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Trip Report - MALAWI
Dr. David G. Cummins

February 2, 1981.

Dr. Wheelock and I arrived in Lilongwe about 5:00pm, 31 January and went to the Hotel. Dr. Daryl McCloud and Dr. Art Hansen from the University of Florida project here at Chitedze Research Station they picked us up at the hotel on Sunday afternoon. The driver Khaosun Phiri knew farmers in the area and he took us to two farms, one along the road where we did not see the farmer and the other at a village where we picked up the farmer and his wife and drove out to his peanut and corn fields to look at his farming practices. The farmers name was Frank Madson Chika of Chideru Village and his wife Regina. They farm an area that consists of about 1 hectare of corn and 1 hectare of peanuts. In addition to this in a lower wet area away from this field they have a vegetable garden where they grow additional food. He has pumpkins, corn, cassava and sweet potatoes after the corn in his garden. The low wet land gives him a longer corn season than in the other areas of his land. The normal growing season is from late November,at the onset of the rainy season, until March 15 when the rains quit. At the end of the rainy season, the crops will grow another 2-3 weeks on moisture from the rains.

A typical meal for this family which includes two children, the oldest being 8 years old, is a thick corn meal mush, pumpkin leaves with peanuts cooked with them, to make a dip for the corn mush. In addition they will have peanuts which are cooked in three different ways. They are roasted and eaten as a snack, boiled green with salt, and a peanut butter like material which is made by frying the peanuts, pounding them, salting and eating with mush. Their word for mush is mshima.

Peanuts are an important part of the diet in this area. The farmer will keep back part of his peanuts and sell the other for cash. He saves a 5 kilogram bag of peanuts, unshelled, in bags hung in the kitchen. During the year he will eat one of these bags of peanuts and save the other 4 for seed for next year. The one hectare of maize is consumed entirely by this family of four. The hectare yields approximately 1,000 kilograms of maize.

The crops are made entirely by hand labor. No animal power is used. The corn and peanuts are planted on ridges in order to have better drainage during the rainy season.

Most of the farmers in Malawi are extended to their maximum as far as the amount of peanuts they can grow because they are using all of their available land and labor. Most farms are single family units but some larger farms do employ additional labor during peak labor seasons.

The following points summarize the production practices used by this farmer in growing his peanuts.

1. He used no fertilizer or pesticides.
2. During the dry season he tilled his land with a hoe and made the ridges to plant on. It took one week to make the ridges for the one hectare of peanuts.

3. The peanuts were seeded on 16 December which was somewhat late this year because of a later onset of rain. It took 2 1/2 days to plant the one hectare of peanuts.

4. Single seed were planted in hills 6 inches(15 cm) apart on ridges spaced about 90cm apart. The ridges appeared to be about 10 inches high. The maize was planted before the peanuts.

5. The peanuts are hand-weeded by pulling the weeds out of the row and using a hoe between the row. Soil is pulled back up to maintain the ridges that are washed down by rain. They are careful not to allow the dirt to cover the peanut plants during this re-ridging process. The peanuts are weeded several times a year. His fields was very clean of weeds.

6. The peanuts and maize are rotated each year. The maize receives 100 kg per ha of a 20-20-0 fertilizer and 100 kg of urea which is 26% nitrogen. There is no lime added - Dr. McCloud said the pH is in a good range - probably around 5.5 -6. The soil has a high supplying power for potassium. Another interesting point in general management was that farmers that grow tobacco which is one of the major crops in this area - use their maize stalks to burn on the tobacco plant beds for weed control.

7. The farmer expects a return of 150 -250 kwacha (monetary unit - exchange rate is about $1.20 per kwacha). Last year the peanuts brought about $33 tambala (1/100th of a kwacha) per kilogram. These figures gave him an expected yield range of 450- 750 kilograms per hectare or an average expected yield of 600 kg per hectare. His maize will probably yield around 1,000 kg per hectare.

The peanuts we saw were probably producing about maximum under the conditions of no inputs of fertilizers or pesticides. The variety of peanut use was just a local variety that the farmer kept by saving his own seed. The farmer cannot increase his production of peanuts by adding additional land because of land and labor shortage. He could increase yields by using a higher yielding disease resistance variety, use of fertilizers, and pesticides which would require increased capital investment and by increasing plant density. The present 15 x 90 cm are about all that the land will support without inputs of fertilizers and pesticides. The development of peanuts would be more efficient users of fertilizer could be a profitable and useful breeding objective for production situations as we saw today as well as for disease resistance. There was some evidence of leafspot.

This concludes my notes on the farm visit.

This farm visit as well as the farm visit in Senegal has increased my appreciation greatly relative to the needs of the farmer in these underdeveloped areas.

February 2, 1981 - Visit with O. T. Edge, the University of Malawi, Bunda College of Agriculture, P. O. Box 219, Lilongwe, Malawi.

Dr. Edge leads the Crop Production of the College. Research with peanuts has been primarily in intercropping with maize. During the past two years he intercropped with maize using good management practices and produced seven to eight tons per hectare and 500 kg of peanuts per hectare. A complete fertilizer 20-8.7-0 (N-P-N-K) was applied at the rate of 300 kg per hectare, followed by side-dressing of 300 kg per hectare of calcium ammonium nitrate (26%). The soil pH was in the range of 5.8 to 5.9. For comparision peanuts grown alone in one of the years yielded about 2,000 kg per hectare (average of 5 varieties). Dr. Edge listed the following research objectives or constraints to peanut production:

1. He would like to take a sabbatical for one growing season and tour the country and document the local cropping practices. This needs to be done soon before new production programs destroys the traditional farming systems. Many of the intercropping systems have been developed by the farmers over many years of experience. He would like to determine from the sociological standpoint why the farmers have developed the various intercropping systems. An example of the planting pattern he observed was peanuts planted on top of a ridge that formed the row and corn on the side of the ridge. The corn was spaced 1 1/2 to 2 meters apart on the row. The peanuts matured and were harvested much earlier than the corn.

He proposed to collect local cultivars that have done well in association with corn, then put them in controlled experiments to see if they actually are superior. Also the corn and peanuts would be planted at various spacings and planting patterns.

2. The tolerance of existing named cultivars need to be evaluated with respect to their ability to grow in intercropping situations.

3. The method and rate of fertilizer placement needs to be studied more thoroughly. Relative response to hill or band fertilizer applications may vary according to soil fertility level and soil type.

4. The effect of intercropping on disease and insect incidence needs to be evaluated. For example halo blight in beans can be rather serious in a pure stand, but is lowered if intercropped with maize because maize intercepts the rain water lowering the splash and spread of the halo blight. He would like to determine if peanut diseases such as leafspot might be lowered in intercropping situations.

Dr. Edge has written a proposal to be submitted to IDRC for an interdisciplinary study of farming systems. In the study he proposed to look at crops, livestock, economics and sociology.

After our discussion we went on a field tour and saw some impressive intercropping research. We saw various intercropping systems including corn and soybeans, corn and greenbeans, tobacco and beans, cassava and beans, and peanuts and young Leucaenae trees. They have good field facilities for a large research program but the laboratory facilities are somewhat limited especially in the area of small research equipment. Additional labor could be used because of the high labor requirements of intercropping research. There are about 11 staff members in the crop production section. The Bunda College of Agriculture has about 400 students and gives a B. S. degree in Agriculture.

This concludes our visit with Dr. Edge.

We drove back from Bunda to Lilongwe and visited with Mr. David Garms, the Program Office in USAID for a few minutes before noon. He appreciated our interest in Malawi as a possible location for the peanut CRSP and offered to help us in any way that he could. He mentioned to us of a contact that he had from Mr. Frank E. McGuire, General Manager, National Seed Company of Malawi, Ltd., P. O. Box 30050, Lilongwe. He wanted information relative to handling of peanut seed, primarily related to procedures for processing and storage to maintain good seed quality. He needs he has appears to be one of adapting existing technology to their situation rather than something that needs immediate research.

In the afternoon we visited the Chitedze Research Station. Dr. Daryl McCloud who is with the Flordia AID contract project introduced us to the officer in charge, Dr. Henry K. Mwandemere. Dr. Mwandemere has his Ph.D. from Florida in Soil Fertility. He told us that the Peanut Research had its beginning in 1975 in a grain legume project which sought to increase yields through breeding, improved agronomic practices and disease control. In addition to Dr. McCloud's physiology work there are four other peanut researchers. The breeder is Mr. Sibale. He replaced Ron Gibbons who moved to ICRISAT in 1975. Mr. Sibale is presently at Florida working on his Ph.D under Dr. Al Norden. A second Breeder is Mr. Allen Chiyenbekeda. He has a B. S. from Bunda College and has been in the program for three years. The Agronomist is Mr. Charles Maliro who has a B. S. degree from Bunda College and has been on the staff for one year. Mr. Charles Kisyombe is the Pathologist assigned to peanuts. A small amount of work related to peanuts is being done by two soil microbiologist, Mr. Paul Davis and Douglas Khonje. Mr. Khonje has a M. S. from Southern Illinois University and will take over the program when Mr. Davis returns to England in a few months.

Dr. Mwandemere summarized for us the research that has been done with peanuts. From an agronomic standpoint they have studied spacing, varieties, gypsum and lime response, fertilizer response,and nitrogen balance of a peanut corn rotation. The pathologists have evaluated fungicides for the control of fungal pathogens.

All agronomic practices developed are evaluated economically to see if they should be recommended to the farmers. They try to see if economics may be a factor in the reluctance of the farmers to accept a new practice. They do not have an economist on the staff at this time, but hopefully one will be obtained through the Florida program. The farmers adjust their cropping program quickly according to price changes for various products.

In the soil fertility experiments peanuts have not responded to N P& K fertilization. He feels that the varieties may not be responsive to fertilizer. The soils contain both kaolininic and montmorillinitic clays and have a high supplying power for potassium. The pH ranges from 5.5 to 6.

An intercropping system provides nitrogen to the system but the credit programs prohibit intercropping. Credit is only given for crops grown in pure stands.

There is no food technology research being conducted at Chitedze.

There is a physiologist on the staff who is away on a Ph.D. program, but he will work on wheat physiology when he returns. The government marketing system (ADMARC) test for aflatoxins in marketed peanuts. Aflatoxins in their peanuts are generally very low because they are harvested and dried under good drying conditions and the peanuts are hand graded prior to marketing. Malawi exports over 20 thousand tons of edible peanuts annually.

Discussion with Mr. Charles Maliro. Mr. Maliro was working in the fields so Dr. McCloud took us by his plots and we talked about his work there.

Dr. McCloud's physiology work shows that the varieties grown in Malawi have a lower growth rate than when the same varieties are grown in places such as Florida. They theorize that this low growth rate may be due to magnesium deficiency. To test this hypotheses they developed an experiment with four rates of dolomitic limestone 0-500-1000-and 2000 kilograms per hectare. Top and root growth is measured weekly to chart the rate of growth. The plots were 33 days old and they had made the fourth sampling. There were no differences due to lime level in the first three harvests, but in the fourth harvest there appears to be some response to magnesium.

He has another experiment on a nearby farm in an area where soils are sandy to see if there is need for N, P and K fertilizers. They have applied a 14-18-15 NPK fertilizer. This is the first year of experiment and there are no visual differences due to applied fertilizer at this time.

Dr. McCloud's comments on his physiology research:

The work Dr. McCloud is doing is based on previous work which he did in Florida which showed that varieties differed in their partitioning coefficients or the amount of photosynthetic assimilates that went into top and pod growth. The higher yielding varieties have a higher pod/top ration than the higher yielding varieties. He is determining the partitioning coefficients of Malawian varieties and comparing them to Florunner. This will enable the plant breeders to select peanut lines with higher yield potential.

Comments by Mr. Allen Chiyiembekeda:

The breeding is done as a team including a breeder, plant pathologist and agronomist. The breeding program has at least four major objectives. (1) To develop higher yield potential and better seed quality; (2) to incorporate disease resistance in the varieties. They have developed a rosette variety called RG-1. The farmers don't like it very well because it is small seeded and is hard to shell. They are continuing work on this variety to select for larger seed and easier shelling, and yet maintain its high yield potential. It is a 145-150 day Virginia type. He would like to incorporate Cercospera leafspot resistance into the varieties but at this time he is waiting for disease resistant lines to be developed at ICRISAT that he can incorporate into his breeding program. Leafspot resistance is in wild species which require interspecific crosses to incorporate the leafspot resistance into cultivated lines. This is a long and tedious process. (4) he has developed a diallel selection program. In diallel selection you take a number of lines and make all the possible crosses with them . Selection is then made over a number of generations to pick out the best yielding, or crosses which have desirable characteristics. With most crops this is generally a successful breeding technique and his objective here is to develop varieties with good yield potential, high seed quality and disease resistance.

All the crossing in his breeding program is done in his greenhouse. Primarily because of lack of labor to carry on a large field crossing program.

Comments by Mr. Charles Kisyombe, Plant Pathologist:

He divided his discussion into three parts.

(1) Past work. Early leafspot was the main disease constraint which was considered in early peanut pathology work. This resulted in the use of sulfa dust for control.

(2) Present work.

a. Rust is a major problem along the lake and in the south where is is humid. The chemical Bravo or Daconil has given good control of rust and also it controls leafspot.

b. Web blotch is a disease that is becoming more important in Malawi, and he is evaluating chemicals for control of his disease.

Farmer field trials have shown that if peanuts are grown under a high level of managment that chemical control of diseases is profitable. Average results over a number of field trials showed that unsprayed plots produced about 500 kg per hectare. If grown under ordinary conditions and sprayed they produced about 1000 kg. per hectare and if grown under good management and sprayed they produced about 4000 kg/ha. He described good management as the use of good seed to obtain an even stand which was planted on a 90 x15cm spacing. An early planting date at the onset of rain but without the use of fertilizer.

He has a test in 1981 evaluating 10 chemicals for their possible use of the control of foliar diseases. He hopes to find an effective chemical that will be more economical than Daconil. These are applied at different rates to determine the lowest effective rate. Presently Daconil costs about 115 kwachas which is about the expected profit that they would realize from the use of Daconil.

(3). Future Research plans. About 1/3 of his time will be assigned to cassava and rice and the other 2/3 will be with peanuts. He listed three main problems that he feels need to be worked on with peanuts in the future.

a. Determine the economic returns that can be expected with the use of various chemicals or disease control.

b. Fusarium wilt appears to be a major disease that will face peanut producers in Malawi in the future. Work needs to be done to determine effective controls of this disease.

c. Aflatoxins need to be monitored to see if levels are such that would warrant incorporating aflatoxin resistance into varieties through breeding.

Comments by Mr. Paul Davis and Mr. Douglas Khonje.

There has been no work done in Malawi to determine if peanuts need to be innoculated with rhizobium. They began some preliminary work this year to see if rhizobium is needed. Tests were placed in different areas with different soil types. These tests consisted of three treatments: (a) Uninnoculated, (b) fertilized with urea, and (c) innoculated with three different rhizobium strains. The tests either had one or two varieties of peanuts. They sampled top growth at nine weeks after emergence, but found no difference in top growth among the three treatments.

An earlier study in Malawi showed that molybdenum applications depressed peanuts yields on a sandy soil. This was a greenhouse study.

Mr. Davis commented that sulfur is a major constraint to the production of many crops in Malawi, but has been given little research attention.

Our last discussion was with Dr. McCloud who gave us what he felt were the researchable constraints to peanut production in Malawi.

1. Varietal improvement. Chalaimbna is a common variety of peanuts grown in Malawi for direct consumption. The partition coefficient of this variety is rather low and if this could be improved yields could be improved, provided the seed size was maintained. Breeding should continue to incorporate disease resistance into good varieties.

2. Effective means of disease control need to be developed either through variety resistance or chemical applications. Cultural or biological means of these disease controls should be evaluated.

3. Agronomic practices such as plant population and row spacing should be studied. Farmers generally grow their peanuts on 90 centimeter wide rows. Yields could probably be increased by narrowing these rows to 45 centimeters.

4. Minimal spray practices need to be developed to lower the amount of chemicals needed for disease control. He feels that farmers may be using at least twice the rate of chemicals needed by starting their spray program too early in the season.

5. At present yield levels fertilizers are needed only on problem soils. As higher yielding varieties are developed a fertilizer program may be needed to realize their full yield potential.

6. Aflatoxins may become a problem in the future. Presently aflatoxins are not a problem in Malawi, because the marketed peanuts are hand picked and they are dried and are in good conditions. Aflatoxins need to be monitored to see if control measures need to be initiated.

7. There may be some need for cropping systems research. A practice that may work in this area is relay cropping or planting of a second crop such as peanut into a first crop, prior to the harvest of the first crop. This enables the growing of two crops in one season by taking advantage of an earlier planting of the second crop before rains stop and the growing season ends. He feels intercropping only has a place in situations where yield potentials are low.

8. The Florida project through AID will do some socioeconomic research. Art Hansen who is on the team and is a farming systems analyst. A production or agriculture economist will be added to the team. This work could possibly be extended under the peanut CRSP.