaba	large, oblong, red, solid
C	183	Saaba	medium, kidney, white
A	191	Saaba	large, kidney, white
A	89	Saaba (large)	(no description given)
J	76	Saaba (white)	large, kidney red striped, white
F	182	Saaba chimwera	large, kidney, zebra pattern
F	188	Saaba chimwera	large, kidney, cream white, zebra pattern
F	22	Saaba wachimwella	kidney shaped
F	78	Selenji	large, kidney, red striped, orange
I	429	Shawala	small, round, pink
U	4	Sugar beans	large, khaki with red stripes
U	59	Sugar beans	large, cream white with brown flowers
U	68	Sugar beans	large, round, orange red striped
K	69	Sugar beans	large, kidney yellow
U	119	Sugar beans	large, kidney, cream white, variegated
U	129	Sugar beans	medium, cream white, variegated
U	137	Sugar beans	large, kidney, khaki with red stripes
U	146	Sugar beans	large, kidney, red and white striped
U	155	Sugar beans	medium, kidney, cream white, red or purple (spots)
U	168	Sugar beans	medium, kidney, cream white, variegated
M	428	Sugar beans	large, kidney,khaki
U	55	Sweat beans	medium, oval, beige with red specks
L	56	Sweat beans	small, round, gold
X	92	Tanzania	small, round, brown black spotted
X	140	Tanzania	small, round, blue/black spotted

Bean Category	Code No.	Variety	Description
P	41	Tanzania	medium, oval, dark green
F	20	Wachimvera	cream with purple stripes
V	14	Zambia	large, kidney shaped, red with pale flowers
V	27	Zambia	large, kidney, red white
L	101	Zambia	small, round, yellow
V	118	Zambia	medium, kidney shaped, red, variegated
A	127	Zambia	medium, round, red, solid
B	192	Zambia	small, oval, red, solid
V	530	Zambia	small, kidney, red variegated
M	112	Zambia/Lusaka	medium, round, khaki
V	6	Zgamamuluwa	medium, oval, red with pink specks
D	1	Zitwa	small, round, white
D	46	Zitwa	small, round (oval), white
X	145		small, brown/white spotted
X	194		small, kidney, green/white
X	195		small, kidney, red/white
L	45		small, round, gold
L	175		small, round, orange
X	540		small, round, pink with red flowers
D	148		small, round, white
L	58		small, round, yellow
X	165		small, round, blue/black, spotted
R	178		small, round/square, black
R	446		small, square, dark blue
L	177		small, square, yellow
S	174		medium, kidney, blue
R	110		medium, round, black
W	113		medium, round, black, white spotted
H	111		medium, round, khaki, green/gray striped
F	524		medium, round, white, red spotted
K	381		medium, square, orange
C	117		medium/large, white
Q	523		large, kidney, black
S	116		large, kidney, blue
S	109		large, kidney, blue/black
H	533		large, kidney, brown striped
M	91		large, kidney, khaki
K	124		large, kidney, yellow, solid
C	425		large, kidney, white

Mixtures

Bean Categories	Code No.		Code Nos. of Varieties in Mixture
P,U	272	mixture of 2	4,64
V,A	218		14,63
B,U	302		15,119
A,P	275		17,64
A,P	459		18 (Mwikala), 25 (green Busale)
P,U	382		25,143
P,G	385		25,170
I,K	398		26,144
V,A	386		27,81
E,D	350		29,99
E,D	349		29,158
E,K	383		29,163
C,K	394		31,144
H,U	293		32,34
H,M	292		32,84
H,V	294		32,95
H,D	305		32,99
U,A	210		34,81
U,K	295		34,98
U,K	248		34/96,98
U,I	457		34,102
E,A	201		36,81
D,E	209		37,80
D,B	228		48,77
F,K	543		54,124
A,A	477		63,94
A,C	301		63,122
A,F	362		63,132
A,F	433		63,138
A,F	371		63,187
E,A	241		80,81
E,Q,maize	211		80,86,maize
E,M	287		80,90
A,P(Busale)	459		81,25
A,Q	288		81,86
A,A	235		81,94
A,U	240		81,96
A,K	236		81,98
A,D	250		81,99
A,U	369		81,143
A,U	395		81,157
A,W	474		81,189
V,K	239		95,98
V,K	254		95,107
U,E	234		96,97
D,E	253		99,106

Bean Categories	Code No.		Code Nos. of Varieties in Mixture
D,E	370		99,142
D,K	390		99,144
L,I	237		101,102
I,E	316		102,131
E,D	367		106,158
K,V	368		107,154
K,V	279		107,186
?,B	374		115,192
C,E	365		117,149
A,F	363		125,182
A,F	372		125,188
E,I	327		131,150
F,A	361		132,180
A,D	319		133,134
U,K	364		143,144
E,I	397		149,150
E,D	331		149,151
E,K	333		149,153
E,V	358		149,154
E,U	332		149,157
E,D	328		149,158
A,K	384		152,153
A,U	366		152,157
K,U	325		153,157
U,D	105		157,158
K,G	461		161,181
K,E	360		163,179
B,X	324		192,194
U,D,K	455	mixture of 3	4,24,49
U,E,K	276		4,29,49
U,D,P	271		4,48,64
U,A,J	502		4,63,76
P,A,F	203		13,17,76
P,C,B	202		13,18,77
P,D,B	233		13,48,77
P,C,F	261		13/64,18,76
P,D,B	262		13/64,24,77
B,A,A	373		15,63,125
A,F,U	213		17,19,59
A,N,P	220		17,50,64
C,U,P	225		18,59,64
C,I,M	497		18,108,112
P,E,K	388		25,29,163
P,E,G	387		25,29,181
P,E,C	389		25,29,183
P,A,K	345		25,81,144
E,D,K	354		29,99,161
E,D,K	359		29,99,163
E,K/G	471		29,161/181

Bean Categories	Code No.		Code Nos. of Varieties in Mixture
C,A,U	344		31,81,143
K,P,O	274		33,64,65
U,A,K	311		34,81,98
U,K,E	306		34,98,131
D,A,U	222		48,63,68
N,V,P	242		50,53,66
A,P,O	260		63,64,135
A,P,F	432		63,64,138
A,A,M	340		63,88,112
A,V,F	318		63,118,132
K,W,V	454		79,160,167
E,D,K	280		80,99,107
A,B,X	376		81,192,194
U,K,D	238		96,98,99
D,E,I	468		99,149,150
P,A,D	472		99,151,152
K,A,K	309		107,152,153
C,E,I	334		117,149,150
C,I,U	392		117,150,157
C,P,A	335		117,151,152
V,F,A	444		118,132,180
F,A,U	375		132,133,168
E,I,P	308		149,150,151
E,P,V	378		149,151,154
E,K,U	329		149,153,157
E,U,D	407		149,157,158
P,A,K	377		151,152,153
P,A,V	310		151,152,154
P,A,U	396		151,152,157
A,K,U	326		152,153,157
U,A,C,F	206	mixture of 4	4,17,18,76
U,D,A,P	258		4,24,63,64
P,A,N,A	215		13,17,50,88
P,A,N,A	219		13,17,50,88
P,V,A,U	423		13,30,63,146
V,A,P,K	273		14,17/63,64,93
A,U,P,F	230		17,59,64,67
C,D,B,A	232		18,48,77,94
C,A,P,F	419		18,63,64,76
C,P,J,K	417		18,64,76,139
C,P,J,K	503		18,64,76,139
D,A,P,O	409		24/48,63,64,135
D,A,P,U	336		24/48,63,64,137
P,E,D,K	296		25,29,99,161/163
P,E,K/G	464		25,29,161/181
E,D,K,E	321		29,99,141,142
E,D,E,K	307		29,99,142,161
E,D,E,K	351		29,99,142,163

Bean Categories	Code No.		Code Nos. of Varieties in Mixture
D,E,K/G	466		29,99,161/181
E,D,K,P	393		29,158,163,185
C,K,U,K	322		31,141,143,144
C,U,K,K	317		31,143,144,161
C,U,K,K	352		31,143,144,163
C,U,K,K	320		31,96,98,107
K,A,P,O	479		33,63,64,65
U,E,A,K	314		34,80,81,98
U,A,I,K	456		34,81,102,144
U,M,K,D	249		34/96,84,98,99
N,F,P,K	268		50,53,66,69
N,V,P,K	480		50,53,66,139
N,L,C,A	441		50,58,122,191
N,C,K,A	529		50,122,124,191
V,P,A,F	448		53,64,88,138
A,P,B,W	450		63,64,77,445
A,P,A,M	429		63,64,88,112
A,B,A,U	520		63,77,88,137
P,O,F,K	282		64,65,76,93
P,J,O,K	499		64,76,135,139
P,A,F,F	525		64,88,138,524
E,D,E,K	255		80,99,106,107
U,K,D,P	463		96/34,98,99,151
D,E,I,U	469		99,149,150,157
D,K,P,E	353		99,163,171,172
C,E,I,U	391		117,149,150,157
C,C,K,C	303		122,123,124,191
E,P,A,V	408		149,151,152,154
E,P,V,M	400		149,151,154,190
E,A,K,U	312		149,152,153,157
P,A,K,U	379		151,152,153,157
A,K,U,C	399		152,153,157,189
D,U,E,K,P	473	mixture of 5	1,34,80,98,151
U,P,A,C,F	205		4,13,17,18,76
U,P,A,C,B	212		4,13,17,18,77,large,red,kidney
U,P,A,D,K	267		4,13/64,17/63,24,49
U,A,C,F,A	264		4,17/63,18,78,88
U,C,D,A,B	283		4,18,24,63,77
U,C,A,F,B	281		4,18,63,76,77
U,A,P,M,O	492		4,63,64,90,427
P,V,A,A,K	217		13,14,17,63,87
P,A,D,K,U	214		13,17,48,49,59
P,A,V,N,T	422		13,63,146,426,427
V,D,V,U,A	243		14,48,67,68,88
B,D,A,V,U	298		15,24,63,118,119
A,A,B,A,U	413		17,63,77,88,146
C,D,A,B,U	416		18,24/48,63,77,137
C,D,P,B,U	418		18,24/48,64,77,137

Bean Categories	Code No.		Code Nos. of Varieties in Mixture
C,A,P,B,M	406		18,63,64,77,112
F,D,U,A,X	224		19,48,59,89,92
F,D,A,X,U	483		19,48,89,92,137
F,A,I,M,U	494		19,63,108,112,137
F,V,W,A,M	223		19,67,70,89,91
D,A,P,F,K	284		24,63,64,76,93
D,A,P,B,U	420		24/48,63,64,77,137
D,A,P,B,C	405		24/48,63,64,77,198
D,A,P,K,U	341		24/48,63,64,114,137
P,E,D,K/G	460		25,29,99,161/181
K,U,E,D,M	208		33,34,80,83,84
K,A,P,O,A	478		33,63,64,65,94
K,D,E,I,U	470		33,99,149,150,157
D,F,U,A,M	481		48,67,68,88,112
L,B,F,C,H	534		58,99,138,425,533
A,P,F,U,K	430		63,64,67,137,139
A,P,F,U,K	494		63,64,67,137,139
F,M,K,O,F	495		67,112,114,135,138
A,P,B,M,U	337		63,64,77,112,137
P,V,K,W,A	221		64,67,69,70,89
P,F,W,A,K	482		64,67,70,89,139
E,D,E,K/G	462		80,99,106,161/181
E,I,P,A,K	403		149,150,151,152,153
E,P,A,K,U	380		149,151,152,153,157
U,A,C,J,B,D	500	mixture of 6	4,17,18,76,77,99
U,A,P,V,B,A	270		4,17,64,67,77,88
U,A,P,M,D,O	493		4,63,64,90,99,135
V,A,P,O,K,A	216		14,17,63,64,65,87
C,D,A,P,B,M	522		18,48,63,64,77,112
C,A,P,J,O,K	506		18,63,64,76,135,139
F,L,A,P,M,H	535		20,58,63,64,91,533
D,A,P,M,K,U	410		24/48,63,64,112,139,146
H,U,A,M,K,D	297		32,34,81,84,98,99
U,E,A,K,D,P	465		34,80,81,98,99,151
U,E,A,M,K,D	251		34/96,80,81,84,98,99
K,A,P,F,B,K	285		49,63,64,76,77,93
A,P,M,U,F,A	338		63,64,112,137,138,159
V,E,P,A,K,D	402		85,149,151,152,153,158
C,E,P,A,K,U	313		117,149,151,152,153,157
E,I,P,K,A,U	467		149,150,151,153,156,157
E,P,A,K,U,D	330		149,151,152,153,157,158
U,C,D,P,V,B,A	244	mixture of 7	4,18,24,64,67,77,88
U,K,A,P,B,S,R	489		4,49,63,64,77,109/116,178
Q,A,D,P,C,K,H	544		10,63,99,104,117,124,533
P,F,D,K,U,A,B	227		13,19,48,49,59,63,77
B,D,A,V,U,K,C	299		15,48,63,118,119,120,191
D,A,P,B,S,K,U	439		24/48,63,64,77,109,114,137
D,A,P,B,S,K,U	435		24/48,63,64,77,109,114,146

Bean Categories	Code No.		Composition of Mixture
A,P,B,A,D,U,L	521		63,64,77,88,99,137,175
A,P,B,U,L,K,B	414		63,64,77,88,137,381,424
A,P,B,M,U,F,A	498		63,64,77,112,137,138,159
V,E,I,P,K,U,D	404		85,149,150,151,153,157,158
C,E,I,P,A,K,U	315		117,149,150,151,152,153,157
E,I,P,K,A,U,D	169		149,150,151,153,156,157,158
U,P,A,C,B,F,K,D	207	mixture of 8	4,13,17,18,24,77,78,79
A,F,K,P,F,B,A,W	511		17,19,49,64,67,77,88,445
A,F,P,O,U,K,D,S	516		17,30,64,135,137,139,148,174
C,D,A,P,F,B,O,K	421		18,24/48,63,64,76,77,135,139
C,D,A,P,B,A,O,U	517		18,48,63,64,77,88,135,137
D,A,P,J,B,R,O,U	501		24,63,64,76,77,110,135,137
D,A,P,B,K,O,U,L	518		24,63,64,77,114,135,137,175
D,A,P,F,B,M,O,K	515		48,63,64,67,77,112,135,139
U,F,D,A,P,B,S,O,K	491	mixture of 9	4,19,48,63,64,77,109,135,381
C,A,P,J,B,D,O,U,K	507		18,63,64,76,77,99,135,137,139
A,F,F,L,A,P,D,K, C,X	541	mixture of 10	7,19,20,58,63,64,99,124,425,540
A,P,B,D,O,U,F,K, G,X,R	512	mixture of 11	63,64,77,99,135,137,138,139,164,165,178
C,A,P,J,B,D,M,I, M,O,K	504		18,63,64,76,77,99,90,108,112,135,139
D,A,P,B,K,O,U,F, E,L,R	519		24,63,64,77,114,135,137,138,176,177,178
D,A,P,F,B,U,F,L, W,R,Q	526		24,63,64,67,77,137,138,177,445,446,523
U,A,K,A,P,B,D,F, K,X,R,W	508	mixture of 12	4,17,49,63,64,77,99,138,139,165,178,445
U,A,K,L,A,P,W,B, D,O,K,R	514		4,17,49,58,63,64,70,77,99,135,139,178
U,F,D,A,P,F,B,S, O,X,R,C	490		4,19,48,63,64,67,77,109,135,165,178,425
A,A,P,B,K,G,I,U, F,K,D,L	513		17,63,64,77,114,128,136,137,138,139,148,17

7

Bean Categories	Code No.		Composition of Mixture
F,A,P,B,S,K,O,U, F,D,R,C	488		30,63,64,77,116,124,135,137,138,148,178,425
D,K,A,P,F,B,S,O, F,U,L,W,R	527	mixture of 13	24,49,63,64,67,77,109,135,138,146,177,445,446
U,P,A,C,D,K,F,W, J,B,K,A,W,F	476	mixture of 14	4,13,17,18,24,49,67,70,76,77,79,88,445,475
P,A,P,V,U,K,A,X, A,G,K,F,B,A	531		48,63,64,118,119,120,125,126,127,128,130,138, 167,191
K,A,P,F,B,D,U,K, A,R,O,X,X,J	510		49,63,64,67,77,99,137,139,191,199,200,342, 343,509
A,B,C,D,F,F,H,J,K, M,M,O,P,R,S,U,W	458	mixture of 16	259 minus 135 in the remaining 16 varieties
	38	mixture of	Kabaghe and Chulu
	166		mainly khakis and blacks in 15 varieties
	40		Mwasipengile and Ghoshi
	62		mainly Mzaza
	44		mostly Stozi medium, round, black
	42		mostly Sugar beans, medium, beige with red specks
	47		Sugar beans and Tanzania
	41		mostly Tanzania, medium, oval dark green
	486		second set of 4 unknown varieties in same Famid/Date
	487		third set of 4 unknown varieties in same Famid/Date
	484		second set of 5 unknown varieties in same Famid/Date
	485		third set of 5 unknown varieties in same Famid/Date
	548		7 varieties (more 51)
	553		10 varieties
	547		11 varieties (more 51)
	552		13 varieties
	546		17 varieties (more 533)
	550		18 varieties
	532		23 varieties
	542		26 varieties
	549		27 varieties
	545		30 varieties (more 63)
	553		60 varieties
	505		71 unnamed varieties
	536		mixtures #2 unidentified
	537		mixtures #3 unidentified
	538		mixtures #4 unidentified
	539		mixtures #5 unidentified
	451		mainly 4,7,54 in mixture of 18
	452		mainly khakis and blacks in mixture of 15

Family Name _____

FAMILY OBSERVATION SHEET
BEAN/COWPEA CRSP MALAWI PROJECT
BUNDA COLLEGE - MICHIGAN STATE UNIVERSITY

Recorder _____

List ADULTS by name, gender and position in family
I. _____
II. _____
III. _____
IV. _____
V. _____

List CHILDREN by name, age and gender--oldest first
A. _____
B. _____
C. _____
D. _____
E. _____
F. _____
G. _____
H. _____
J. _____
K. _____

CODE #: _____ DATE _____

TIME	PERSONS	FAMILY ACTIVITY DESCRIPTION						
		1. AGRICULTURE a-animal care b-clearing land c-plowing d-planting e-weeding f-fertilizing g-watering h-other plant care i-harvesting j-storing k-other agriculture l-grading/sorting	2. CHILD CARE a-bathing b-grooming c-carrying d-teaching e-attending f-feeding g-other child care	3. DOMESTIC a-collecting wood b-chopping wood c-hauling water d-boiling water e-preparing food f-washing dishes g-washing clothes h-cleaning i-repairing j-other domestic	4. ECONOMIC a-selling (market) b-buying (market) c-wage work d-fabricating e-other economic	5. PERSONAL a-praying b-eating c-grooming d-traveling e-transporting f-schooling g-other personal h-resting/sleep. i-riding j-drinking k-alone	6. SOCIAL a-visiting b-church c-meeting d-celebration e-bar f-restaurant g-other social h-playing	7. OTHER/NOTES Indicate here the specific activity referred to as "other." Back of sheet may be used, first indicating the time person, category and behavior.
1	All Adults							
	All Children							
2	All Adults							
	All Children							
3	All Adults							
	All Children							
4	All Adults							
	All Children							
5	All Adults							
	All Children							
6	All Adults							
	All Children							

Family Name _____ T. A. _____

Village _____ District _____

BEAN OBSERVATION SHEET
BEAN/COWPEA CRSP MALAWI PROJECT
BUNDA COLLEGE - MICHIGAN STATE UNIVERSITY

Recorder _____

Code #: _____ Date _____

(1) Planting (4) Growing (7) Shelling (10) Transporting (13) Buying (in) (16) Precooking (19) Eating (22) Other (explain)
(2) Watering (5) Harvesting (8) Sorting (11) Drying (14) Processing (17) Cooking (20) Cooling
(3) Weeding (6) Thrashing (9) Storage (12) Selling (out) (15) Soaking (18) Feeding (21) Leftovers

TIME	VARIETY/MIX #	CONDITION	AMOUNT	METHOD	CONDITION	AMOUNT	METHOD	CONDITION	AMOUNT	METHOD	CONDITION	AMOUNT	METHOD	NOTES
		a.	a.	a.	b.	b.	b.	c.	c.	c.	d.	d.	d.	
1														
		a.	a.	a.	b.	b.	b.	c.	c.	c.	d.	d.	d.	
2														
		a.	a.	a.	b.	b.	b.	c.	c.	c.	d.	d.	d.	
3														
		a.	a.	a.	b.	b.	b.	c.	c.	c.	d.	d.	d.	
4														
		a.	a.	a.	b.	b.	b.	c.	c.	c.	d.	d.	d.	
5														
		a.	a.	a.	b.	b.	b.	c.	c.	c.	d.	d.	d.	
6														

APPENDIX 7

HEALTH OBSERVATION SHEET
BEAN/COWPEA CRSP MALAWI PROJECT
BUNDA COLLEGE - MICHIGAN STATE UNIVERSITY

Family name_____ CODE #:_____
Date:_____ Recorder_____

Make a note below of all health conditions learned about and health symptoms you observe. Look especially for nervous behavior, muscle twitches, swelling, indications of diarrhea, dermatitis, open sores, coated tongue, mouth sores, coughs, running noses, indications of parasites, abdominal pain, bloated stomach, red or light hair, general malaise but ambulatory, bedridden but functioning, bedridden and incapacitated, specific disease reports such as malaria. Do not make diagnoses yourself but record all symptoms.

Adult by name	Health condition	Body place	Severity*
1.			
2.			
3.			
4.			
5.			

Children by name	Health condition	Body place	Severity*
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			

*(mild - serious - extreme)

APPENDIX 8

HYGROMETER RECORDING FORM

Keep the wick clean and supplied with a pool of water. Use the medicine dropper to add water to water-well. Set the hygrometer outside in the shade and fan it for about a minute before reading. Then read first the wet bulb and then the dry bulb, recording those figures below with the date and time of the reading. Record this information at the family's home in the morning on arrival and in the evening before leaving. Keep using this same sheet for the several days in a row you are observing the same family. Start a new sheet when you change families.

Family Code: _____ Recorder's Name: _____

Date	Time	Wet Bulb	Dry Bulb

APPENDIX 9

BEAN/COWPEA CRSP MALAWI PROJECT FIELD NOTES GUIDE

FIELD MEASUREMENTS FOR EACH BEAN FIELD

1. Paces long and paces wide*

   a. One pace is the distance from the back of one heel to the back of the heel of the other foot in a normal walking (not stretched) stride.

   b. *The width is the side that runs across ridges.

2. Total number of ridges in the width.

3. Average number of rows per ridge (average from at least five ridges).

4. Average number of plants per pace (average from at least five paces at different places in the field).

5. Average number of pods per plant (average from at least five plants).

6. Average number of seeds per pod (average from at least five pods on different plants in the field).

7. Name all crops growing in this field.

8. Date these measurements were taken.

EACH DAY

Diary--

1. At top of page write:
   Date.
   Family visited that day and their code.

2. Include:

   a. Weather--
      Hot, warm, medium, cool, cold.
      Did it rain or not--how long, how much?
      Was it cloudy but no rain, sunny.
      Other.

   b. Family--
      Were they happy, sad--why?
      What things happened that day?

   c. You--
      What did you learn about this family?
      What did you learn about the way they do anything with or about beans?
      What else happened today?

Hygrometer--(Use Hygrometer Recording Form)

APPENDIX 10

TABLE 50: NUMBER OF VISITED FAMILIES PER MONTH BY YEAR AND DISTRICT

	1984		1985		1986		District Totals		Grand
	Chitipa	Rumphi	Chitipa	Rumphi	Chitipa	Rumphi	Chitipa	Rumphi	Totals
JAN	5	4	10	7	15	8	30	19	49
FEB	5	5	9	6	16	8	30	19	49
MAR	5	8	9	7	15	16	29	31	60
APR	9	10	8	9	16	16	33	35	68
MAY	6	11	10	10	16	15	32	36	68
JUNE	6	9	14	15	16	16	36	40	76
JULY	5	10	12	16	16	7	33	33	66
AUG	5	4	14	16	—	—	19	20	39
SEPT	3	5	15	8	—	—	18	13	31
OCT	0	4	15	7	—	—	15	11	26
NOV	—	—	16	8	—	—	16	8	24
DEC	0	5	16	10	—	—	16	15	31

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project

28 month average = 11
30 month average = 9

TABLE 51: REPORTED HEALTH CONDITION DAYS, RAW SCORES

	1984				1985				1986				Totals by District and Gender				District Totals		Grand
	Chitipa		Rumphi		Chitipa		Rumphi		Chitipa		Rumphi		Chitipa		Rumphi		Chitipa	Rumphi	Totals
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F			
JAN	0	7	4	6	23	6	1	3	3	12	10	10	26	25	15	19	51	34	85
FEB	1	7	7	11	9	11	15	11	8	4	6	7	18	22	28	29	40	57	97
MAR	7	6	15	19	14	18	10	4	11	11	9	11	32	35	34	34	67	68	135
APR	4	9	31	22	10	13	6	10	6	9	4	17	20	31	41	49	51	90	141
MAY	2	12	27	28	17	5	15	19	8	7	8	14	27	24	50	61	51	111	162
JUNE	0	9	15	11	5	5	14	25	3	17	9	22	8	31	38	58	39	96	135
JULY	0	4	7	13	6	16	20	38	4	3	0	1	10	23	27	52	33	79	112
AUG	0	5	4	1	4	11	7	6	0	--	--	0	4	16	11	7	20	18	38
SEPT	1	0	7	14	12	11	11	10	--	--	--	--	13	11	18	24	24	42	66
OCT	--	--	4	14	3	11	5	1	--	--	--	--	3	11	9	15	14	24	38
NOV	--	--	--	--	10	9	3	7	--	--	--	--	10	9	3	7	19	10	29
DEC	--	--	--	--	4	1	12	7	--	--	--	--	4	1	12	7	5	19	24
TOTAL	15	59	121	139	117	117	119	141	43	63	46	82	175	239	286	362	414	648	1,062

Bean/Cowpea CRSP, Malawi/Mich. State Univ. Project