

REPORT ON SURVEY  
FOR MAIZE PRODUCTION AND MARKETING  
IN  
TANZANIA

MARCH 1968

OVERSEAS TECHNICAL COOPERATION AGENCY

GOVERNMENT OF JAPAN



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## P R E F A C E

The Japanese Survey Mission, organized by the Overseas Technical Cooperation Agency under instructions from the Government of Japan, visited Tanzania to study the methods of increasing the production and improving the marketing of maize. The Mission stayed 30 days in Tanzania from November 5, 1967.

In presenting this report which summarizes the observation and recommendations of the Mission, I wish to express our gratitude to his Excellency Mr. D.N. Bryceson, Minister of Agriculture and Cooperation, and other members of the Government of Tanzania for their cooperation, and extended to the Mission. I sincerely hope that this report will serve useful purposes for the development of maize in Tanzania.

March 1968



Shinichi Shibusawa  
Director General  
Overseas Technical Cooperation Agency  
Tokyo, Japan

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1. Member of the Japanese Government Survey Mission for the  
Development of Maize Production in Tanzania

Tadashi Miyamoto (Leader)	Bachelor of Agriculture Advisor of Overseas Technical Cooperation Agency "Chief of Administration Division, Trade Information Center, Japan External Trade Organization (JETRO)"
Shinichi Hasegawa (Cultivation)	Doctor Chief of Upland Farming Division, Central Agricultural Experiment Station, Ministry of Agriculture and Forestry
Hiromu Suzuki (Quality Problem)	Manager of Tokyo Branch, Nihon Cornstarch Co., Ltd.
Katsumi Goto (Chemical Fertilizer)	Secretary Technician, Chemical Fertilizer Division, Chemical Industry Bureau, Ministry of International Trade and Industry
Kosaku Kawai (Marketing Research)	Deputy Chief, 3rd Overseas Market Section, Ministry of International Trade and Industry
Tsunekichi Iwaoka (Coordinator)	Primary Product Development Cooperation Office, Overseas Technical Cooperation Agency

## 2. Itinerary of the Survey Mission

October 31, 1967 (Tues.)	Left Tokyo for Nairobi
November 1, 1967 (Wed.)	Arrived in Nairobi. Joined the Price System Survey Team at the Embassy. Held a preliminary discussion matters concerning the survey, attended by Mr. Watanabe, Charge d'Affairs, and resident representatives of Japanese trading firms.
November 2, 1967 (Thurs.)	Obtained survey data. Held a preliminary discussion with all team members on the survey program.
November 3, 1967 (Fri.)	Surveyed status of agriculture in the vicinity of the city of Nairobi.
November 4, 1967 (Sat.)	Visited EAST AFRICA AGR d FORREST RESEARCH at KIKUYU, near the city of Nairobi.
November 5, 1967 (Sun.)	Left Nairobi for Dar-Es-Salaam. On arriving, paid a courtesy call on Ambassador Yoshida.
November 6, 1967 (Mon.)	Paid a call to the Embassy. Held a preliminary consultation meeting with Mr. Togashi, Secretary and other Embassy officials.
November 7, 1967 (Tues.)	Paid a call on the Agriculture Cooperation Ministry with Ambassador Yoshida and other embassy officials and conferred with the Undersecretary and other officials concerned, on the establishment of a center.



November 8, 1967 (Wed.)	Paid a call on the NATIONAL AGR. PRO- DUCT BOARD and met with Mr. O. Muwanbunu (Gen. Manager) and Mr. J. Pollak (Adviser).
November 9, 1967 (Thurs.)	Held a preliminary discussion at the Embassy.
November 10, 1967 (Fri.)	1. Paid a call on the EAST AFRICA CARGO HANDLING SV. at Dar-Es- Salaam, and met with G. Wakessa (Assit. Manager).  2. Paid a call on the NORDIC TANG- ANYKA CTR at Kibaha in the suburbs of Dar-Es-Salaam. Met with B. Melin (Project Dir.).
November 11, 1967 (Sat.)	Left Dar-Es-Salaam and arrived in Mwanza.
November 12, 1967 (Sun.)	Made an on-the-spot inspection of food markets in Mwanza.
November 13, 1967 (Mon.)	Paid a call on the UKIRUGURU RESEARCH STA. Met with Mr. A.K. Auckland (SENIOR RESEARCH OFFICER), Mr. A. Bolton (Maize specialist) and Mr. J.P. Spencer (Cotton specialist).
November 14, 1967 (Tues.)	Left Mwanza and arrived in Dar-Es- Salaam.
November 15, 1967 (Wed.)	Preparation for a ten day field inspection tour starting the following day (Nov. 16th).

November 16, 1967 (Thurs.)	Left Dar-Es-Salaam by car and arrived in Tanga.
November 17, 1967 (Fri.)	<ol style="list-style-type: none"> <li data-bbox="734 324 1386 571">1. Paid a call to SISAL RESEARCH OFFICE at Mlingam in the suburbs of Tanga and met with Mr. D. Hopkinson (ACTING SENIOR RESEARCH OFFICER).</li> <li data-bbox="734 616 1386 705">2. Paid a call to the DISTRICT AGR. OFFICE in Tanga.</li> <li data-bbox="734 750 1386 996">3. Paid a call to the EAST AFRICAN CARGO HANDLING SV. LTD. at the port of Tanga, and met with Mr. Mitchell (PORT MANAGER) and Mr. Crowhurst (BRANCH MANAGER).</li> </ol>
November 18, 1967 (Sat.)	Left Tanga and arrived in Arusha.
November 19, 1967 (Sun.)	Made a field inspection of farms in Arusha and surrounding vicinity.
November 20, 1967 (Mon.)	<ol style="list-style-type: none"> <li data-bbox="734 1265 1386 1512">1. Paid a call to the AGR. RESEARCH. STA. at Tengeru eighty miles east of Arusha. Met with Mr. A. A. Salama (AGRONOMIST) and other members of the technical staff concerned.</li> <li data-bbox="734 1556 1386 1848">2. Paid a call to the KILLIMANJARO REGIONAL AGR. OFFICE (met with Mr. S. P. Kalling, Senior Officer) and the KILLIMANJARO NATIVE UNION COOPERATIVE. (met with Mr. O. M. J. Lema, President)</li> <li data-bbox="734 1892 1386 1977">3. Paid a call to the REGIONAL AGR. OFFICE in Arusha.</li> </ol>

November 21, 1967 (Tues.) Left Arusha and arrived at Dodoma.

November 22, 1967 (Wed.)

1. After paying a courtesy call on Provincial Governor Mr. Hon J.B. M. Mwakangale, Visited the REGIONAL AGR. OFFICE and met with Mr. Magohe (AGR. OFFICER).
2. Paid a call to the NATIONAL AGR. PRODUCT BOARD and met with Mr. M.K. Mwalutuwa (BRANCH OFFICER). Left Dodoma and arrived in Iringa.

November 23, 1967 (Thurs.) Paid a call to REGIONAL AGR. OFFICE (met with Mr. Philop A. Magan . . . . . Regional Agr. Officer and Mr. M. Coombs . . . . Field Officer) and NATIONAL AGR. PRODUCT BOARD (met with Mr. G.S. Mwachache . . . Branch Officer). In the afternoon, made a field inspection of experimental farms at Isamani, 320 miles from Iringa, under the guidance of Mr. M. Coombs.

November 24, 1967 (Fri.) Visited IRINGA FARMING CTR (met with Mr. P. Mwlyober) and SEATON DALE FARM, adjacent to this center (met with Mr. Alexander Kbati . . . Field Officer) Left Iringa and arrived in Morogoro.

November 25, 1967 (Sat.)

1. Paid a call to the CENTRAL RESEARCH CTR. at Kiroasa, 92 miles northwest of Morogoro and met with Mr. I. A. D. Robertson (OFFICER IN CHARGE), Mr. D. R. Haswell (PLANT BREEDER) and MR. I. E. Currah (AGRONOMIST).

2. Visited REGIONAL AGR. OFFICE in Morogoro and met with Mr. M. J. P. Chalamira (DISTRICT FIELD OFFICER) and other officials.

Left Morogoro and arrived in Dar-Es-Salaam,

November 26, 1967 (Sun.)

Each member of the team prepared a report on the items of his respective field survey tour of the past ten days.

November 27, 1967 (Mon.)

Made a report at the Embassy on the field inspection tour.

November 28, 1967 (Tues.)

Joined Mr. Higaki, Secretary, Technical Cooperation Section, Foreign Ministry, at the Embassy. A report was made to him on the items of the survey and a preliminary discussion was held for the forthcoming negotiations with Tanzania.

November 29, 1967 (Wed.)

Held a preliminary discussion

November 30, 1967 (Thurs.)

Head of the team and Mr. Hasegawa, a team member, together with secretaries Mr. Togoshi and Mr. Higake, Negotiated with officials at the AGRICULTURAL COOPERATION Ministry on the establishment of the center.

December 1, 1967 (Fri.)

Held a preliminary discussion with all team members on the preparation of the survey report which will be finalized after the team has returned to Japan.

December 2, 1967 (Sat.)                      Paid a courtesy call on Ambassador Yoshida before leaving Tanzania the following day (December 3rd.)

December 3, 1967 (Sun)                      All members of the team (except its Head) departed for Dar-Es-Salaam. There team members Mr. Kawai, Mr. Suzuki, and Mr. Goto started for home. Team members Mr. Hasegawa and Mr. Iwaoka started for Nigeria.

December 4, 1967 (Mon.)                      Mr. Hasegawa and Mr. Iwaoka, after paying a courtesy call on the Ambassador, conferred with Secretary Murai of the Embassy and with the resident representatives of Japanese trading firms, on the matters concerning the survey.

December 5, 1967 (Tues.)                      Met with Mr. Rado Joseph Kinzuber, Officer in charge of agriculture, U. S. Embassy, then visited U. S. A. I. D. and met with Mr. W. M. Nixon.

December 6, 1967 (Wed.)                      Lift for Ibaden, 60 miles North of Lagos. Made an inspection tour of the suburbs of Ibadan.

December 7, 1967 (Thurs.)                      Paid a call on the Agriculture Experiment Station, FEDERAL DEPT. OF AGR. RESEARCH, United States Government, in the suburbs of Ibadan and met with Mr. Baker (ACTING DEPUTY CHIEF of the AGR. RESEARCH OFFICE) and other specialists concerned. Left Ibadan and arrived in Lagos. The head of the team Mr. Miyamoto arrived in Lagos from Tanzania.

December 8, 1967 (Fri.)

Visited the Embassy and reported on matters concerning the survey in this country and paid a last visit to the Ambassador on leaving the country the following day (December 9th).

December 9, 1967 (Sat.)

The team departed for home.

## I. GENERAL

### I. A study of Tanzania Maize

#### 1. Maize production in Tanzania

Past records of N.A.P.B. (National Agricultural Products Bureau) on the handling of agricultural products are shown on the attached sheet. Items handled in large quantities are sisal, maize, bananas, cassava, cashewnuts, etc. The amount of maize handled is fairly great.

When these items are shown in monetary value, it is evident that primary products of high earning power for export such as sisal, coffee, raw cotton, pyrethrum, etc. have an overwhelming, large share while maize is subject to be neglected, because of its low unit price. However, when the crops are limited to foodstuffs only, maize, cassava, bananas, sorghum, rice and sweet potatoes, the share of maize is much greater, surpassing the others both in quality and quantity.

Since there is no data available to accurately substantiate the status of the national economic structure or the national agricultural production structure, it is not definitely known (past records of products which are not on the distribution line have not been tabulated), but the importance of maize is considered high, though it may vary in different areas.

For example, the priority of maize in the western and northern area (the region centering around Mwanza and Arusha) is not considered high, judging from the attention, interest and the efforts of government officials, bureau officials, specialists and the research staff.

It is presumed that this situation is due to the large number of estates and the vastness of these estates or the high weight of cash crops such as raw cotton, sisal, coffee, and nuts.

However, there is a strong desire and willingness to produce maize in the central area or in the region centering around Iringa and Morogoro, according to the Regional Officer. Also, at the branch office of N.A.P.B.,

because of the change in propensity of consumption "from BANANA to SENBE" and because of an unfavorable harvest record the previous year, there is concern over the collapse of the demand and supply balance.

Of course the importance of maize is not ignored in the western area or in the northern area. In both the Ukiruguru and Tenguru Research Stations, research workers in their specialty are performing trial cultivation and experimentation of the so-called UKIRUGURU composite, experiments to improve planting space for mize, correlative experiments of latitude, elevation, fertilization, soil condition and precipitation, and are concentrating their combined efforts on the extensive experimental work which is of national importance. As a result, importance of maize may be described as being unavoidably hidden due to other conspicuous products, weather conditions, precipitation, limitation of soil condition and economical factors. The yield of maize in Arusha in 1967 is said to be an all time high and this accomplishment is not only the result of favorable weather but it substantiates the fact that maize production still is of importance.



Table I - 1

## Calory Calculation of Nations Staple Food

(Trial calculation by Mr. G. A. SEMITI)

	Average annual production (1964 - 66) M. ton	Total calories in a year unit quantity C. UNIT	Calories per ton unit quantity C. U.	Gross calories unit composition
Maize	740.0	3,552	4.8	36.8%
Cassava	424.0	1,993	4.7	20.6
Banana	810.0	810	2.0	8.4
Sorgham	145.0	681	4.7	7.1
Pulses	142.0	667	4.7	6.9
Millets	106.0	477	4.5	4.9
Meat	155.0	450	2.9	4.7
Sweetpotato	194.0	252	1.3	2.6
Rice	42.0	202	4.8	2.1
Wheat	35.0	168	4.8	1.7
Total of others	3,092.0	9,654	--	100.0
Calories required for 10 million people	--	12,500	--	(100.0)
Shortage of calory	--	2,846	--	( 29.5)

These food consumption structures, i. e. the composition and weight of food in the total consumption may change from time to time by type of harvest and prices, yet the majority of them are stable and from the obvious fact that both crops, maize having a weight of nearly 40% (in caloric calculation) and cassava having a weight of over 20%, constitute the greater part (60%) of the total daily food consumption for the nation as a whole, it can be said that both crops, though they may be changed by the influence of other factors, are supporting national life by supplementing each other.

In Dodoma and Iringa areas where no other prominent cash crops, and not many estates are seen (one of the reasons for this fact is that there are so many medium sized farms) it is natural that the weight of production is concentrated on the crops which require little care and which grow satisfactorily if favored by proper precipitation and temperature and for which a growing demand rather than a slump is foreseen in the future.

Regarding sweet potatoes, a considerable effort is being made. However, it cannot go beyond testing stage and the degree of diffusion is low, Rice; it is true that rice is becoming the staple food for the middle or upper classes, however, because of the limited quantity of production and the import and also due to its price (double or more of that of maize), it will require a long time before it comes to be used widely by the general public, and becomes a staple food.

## 2. Measures of the Tanzanian Government for Increased Production of Maize

### (a) Plant Breeding

#### (i) Existing plant breeding:

Although there seems to be a great deal of local plant breeding, many have a low unit yield and their yield, in most cases, is one to two bags per acre. The principal cause for the low yield of 0.5 to 1.0 bags, on the average obtained by dividing the total yield (estimate) by the total number of farm houses (estimate), is believed to stem from this fact.

#### (ii) New Plant breeding

Although the tendency of the world is for HYBRID, (Kenya, South Africa, etc.) this single crop type always requires a smooth procurement and supply of new seed and it also requires technique and labor for maintenance and fertilization. Therefore it is considered most appropriate to introduce Composite and Synthetic under the existing circumstances.

(iii) Measures for Improvement

As previously stated, adoption of a new breed may be appropriate as a policy. However, local breeds are still predominant and further publicity, and the activities and guidance of the FIELD OFFICER are required, yet the effort of the FIELD OFFICER has not reached the dispersed and isolated farm houses and farmland under the existing circumstances. Particularly, the production method of seed for distribution may require further improvement in the future for increased production.

(b) Method of Cultivation

(i) Existing spacing and ridging need a great deal of improvement.

While the research center tries to show the efficiency and to explain the method, there are still many farmers who will not put them into practice. The Research Center authorities say that this improvement alone should easily increase production by 20%.

(ii) The FIELD OFFICER aided by an assistant is providing instructions through demonstrations of experiments at the model farms and practical exercises at the training center. Publicity activities may gradually show their result. However, it is believed that results will be more effective if publicity activities are combined with the diffusion of machinery and fertilization. In conclusion, we strongly feel that machinery, fertilization and cultivation methods should be brought in as a whole.

(iii) It seems that mechanization is being practiced to a considerable extent in the test station but very few are in conformity with soil condition, crops and working efficiency. Tractors are mainly used contract cultivation SOCIETY and some of them are owned by farmers in the middle or upper classes, but number very few when compared with the total number. Use of cultivators and the utilization of cattle (particularly 2 heads) is said to be best. Judging from the financial capability of farmers and the advantages of obtaining manure and its mobility providing small turn, this method seems to be fitted to the existing condition. When its low cost and its

mobility with small turns alone are considered, would not the introduction of a Japanese made small cultivator reveal an unexpected adaptability?

(c) Fertilizer

(i) There are very few cases in which chemical fertilizer is being used for maize crops except by large scale farmers. Experiment and research institutes and training centers are currently providing instructions on the use of compost and manure but its diffusion is making slow progress, due to the farmers' unwillingness towards the complex handling of fertilizer. Use of commercial fertilizer in the test has substantiated that it surely will result in increased yield and it is said the recovery of funds invested in commercial fertilizer is possible, yet the obstruction for its becoming popular seems to stem from the fact that it requires cash payment. Therefore, it is desirable to distribute fertilizer free of charge for trial and experimental use in the initial stage. However, if instructions on the use, proper time and cautions are ignored it may result in an adverse effect and this would be particularly true in the case of N. fertilizer.

(ii) Since  $p_{205}$  is said to be particularly effective for increased production, its use in combination with N is recommended. It seems that assorted fertilizers and compound fertilizers have never been used nor have they been used for test purposes. However, experimentation in this field is yet to be done, and in this respect, isn't there a key for the solution of problems involving the cooperation of our country? Since most of the farm land contains acid soil requiring the use of lime and if the use of ammonium sulphate increases, the requirement for the lime will be increased accordingly.

(iii) Because of the small quantity of fertilizer in actual use, this may not be the time to judge the appropriateness of the method of fertilization, but there seems to be a general standard of diffusion and guidance on the time and method of fertilization. In the case of maize, the research center authorities stated that additional utilization of fertilization when the plant is about knee high should bring remarkable results. It seems that the

authorities are also recommending the use of compost and manure but because of its requirement for patient preparation, it is questionable whether this method can be diffused among the farmers of the middle and lower classes, who have been practicing the existing simple method of cultivation.

#### (d) Irrigation

At present, the Ministry of Land Development and Water Utilization is putting an irrigation scheme into operation in the vicinity of Moshi and water is pumped out from an underground well 80 feet deep (by a 30 HP pump) for trial cultivation of maize, rice, pulses, tomato, etc. (Approximately 300 acres) it is said that the can be pumped out from underground about 3 meters deep depending on the location. If an underground water vein is discovered, the water pump facilities could be installed comparatively easily and two or three crops a year will be practiced extensively. The problem will be the cost of facilities for pumping water and irrigation and also the power sources.

Crops of high earning rate only will be planted in the land thus developed, and it is considered, therefore that there will be only a few cases of which the land for maize plantations are irrigated.

#### (e) Harvest

As to the mowing of maize, it is said that the method of cutting the stem about 1 foot from the root and tearing off the cob is being employed. The remainder of the plants are consumed by livestock that are let on the farm land and results in the fall of ridges and hardning of the soil, bringing an adverse effect to the after preparation. Instructions being given require early disposition of plants in bundles in the ridges and plowing them by mixing stems after the crop is harvested.

#### (f) Storage and Delivery

Delivery of crops to N.A.P.B. is made in jute bags (gunny sacks) and it seems that disinfectant powder is being used in the warehouses.

However, this method does not seem to be sufficient and there appears to be many cases in which insects are found in the harvested crops after one year of storage. Selection of crops is done by judging the grade at the time of sale. However, this method is not sufficient and there seems to be a need for selecting crops physically or mechanically or variety standardization (at the time of planting).

SURVEYS ON WHITE MAIZE IN TANZANIA

October 23, 1967

Fiscal Year	Name of Delegation	Dispatching Organization	Members	Results of Outline of Survey	Problems, Countermeasures, Conclusions.
1964 (Jan. - Mar. '65)	Survey Mission on Maize in Three Southeast Asia Countries.	Committee for the import of Maize from the Three Southeast Asia Countries.	Head : Shuntaro Ito (Chief of Research Division, Nihon Food Processing K. K.) Members : Hiroshi Usami (Business Department Mitsubishi Trading KK)  Hiroshi Ohhara. (Oils and Fats Division, Mitsui & Co.)  Fujio Kurachi (Nihon Cornstarch KK)  Shigeo Yamamoto (Nihon Cornstarch KK)  Norio Wada (Oils and Fats Division, Toyo Menka KK)	1) The Government of Tanzania taken a very active policy toward the promotion of maize production with results shown here seemingly justifying this. 2) The competence of the native labor force is said best among the three southeast Asia countries. 3) Efforts are being made for the dissemination of improved breed but not yet thoroughly propagated. 4) If farm land is expanded and sufficient water supply is available, the highest production among the three countries may be expected. 5) The Cooperative Board and unions are systematically organized but product distribution leaves much to be desired.	1) To be Self-supporting is the prime object of the government. The reserve supply for export is not great, therefore the government has no plan for constant export at this time. 2) Standards and prices of products for export are questionable. Particularly, the low quality risk is considered unavoidable at present. 3) If the development of cultivation area, maintenance of fertility, improvement of irrigation varieties is continued, the future appears fairly promising.
1966 (Jul. - Aug. '66)	Survey Mission on the Primary Products in Three Southeast Asia Countries.	Council for the Disposition of Problems on the Primary Products.	Head : Yoshitsugu Togari (Professor at Agricultural Department, Tokyo University) Member : Kameo Nomoto (Division chief, Experiment Station, Ministry of Agriculture and Forestry)  Masuichi Ohmori (Oils and Fats Division, Mitsui & Co.)  Masaya Hosomi (Asia Research Institute)  Kiichi Takahashi (Technical Cooperation Section, Ministry of International Trade and Industry)	1) The Government of Tanzania has adopted a reasonable measure for raising production to cope with the population explosion and a mechanization program is now partially in progress. 2) The self-supporting and self-sufficient system of the past has been restored and efforts are being made to build up reserves for export. 3) Though the system of N. A. P. B. is well organized, domestic transportation capacity (roads & harbors) is causing a bottleneck. 4) The main force for experiments and research work is located in Kenya and Uganda with 4 experimental stations located in Tanzania.	1) A fairly large area is available for development but investments are required for both water supply and irrigation. 2) Leaves plenty of room for Japan to introduce all kinds of machinery. 3) Improvement of breed increase in the transportation and storage capacity must be achieved. 4) Object of Japanese cooperation will be the invitation of experts on mechanization, from foreign countries, the sending of technicians and construction of fertilizer plants abroad. 5) The possibility of growing aquatic rice is questionable because of precipitation of the land.
1966 (Feb. 1966)	Africa Economic Mission (Reference: The policy of Japan with regard to Trade with three Southeast Asia Countries and placed on the present situation of the import of primary products and related problems)	The Productivity Center. The Federation of Economic Organization. Japan Chamber of Commerce and Industry. Japan Committee for Economic Development.	Team was composed of representatives of the foregoing organizations.	1) Production increases from 800,000 to 900,000 tons when there is excessive but only 10% on the total production is distribution. 2) The majority is consumed thru the domestic market with the government having no thought of constant export.	1) Even the guaranteed price of N. A. P. B. would not keep the maize in the line. This is also for storage purposes and is not presently considered for use as a means to correct one-sided trade. 2) Has the possibility of becoming the top nation in Southeast Asia in terms of labor. 3) There is much room left for the improvement of harbor and transportation facilities.
1967 (Jun. - Jul. '66)	Survey mission on the system for the procurement of Primary products.	Nihon Cornstarch Association Nihon Food Processing KK (Jointly sponsored)	Head : Mr. Ohkura (Nihon Food Processing KK)	1) Reserve for constant export is meager. Between 20,000 to 30,000 tons can be released from stock (reserve) and this is considered the limit for export. 2) There is a shortage of seed (improved) and this is covered with the assistance of Zambia.	1) Adoption of this product as a measure to correct present one-sided trade can not be expected. 2) It will take 5 years before this country has sufficient reserve power for constant export. The improvement of seed, etc. However, it will never be possible if long range improvement measures are taken and then, the cooperation by Japan will be worthwhile.
1967 (Jan. '67)	Survey on the Enterprise for the Promotion of Import of Product from Developing Countries.	Japan External Trade Organization.	Mr. Kasegawa (Director, Japan External Trade Organization (JETRO))	1) Though the available data on Tanzania is not sufficient, the weather in the production areas except the central area is considered appropriate. However, precipitation is changeable. 2) Self-supporting agriculture by migratory farming (farming by clearing land) is being exercised and farm products are not commercialized. 3) There are many cases of erosion because of inadequate utilization of fertilizers (manure). 4) There is also a problem with the land ownership system. 5) Price structure has not been regulated among the areas and prices fluctuate wildly during the year.	1) Autarchy affects the distribution system to some extent. 2) It is difficult to give guarantee for a constant supply. 3) There is a wide difference between these prices and international ones. 4) Progress of the MARKETING BOARD is most among the three Southeast Asia countries. 5) Measures to cope with damage by blight and noxious insects are in progress. Improved varieties are being introduced. 6) Improvement of transportation facilities is required. 7) Regulation in the price structure is necessary.

## II. CULTIVATION METHOD

In Tanzania the maize seed is sowed from December through March and harvested about 5 months later. Therefore, in mid November when we made our survey, it was the non-cultivation period prior to planting, and we had an opportunity to see off-season cultivation only. In this respect, the time of our survey was definitely inappropriate for the survey on production. It is regrettable that we were not able to judge on actual observation of maize growing and that we had to rely mainly on hearsay, therefore attention must be paid to the fact, that as a result, the following statement may contain misunderstanding, omissions, and that in many cases the story was influenced by the subjective point of view of the person we interviewed.

### 1. Actual Condition of Maize Cultivation

About the natural conditions such as soil and climate, the report of several surveys in the past have already described them in detail, therefore, we will not go further at this moment. We only would like to mention particularly the fact that the greatest factor which controls the agricultural production in this country is the precipitation.

Annual precipitation in this country except the Southern area and a portion of the district along a mountain range is approximately 520 to 1,040 mm, which is 1/3 to 2/3 of the figures in Japan; In addition, the year is divided into the dry season and the rainy season and in the case of the latter, cultivation of crops is impossible even with a favorable temperature. Moreover, even during the rainy season, the period of rainfall and the precipitation vary greatly depending on the year and they have a great influence on the yield of the crops.

#### (a) Chief producing district of maize

This country totally lacks any statistics on production and the entire picture of agriculture such as total national or regional cultivated acreage, the yield per acre, gross production, etc. are not available. The past report by the survey team estimates the total production as 0.8 to 1 million tons.



However, according to the information we obtained from the National Agricultural Products Board (hereafter referred to as N.A.P.B.) at Dar-Es-Salaam, the total production is estimated at seven to eight hundred thousand tons but even these figures are not definite. According to the attached sheet, "The National food balance sheet" by Mr. G.A. Semiti, the total production is estimated at seven hundred forty thousand tons. Judging from the instability owing to fluctuation of precipitation and also from the difference in years in the quantity handled by NAPB, total annual production is considered to undergo a great change depending on the year. Therefore, it is estimated that the total production is from 700 thousand to 1 million tons.

Though the total production is not as clear as this it became possible to obtain clearly the quantity distributed through the market, after the establishment of the aforementioned NAPB in 1963. The quantity of visible supply by year and area after the establishment of NAPB is as shown in Table II-1:

As shown in this table, the quantity of visible supply in both Iringa and Dodoma region totals about 50% and 70% of the total quantity respectively in bumper years in lean years and it can be said that the chief production areas of maize as merchandise are also in these two districts.

This is true not only in the matter of quantity but also in (1) production stability, (2) quality and (3) yield per unit area. That is, the quantity of visible supply in both regions has a small fluency in the year and production in these two areas is more stabilized than any other district. Also, according to the results of hearing inquiries we made at the branch offices of NAPB at various districts during our recent survey on the quantity handled by grade, it was found that while in Kilimanjaro the majority of crops are grade 3 to 4, 99% of the total quantity in Iringa was said to be grade 1. These facts indicate superiority of these two areas in the respect of appropriateness for growing maize of high quality and as merchandise. Superiority of the two areas also in respect to the yield per 10 acre (land productivity) is explained in the following.

(b) Land Productivity

The figures the NAPB main office provided us with as the national average yield was 4 bags/acre (1 bag weighs 200 lbs. and is the equivalent of 90kg) but the yield in each area we had surveyed afterwards are as follows and are a little higher than the national average yield.

Region	Sources of information	Yield per acre(bag)
Arusha	Tengeru Agr. Experiment station Northern Res. Center	5 - 10
Kilimanjaro	R. A. O.	5 - 8 (3 in lean year)
Dodoma	R. A. O.	10
Iringa	NAPB R. A. O.	8 - 10 8
Kilosa	Iringa Agr. Experiment station Central Res Center	5 - 6

As shown in the above figures, the yield is from 5 to 6 bags/acre in lean years and 8 to 10 bags/acre in bumper years. Yield per 10 acres is from 100 to 200kg and these figures represent 40 to 80% of the national average yield of Japan and 20 to 40% of the average yield in Nagano Prefecture, Japan where the yield is highest.

(c) Cultivation Period

Seed is sown during the rainy season in November and December or in March and crops are harvested from May through August depending on the time of planting.

(d) Varieties

The typical native variety in this country is said to be "Katumbili", but in reality it seems that many other varieties are being grown and the "Katumbili", is included in the items of recommendation. Though the raising cultivation of this variety is encouraged and the cultivation of the improved variety this seed is listed as the top item of recommendation in each area, its diffusion among the farmers seems to be making slow progress.

(e) Method of Cultivation

i. Method of plantation

Based on the results of past experiments, 3ft. space, between rows, 1ft. between mounds and one plant for one mound system calling for is being recommended. However, as far as we know, the attitude of farmers toward this matter is very irresponsible and their furrows are not straight, some mounds are missing and in some cases roots are planted 2 meters apart and it seems that the above mentioned standard has not penetrated among farmers at all. In this respect, Mr. Salaama of the Northern Research Centre sorrowfully stated that if only the proper seed is selected, and this cultivation method is strictly observed with proper ridges maintained, it would result in an increase in yield by 20 to 30%. Judging from his comment, we may justly assume this state as the prevalent condition.

ii. Fertilization

In this country, shifting farms by burning the wood land is still prevalent. This is the method of shifting farms one after another when the land becomes lean, therefore, the majority of cultivation is without fertilizer. It is said that at Isumani in the Dodoma area, particular attention has steadily been paid to the cultivation of maize in the past several years but because of the continuous cropping of maize on the same field, the yield of 15 bags/acre (340kg/10 a) at the time of reclamation of the land has recently has been reduced to 1/3 of the original figure, only 5 bags/acre. It has been reported that in this district the testing of fertilization is being carried out in the field and farmers are increasingly showing their interest and that as a result, the number of farmers actually using fertilizer has increased. According to the RAO report in 1966 for the Iringa region, 75 tons of double phosphate and 20 tons of Ammonium Sulphate were distributed in the Ismani district and this fact shows an outstanding amount of consumption of fertilizer in the Ismani district. However, if the standard of 100 lbs/acre each of Double Sulphate and Ammonium Sulphate is being recommended for this district, it means that each fertilizer is being used only on 2 to 3% of the

total maize field of 80,000 acres. It could be safely said that in general cultivation is being carried out without fertilizer in all other districts.

### iii. Damage by Pests, Diseases and other Obstacles

As stated in the previous report, there are many harmful insects. Judging from the result of our surveys it seems that the most extensive outbreak and damage was by stemborer, followed by Army worm. Control of these pests by the use of DDT is encouraged but this method does not seem to be practiced. Harmful insects during storage of maize; damage by grain weevil accounts for the most damage, and during our survey of maize in storage, a major outbreak of grain weevil was observed.

Diseases; damage by maize streak accounts for the major portion of the total damage and cultivation of a variety resistant to this disease is one of the important objects of cultivation. Control by use of DDT carrying the virus, is encouraged, however, in this case, this method seems to be insufficient for actual use.

### iv. Working Condition (agricultural implements)

The scale of holding is small in general and the average cultivation area is from 3 to 5 acres. Farming at present depends largely on manual work. However, plowing by 4 to 8 head of cattle is being practiced in some cases and in the Northern Research Center (Tengeru), as the centre of the whole country, performance and selection tests of the machinery and implements utilizing livestock are being carried out and diffusion of selected machinery and implements is being promoted. Also, recently, unions in each area have purchased large tractors and placed them under the care of an affiliated society to meet the demand of contract farming. Demand for this type of farming is said to be increasing yearly.

Table II - 2

Area	Contract price
Mwanza	20 sh/acre
Kilimanjaro	20 sh/acre (40sh in riasu district)
	50 sh/acre (cultivation of new land)
	25 sh/acre (Earth breaking, Harrow)
Dodoma	50 sh/acre
	25 sh/acre (Earth breaking)
Morogoro	80 sh/acre
Iringa	40 sh/acre

Effectiveness; the record crop in 1967 is attributed to the increased cultivated area and increased yield per area and for the latter, plowing by tractor is appraised as the major factor. Except for plowing and harrowing, most of the farming is done by man power. (Table II - 2)

## 2. Experiments and Research Work on Maize

### (a) The Breeding

The breeding of maize; the laboratory of the East African Agriculture and Forestry Research Organization (EAAFRO), an international research organ for the three East African Countries, Kenya, Uganda and Tanzania, is located in Kitale in the Northern part of Kenya and research work is being carried out centering around this laboratory. Although we were not able to visit this laboratory during the survey, the annual report indicates that an emphasis is placed mainly on research work on the method of breeding suited to the conditions in the three East African countries and that as the results of the research work, excellent varieties such as Kitale Composite A, Kitale Synthetic II, or Kitale Hybrid H622, H623, etc. were bred.

On the other hand, in Tanzania research had been carried out in each individual research center in the past. However, such a system of

research work results in a shortage of personnel and a waste of time and expence because of the overlap of ecological area. Therefore, beginning two years ago, (1966), a system of cooperation was adopted with Mr. Bolton of the Western Research Center (Ukiriguru) as its head. This system operates with Mr. Bolten responsible for planning and coordination and breeding is carried out with the cooperation of the Central Research Center (Ilonga) and Northern Research Center (Tenguru). The varieties or hybrids bred at these three centers, including the varieties bred at the previously mentioned Kitale (Kenya), are presently distributed throughout the country for comparative experiment and are being tested for their adoptability to local conditions.

As a result of these tests, Ukiriguru Composite A, B, Ilonga Composite A, Ilonga Synthetic I-V etc., have already been composed and cultivation is also carried on in Tengeru. As far as cultivation is concerned, it may well be said that this work is being proceeded with high techniques adopting the results of recent result of genetics and with appropriate cooperation. The only thing we had noticed during our visit to these centers was that the Central Research Center in particular was somewhat short of personnel.

However, since there is no established system of seed production in this country, it is feared that the long awaited varieties of excellent quality may not be widely used. Particularly in the case of hybrid seeds, because of their unavailability for home seed growing, its wide spread growing can not be expected unless the seed production system is established, and even with the established seed production system it has the disadvantage of high costs. In this connection, the attitude of placing emphasis on the cultivation and improvement of Composite varieties for the time being may be said to be very wise and appropriate.

#### (b) Cultivation

Experimental work is being carried out in the Agonomy section or Soil and Fertilizer section of each Research Centers. Much of the work is experiment with fertilizer. Other experiments are conducted for plant

density or plant spacing. As previously mentioned, a general standard has been established and is encouraged. However, the instability of rainfall makes it very difficult to follow the recommendations on fertilizer in this country and fluctuation in precipitation affects the yield and is making it difficult to establish cultivation techniques.

(c) Agricultural Machinery

Research work on agricultural machinery is being conducted at the Northern Research Center in Tengeru. In this country, emphasis is placed on the test of farm machines and implements for small holding farmers. Particularly because of their traditional practice of using cattle for plowing, plows for utilization of 6 to 8 head of cattles, planters, harrows, and cultivators have been introduced from foreign countries and are being tested.

3. Problems and Countermeasures

(a) Technical Problems

i. Crops (Variety - Cultivation)

It is needless to say that in agricultural production the efficiency of crops (variety cultivation) themselves is the important factor.

Systematic breeding is being carried out in a joint effort by the three East African countries and by Tanzania alone and as a result, the varieties or the hybrids having excellent characteristics has already been bred. The only problem concerning this point is the fact that the varieties and hybrids have not been widely utilized by farmers. In this connection, establishment of function for systematic production and sale of seed, such as Kenya Seed Co. in Kenya, should be a matter requiring immediate attention. Further, these improved varieties can not discharge their efficiency fully unless appropriate cultivation methods (for example, heavy dressing of fertilizer, etc.), are employed. This must also be done in parallel with the extention of the following cultivation techniques.

(b) Natural Conditions

Weather conditions and soils in this country are, suited to the cultivation of maize. The results of the previously mentioned variety comparative test, with a good example of 6,600 lbs/acre = 720 kg/10a. also indicates that if the selection of variety and cultivation method are appropriate under favorable conditions, a high yield could be expected.

What are favorable conditions? This land is subject to precipitation. This drawback and the area to which it applies is the point of concern. This country belongs to the dry zone, and draughts have frequently hit the area causing a decrease in the yield of crops. Also, squalls, a type of storm peculiar to the tropics have eroded the soil for long periods deteriorating the land and resulting in the loss of fertilizer. These ravages by the elements are obstructing the diffusion of fertilization, and how to control the water content of the soil will be one of the greatest problems in obtaining favorable conditions.

As for the basic countermeasures, the establishment and enforcement of an irrigation project is essential and in fact there have already been several irrigation projects. However, in such a country, where the absolute quantity of precipitation is small and where the year is distinctly divided into a dry and a rainy season, we often see the small rivers without any water during the dry season. Accordingly, areas which may possibly be irrigated will be limited and even for the area where irrigation is possible, the cost of irrigation water will be extremely high. Also, judging from a recent trend, it seems that the areas falling into possible irrigation areas are being converted to paddy fields.

As a tentative measure to retain the water content of the soil, such measures as improvement of the water retaining ability of soil by means of contour ridging cultivation, deep furrowing, utilization of compost and manure (this should be easily accomplished if means are obtained because of holding of many livestock or by means which control the evaporation of water during the dry season by mulching should be employed.



Also, in the middle and northern area, particularly in the northern area, cultivation of varieties requiring a short growing period is essential to avoid drought. On the other hand, soil erosion by heavy rainfall was particularly noticeable in granite soil areas in the vicinity of Kondoa in the central region. In these areas measures to introduce terracing, contour cropping, and cover crop are required.

#### (c) Cultivation Techniques

Research work on fertilization techniques, plant density, planting method (pattern), etc. are being carried out at every research centre and general techniques for increased crops have been established. However, as far as we have seen (of course as stated in the beginning, our observations may have been of the worst example out of season), the gap between the techniques of research centres and those of farmers is too great. As previously stated, the width of furrows is not uniform and regular, mounds are missing in many cases and in some extreme cases the distances between mounds is greater than 2 meters. Generally speaking, plant density is too sparse and according to hearsay during our survey, almost no fertilization is taking place. The previously mentioned comment of Mr. Salaama, Agronomist at the Northern Research Center, to the effect that if good seeds are selected, population and plantation methods well prepared and ridges are formed, this alone should result in an increase of crop by 20 to 30%, is probably the most appropriate way to describe the situation. As a tentative measure for the increased production of maize, filling the gap between the techniques of research centers and those of the farmers rather than accomplishing any steps in the field of research work is the shortest and most practical way.

#### (d) Operation and Economical Problems

##### i. Prices

According to the data furnished by the NAPB, the purchase price of the 1st grade in 1967/68 is 39,60sh/bag and the sales price is 46.80 sh/bag. These figures are equivalent to \$60.50 and \$71.50 per ton respectively.

The former is almost equal to the international price and the latter is about 20% higher than the international price. Yet, a RAO report indicates that farmers in several areas are not satisfied with these prices and are demanding higher prices. Thus the price of maize in this country is not fixed. Also, if maize is to be transported to Japan, the price of maize will be higher than that of maize produced in Southeast Asian countries, due to the difference in freight charges.

#### ii. Supporting factors for Maize Production

The main point, therefore, is not on the mere possibility of increased production but is on the possibility of increased production with low cost or whether it is possible to bring down the price by increased production. Since maize and soy beans, etc. are the crops suited for large scale production, they could not compete with those produced by large scale operations using machinery. As previously mentioned, the average size of a farm in this country is said to be from 4 to 5 acres. Since the improvement of the living standards of farmers must also be considered, expansion of the scale of holding should be taken into consideration. To materialize this expansion, means of labor must be improved. In connection with this, efforts are being directed under the direction of the Northern Research Center for the improvement and diffusion of machinery and implements utilizing livestock, the traditional practice among farmers. However, for plowing and harrowing, they should depend on contract work which utilizes tractors of the society, which is becoming popular among farmers and depends on the method of utilizing livestock for weeding and cultivation. For these operations, the use of small tractors instead of livestock can also be considered and in such a case the contribution to introduce such machinery and techniques from Japan may be considered.

Improvement of the means of labor could be a turning point for expanding the scale of holding and also with its vast undeveloped land area and the fact that the entire land is owned by the government, expansion of the holding scale is considered comparatively easy to accomplish, however, there are many problems involved in its process. In order to help solve

these problems a survey of the development and process of the establishment of large scale plantations seen around Wami Prison along the road leading from Morogo to Kilosa should be begun.

#### 4. Technical Cooperation

##### (a) Priority areas for increased production of maize

Principal maize production areas in this country are Iringa and Dodoma. In the areas of Iringa and Dodoma, because of fewer estates, farming is on a relatively large scale, thus, the maize supply should be large.

Now, let us try to see the status of the Iringa area which handles the largest quantity of maize in the country. The ratio of production handled in this area to the total production of the country was approximately 30% in the year 1963/1964 and about 40% in the periods 1964/1965 and 1965/66, indicating very high rates. Moreover, in the area of Iringa it is said the quantity handled at Isumani, north of Iringa, is extremely large, amounting to 60% of the total. There is a similar maize production area in Mpwapwa district in the Dodoma region.

This fact indicates that the amount of maize sold by each individual farmer in other areas is extremely small. Although the necessity of expanding the scale of holdings of farmers was discussed previously, if technical cooperation is intended to increase the overall production of maize then the shortest and most appropriate way would be to try to increase production in the Ismani and Mpwapwa areas or in the areas similar to these.

##### (b) Method of Cooperation

As was stated in paragraph 3, the most noticeable fact in the agriculture of this country is that new methods of production resulting from research work are not taken up by farmers.

Research work itself must be continued. Also it has been noticed that some of their research work requires further improvement. However,

as to the research, cultivation in particular is being promoted under a systematic network, so isolated research work by Japanese research workers would be very difficult and not so effective. The only thing conceivable is to get into the existing network and to share the work under the control of the Western Research Center.

It is considered that technical cooperation could be best accomplished by getting farmers to combine their own techniques with the methods obtained from research. In connection with this, various measures are being employed in this country. In each district Field Officers are assigned under the control of the Regional Agricultural Officer, advising farmers on the application of the new methods. Also, the Farmers Training Center in every district sponsors several different courses and training through short and long periods. In the field of technical cooperation with foreign countries, the Nordic Center, which we visited, has been established by the joint investment of four Northern European countries and has under its direction the Farmer's Training Center the Education Center and Health Center and conducts similar training courses.

However, bearing in mind the vast area of the country, one Field Officer seems to be insufficient, and an increase in staff is necessary. For example 1. Perfection of Training Center. Courses to be sponsored for a much longer period, particularly for younger people. Self-supporting diligent farmers should be assisted. 2. A course such as the one in Japan should be arranged for the training of officers in the extension system.

These are general considerations and if we focus on the questions that confront us, the production increase and import scheme for maize, the shortest and most practical way would be for the selection of a mass production area of maize such as Ismani and Mpwapwa as previously mentioned, and the conducting of experiments for the purpose of establishing improved techniques suited to local conditions. At the same time efforts should be made on the guidance and diffusion of techniques. The importance of establishing a nationwide seed production system, for the diffusion of variety of first-class quality quality has already been discussed and if the above-mentioned

technical cooperation is to be implemented, cultivation for seed production should also be included to ensure a supply of seed to that area.

In conclusion an obstruction that confronted us in our survey of agriculture in this country was the lack of basic statistical data for any of the subjects we studied. Apart from the present issue of technical cooperation, if anything is required as a contribution to the development of agriculture here it would be that a consultant be sent to establish statistical research systems, and that the necessary improvements in the extension system be made.

Calory Calculation of Nations Staple Food  
(Trial calculation by Mr. G. A. SEMITI)

	Average annual production (1964 - 66) M. ton	Total calories in a year unit quantity C. UNIT	Calories per ton unit quantity C. U.	Gross calories unit composition
Maize	740.0	3,552	4.8	36.8%
Cassava	424.0	1,993	4.7	20.6
Bannana	810.0	810	2.0	8.4
Sorgham	145.0	681	4.7	7.1
Pulses	142.0	667	4.7	6.9
Milletts	106.0	477	4.5	4.9
Meat	155.0	450	2.9	4.7
Sweetpotato	194.0	252	1.3	2.6
Rice	42.0	202	4.8	2.1
Wheat	35.0	168	4.8	1.7
Total of others	3,092.0	9,654	--	100.0
Calories required for 10 million people	--	12,500	--	(100.0)
Shortage of calory	--	2,846	--	( 29.5)
Area	Sources of information		Yield per acre (bag)	
Arusha	Tengeru Agr. Experiment station		5 - 10	
Kilimanjaro	R.A.O.		5 - 8 (3 in lean year)	
Dodoma	R.A.O.		10	
Iringa	R.A.O.		8 - 10	
Kilisa	Iringa Agr. Experiment station		5 - 6	

Calory Calculation of Nations Staple Food  
(Trial calculation by Mr. G. A. SEMITI)

	Quantity Handled (Ton)		Average Prices (1966)	
	1961	1966		
Tea	4,388	6,693	--	--
Rice	22,927	42,176	27	0.54
Maize	50,386	123,232	14	0.28
Sorghum	8,878	13,964	20	0.40
Wheat	5,444	32,815	27	0.54
Cassava	26,139	85,865	--	--
Sweetpotato	2,000	18,001	10	0.20
Millet	13,688	16,863	20	0.40
Banana	38,788	91,858	10	0.20
Coffee (mild)	13,278	42,283	240 (owner farming)	4.80
Coffee (strong)	6,024	12,385	210	4.20
Sisal	197,968	223,073	70	1.40
Raw cotton	32,969	78,202	--	--
Tabacco	2,645	5,056	--	--
Cashewnut	28,579	81,164	(estate)	--
Pyrethrum	1,274	4,353	280	5.60



Photo 1. Coordinating experiment bed for maize at Muringa Sisal Experiment Station in the suburbs of Tanga City. (Nov. 17, 1967)



Photo 2. Maize field with many missing plants (Nov. 17, 1967)



Photo 3. Collective cultivation of maize in Isumani district in the suburbs of Iringa (After cropping) (Nov. 22, 1967)



Photo 4. Maize breeding experiment bed at the West Experiment Station in Ukiriguru in the suburbs of Muwanza. Shown in the picture are Mr. A. Bolton and Mr. Miyamoto, head of the survey team. (Nov. 13, 1967)



Photo 5. Breeding bed for Sorghum and maize in the same experiment station.



Photot 6. Maize breeding experiment at the irrigation experiment station at Alusha Chini in the suburbs of moshi (showing back at the center is Mr. AA. Salama of The North Experiment Station) (Nov. 19, 1967)





Photo 7. Maize streak resistance test at the East African Agricultural and Forestry Research Center in Kikuyu in the suburbs of Nairobi. (At left is an infected plant) (Nov. 4, 1967)



Photo 8. Director Mr. Mwiyobera (Second from left) explaining on maize cultivation at the Farmers Training Center in Iringa (shown in the center is Field Officer Mr. M. Coombs) (Nov. 24, 1967)



Photo 9. Maize threshing machine (At the Farmers Training Center) (Nov. 24, 1967)



Photo 10. A pile of maize in a warehouse (At National Agr. Productive Board warehouse at Dodoma, Nov. 12, 1967)



Photo 11. Piles of maize in Oper area (maize is stored also in the tent) (Nov. 22, 1967)

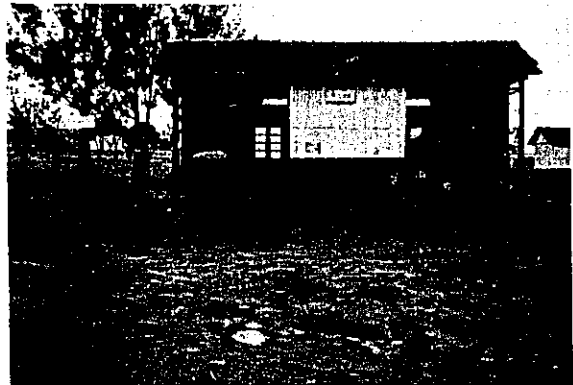


Photo 12. Local terminal for maize (At left is 1st grade crop and at right is 2nd grade crop) (At Babachi, Nov. 21, 1967)



Photo 13. Scene of maize peddling in the street  
(In Tanga City. Nov. 17, 1967)



Photo 14. A Shea Nuts tree (In Oyo City, Nigeria.  
Dec. 7, 1967)

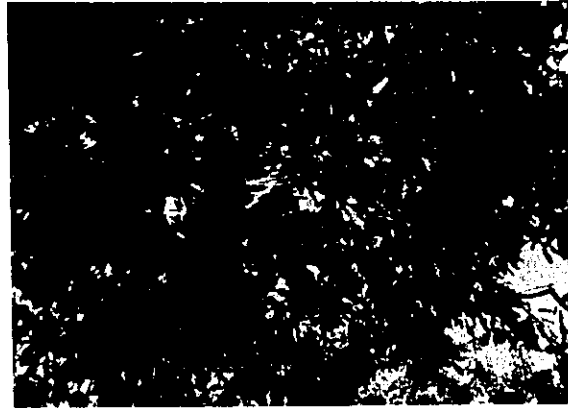


Photo 15. A Shea Nuts blossom (Center)  
(Dec. 6, 1967)

ERRATA

Page	Line	Error	Correct
2	15	AGR. d FOREST	AGR. & FOREST
3	8	at Dar-Es-	in Dar-Es-
4	18	RESEARCH.	RESEARCH
7	6	There team members	Three team members
32	9	Bannana	Banana

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