

Towards Sustainable Nutrition Improvement in Rural Mozambique

TSNI Summary Progress Report #4: 1 October 2003 - 31 March 2004

1. Project Partners

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Nutrition Division, Ministry of Health, Mozambique (Nutrition/MISAU)
World Vision, Mozambique (WV)
National Institute for Agronomic Research, Mozambique (INIA)
Southern African Root Crops Research Network, Mozambique (SARRNET)
Provincial Directorate of Agriculture of Zambézia, Mozambique (DPA)
Helen Keller International, Mozambique (HKI)

2. Project Objective

To determine whether a food-based intervention strategy can lead to sustainable, year-round intake of vitamin-A rich foods, reduced fluctuations in seasonal household calorie supply, and an overall improvement of diet diversity, nutritional status and diet quality in a cost-effective manner, particularly among children under five years of age.

3. Project Approach and Partner Roles

TSNI is an action research project based in Mopeia and Namacurra districts in Zambézia Province, Mozambique. The project integrates nutritional, agronomic, and socio-economic components to achieve the project objective. Project extension personnel will work with farmer groups and groups of women using a consultative approach to successfully introduce beta-carotene rich sweet potatoes and other sources of vitamin A into the young child and family diet. TSNI promotes the use of diversified new foods and also promotes market development for these products. MSU leads the socio-economic research activities, while INIA and SARRNET contribute to the agronomic research component and develop training materials related to the introduction of new varieties and improved agronomic practices. World Vision is the lead partner in the agriculture and nutrition extension activities, in collaboration with the MSU project coordinator and the DPA. HKI is developing the social marketing strategy, with WV and MSU assisting in implementation. Data entry and analysis are being done in-country, emphasizing the training of two nutritionists in data analysis and report preparation.

3. Major Accomplishments and Events

Since the first year report ending in September 2003, considerable progress has been made in the nutrition extension activities and in meeting targets for collecting data on consumption, morbidity and retinol status. The agricultural extension component has shown less progress due to the lack of rains during the second growing season in 2003, normally a highly productive season for sweet potato, and the inconsistent rains during the main growing season in 2004, which typically starts in November.

A major event for the project was the visit of a delegation from the Micronutrient Initiative (MI) and Canadian CIDA on November 30th and December 1st of 2003. The MI team of MI President Venkatesh Manaar, Senior Program Specialist Annie Wesley, and the MI Director for the Africa Region, Carol Marshall, was accompanied by Barbara MacDonald, Senior Nutrition Advisor for CIDA. Although the time was short, the team had a chance to visit two field sites, Malei and Lualua. In Malei, they observed the preparation of enriched weaning foods using orange-flesh sweet potato as a key ingredient and visited one on-farm sweet potato trial. In Lualua, they saw a second on-farm research trial and observed the implementation of the serum retinol, anthropometry and morbidity survey. The visit provided an opportunity for the team to interact with project staff, appreciate the extent of the malnutrition problem in rural Mozambique, and observe key extension activities and the measurement of their impact.

Major accomplishments and events for each major area of the project between October 2003 and March 2004 are described below.

A. Research Component

- ! The consumption and expenditure survey, which began in August 2003, was completed in October 2003. This survey was conducted among both intervention and control households. Consumption was estimated using 24-hour recall of all foods consumed by the household and by the reference child. Quantities were estimated using volumetric measures whenever possible, and using models of foods such as fruits and vegetables when not. Food expenditures were collected for March through August/September 2003, corresponding to the harvest period of the first growing season. Because of the large number of food products, and the detail needed on each product, the food expenditure component required at least an hour to implement, and for this reason was administered to only 25% of the study households. Non-food expenditures were collected among all households. A year-long recall period was used to capture the larger non-food expenditures; a 30 day recall was used for smaller regular purchases such as soap and matches.
- ! As part of the capacity strengthening component of the project, a trainee from the Policy Analysis Department of the Ministry of Agriculture and Rural Development, Lurdes Suleman, joined the survey team for a month of data collection in September 2003. Lurdes also monitored preparation techniques of main dishes in the village and took weight and volume measurements to help construct a conversion table for the consumption data. She was subsequently trained in how to design the data entry program for the consumption and expenditure data using CSPRO and spent three weeks assisting the team in

data entry. As part of her thesis research at Eduardo Mondlane University, Lurdes will use the 24 hour recall data to verify in Zambézia province the NUTRIPROX model developed originally developed with data from Nampula and Cabo Delgado provinces. She is currently constructing the conversion tables based on the data collected in the field.

- ! The second round of data collection on morbidity, serum retinol status, and anthropometric indicators of nutritional status began in November 2003. The original design called for data collection to be done only in intervention households, and for each reference child to receive a placebo in lieu of a vitamin A capsule. If the serum retinol analysis showed inadequate status, the team would return during the subsequent month to administer a vitamin A capsule. However, in September and October 2003, many families in the area were affected by a serious measles outbreak. Given that the second growing season was badly affected by drought making the health environment even poorer than normal for this time of year, a decision was made to in essence repeat the baseline protocol, that is, to visit all households in both the control and intervention areas and subsequent to obtaining serum retinol status, to immediately provide another vitamin A capsule to all study children. In addition, the survey team provided transport to a team of vaccinators from the District Health Center to help ensure that all children in the area were up-to-date on their vaccinations. While being vaccinated against measles provides no protection once the community has been exposed, there were many communities within the study area that had not yet been affected by the outbreak.

- ! Round 2 data collection was completed by mid-January (taking into account call-backs to households not available during the scheduled visit). Between the end of the baseline survey and Round 2, 39 survey participants fell out of the sample, 22 due to the death of the child, 9 due to out-migration, 6 refused to continue, and 2 due to other reasons. The data on the 787 households remaining in the sample (97.5% of the final baseline sample) were double entered in February of 2003. To date, 50% of the serum retinol samples have been analyzed by Craft Laboratories. Results on the remaining samples are expected by mid-April.

- ! In October 2003, Felipe Zano, the project agronomist, worked with marketing specialist David Tschirley and Jan Low to develop an instrument for assessing the profitability of existing wholesale and retail traders in Mozambique. A rapid assessment of five wholesale traders and nine retail traders was conducted during the month.

- ! On 11 March 2004, the survey team began interviewing intervention households about their experience producing sweet potato in 2003, major sources of income in 2003, crops produced and sold in 2003, and the current demographic composition of the household. In addition, the NUTRIPROX consumption indicator survey is being repeated, along with the 7-day recall for intake of vitamin A rich foods by the study child. This survey will be completed by the end of April 2004.

- ! In early April 2004, Nadia Osman successfully defended her upgrading proposal at the London School of Tropical Hygiene and Medicine, which means that her research on the process of communication to ensure behavioral change has been approved as a doctoral topic. Nadia spent September through October 2003 and three weeks in March-April 2004 in England undertaking required course work and working on her research proposal. She will return to England to complete her Phd at the end of the project.

B. Nutrition Extension

Helen Keller International (HKI) is the TSNi partner responsible for assisting the project to develop and implement a social marketing strategy and help project staff refine its behavioral change communication strategy. For three weeks in November 2003, a nutrition consultant from HKI's international office, Micheline Nturu, and nutritionist from HKI Maputo, Jorgette Malanzele, reviewed the nutrition education effort to date and worked with the Project Coordinator to produce a definitive behavioral change communication strategy. The team helped develop a set of counseling cards related to desirable feeding practices for children from birth to five years of age, and protocols for future sessions to communicate messages at the level of the community through village theater and radio programs. HKI-Maputo provided six radio programs on the importance of vitamin A and vitamin A rich foods in Portuguese and Jorgette returned to Quelimane in mid-January 2004 for a month to help implement the communication strategy. This required the translation and production of the six programs in the two dominant local languages in Southern Zambézia, Chuabo and Lomwe. Broadcasts are scheduled to begin in mid-April 2004.

The nutrition extension work in the four study areas has continued to progress. Since this work is divided into group classes and individual counseling, the first part of this section will describe the progress on group classes and the second will summarize experience to date regarding individual counseling sessions.

Group Classes. Group classes started in July 2003 and have usually been held in the afternoons as desired by farmers' group members. Farmers prefer spending their mornings in the field and past experience has shown that attendance was lower in morning group class sessions. To date seven sessions have been given:

- ! Lecture on malnutrition: symptoms, causes and consequences
- ! Lecture using charts, photographs, and songs on the 4 food groups: 1. proteins; 2. fats; 3. carbohydrates; and 4. vegetables and fruits.
- ! Recipe trials with orange fleshed sweet potato as a base for enriched weaning foods
- ! Puppet show explaining the diet of a child from birth to five years of age
- ! Complementary feeding coupled with a demonstration of a porridge comprised of cassava flour, cashew nut and cassava leaves.
- ! Care during pregnancy
- ! Two lectures using counseling cards on the diet of a child from birth to five years of age (in progress)

Different methods of communication were used for each of the topics. For the first two topics, the extensionists lectured the group. While the extensionist encouraged the caregivers to ask questions and discuss the subject, participation was limited. The

recipe trial was a practical demonstration to which the extensionist brought many ingredients to make different enriched porridges, all of them using orange flesh sweet potato. For this class, the extensionist requested the help of the participants during the preparation of the porridge. During this procedure the extensionist explained each step of the preparation to the participants. At the end, mother and child were encouraged to try at least a tablespoon of the porridge. These sessions were well received, but require considerable time and resources to implement.

In retrospect, the puppet show was too long, and had insufficient action to retain the interest of the women throughout. The approach could be improved if class participants were taught to perform with some of the puppets instead of having the extensionist perform all roles.

In the last two topics pictures are used to elicit a discussion. For the last topic instead of being the extensionist herself holding up the picture and discussing with the group participants, the participants are trained to discuss the pictures with their colleagues. The extensionist intervenes only to add more information if this person has not mentioned all the most relevant points.

Participant attendance in group classes varies among the project's intervention areas and also among farmer's groups. At the present time extensionists are working with 49 farmers groups, 9 in Mexixine, 14 in Malei, 14 in Lualua/Posto Campo and 12 in Catale. Not surprising, attendance appears to depend strongly on the quality of the work of the nutrition extensionist. The main area with low attendance at group classes is Lualua/Posto Campo. Low attendance also occurs among two groups in Catale, two in Mexixine and only one in Malei. The consistently higher level of attendance in Malei is probably due to the superior quality of work of the nutrition extensionist working in that area.

Since November 2003, extensionists have monitored the weight of children during class sessions in months when no survey team was weighing children in the area. To encourage greater compliance with the recommendations in the relatively short time frame of the intervention, mothers were informed in February 2004 that they would receive a small prize if their child's weight increases in three consecutive months or if they attain perfect attendance at all sessions.

Individual Counseling. Individual counseling sessions started in mid-August 2003. By mid-March 2004, each of the households in intervention group #2 (receiving group classes and individual counseling) had received three counseling visits. The first and second visits consisted of a questionnaire which included a 24 hr recall with measurement of quantities consumed; these visits also determined frequency of consumption of certain foods during the week prior to the visit, and tested respondents' nutritional knowledge. Following the questionnaire the extensionist explained the 12 recommendations and the importance of their implementation for the reference child, and discussed with the mother the possibility of implementing them. On all subsequent visits, the extensionist checks if the mother implemented the recommendations and investigates major reasons underlying any failure to implement.

Two changes were made in the protocol for the third visit. The intervention households receiving home visits were split into two sub-groups. The first sub-group is interviewed using a simplified questionnaire. The questionnaire was simplified by removing the

knowledge test and eliminating quantity measurement from the 24 hr recall. In contrast, a structured observation during lunch time was conducted for all households in the second sub-group to assess actual implementation of the recommendations to date. Each day, one interview is conducted in the sub-group #1 during the morning hours, the structured observation of cooking and feeding is carried out at lunch-time in sub-group #2, and any group training sessions are held in the afternoon.

In the first year report, the twelve recommendations derived from the Tips for Improved Practices research were described. Progress in implementing each recommendation to date is briefly summarized below.

- ! **Recommendation #1: Feed orange-flesh sweet potato to the child every day.** During the first year of the project, the major sweet potato harvest occurred before the home visits began and few households opted to dry sweet potato for later use. Production was low in the second season due to insufficient rains. Thus, mothers frequently have been unable to implement this recommendation on a daily basis due to the lack of sufficient production at the home level and insufficient availability in the market to date.

- ! **Recommendation # 2: Serve a carbohydrate-rich food to the child at each of the three main meals (breakfast, lunch and dinner).** Most mothers implemented this recommendation. The major constraint to implementation occurs when the child misses one of the main meals because they were asleep by the time dinner was prepared or because the mother did not prepare any meal.

- ! **Recommendation # 3: Serve dark green leaves every day to the child.** Mothers tend to prepare dark green leaves only 3-4 days a week, not daily as recommended. Since these leaves are widely available in all areas, the reason underlying failure to implement needs to be more fully explored. One explanation given is that traditionally dark green leaves are prepared with coconut milk and apart from the coastal Mexixine site, the intervention areas do not abound in coconut trees. Hence, the majority of time people have to purchase coconut, thus constraining their regular consumption. Another explanation, offered by a Mopeia participant, is that dark green leaves have low social status in her area.

- ! **Recommendation # 4: Give fruit every day to the child.** The ability of caregivers to implement this recommendation depends on the seasonal availability of fruit. From November to mid-February, all mothers were able to feed either mangoes or pineapples. However, since then compliance has diminished, but with oranges due to come in season soon, compliance is likely to improve. Pawpaw and banana are quite frequently eaten by the children from November through March when normal rainfall prevails. However, this year due to the irregularity and lack of rain since September 2003, the prevalence of these normally abundant fruits has diminished.

- ! **Recommendation # 5: Feed the child some fat during the three main meals.** This has been very difficult to implement in the non-coastal areas. Only in coastal Mexixine has the recommendation been widely practiced due to the abundance of coconut trees. In the other intervention areas, the household

needs to purchase these sources, a major constraint in cash limited households. The agriculture extension program did distribute groundnut seeds to participating farmer's groups in all non-coastal areas, with the hopes of having a source of fat available in the diet by mid-2004.

! **Recommendation # 6: Feed the child some protein every day.** There has been excellent compliance on this recommendation when fish is abundant. This year the period of availability of fish was extended due to the lack of rain which dried up many water sources and made fish easier to catch. Very rarely do mothers give a legume such as beans. In the non-coastal areas, considerable fish consumption was observed in October through March. In coastal Mexixine, small shrimp are also abundant and widely used to feed children. The months of January and February have seen the majority of households giving fish to the reference child.

! **Recommendation # 7: Do not skip any main meal.** Although the majority of mothers have complied with this recommendation, a significant percentage of women still do not. The most commonly skipped meals are breakfast and dinner. The main reason for skipping breakfast is that mothers wake up earlier than their children to go to the field and do not prepare breakfast before they go. In contrast, dinner is usually prepared, but sometimes the child falls asleep before the dinner is ready and the parents do not wake him/her up for the meal.

! **Recommendation # 8: Give the child his/her own plate for the meal.** The majority of mothers do not have problems implementing this recommendation. However, a significant number of reference children still share their plates with other members of the family. Some mothers report that this is because they do not have enough plates in the household. Others believe that if the child has his/her own plate at home, he/she will demand the same treatment when visiting another household. This rude behavior would be humiliating for the family. In some cases, the child has refused to eat on his/her own when a separate plate was offered.

! **Recommendation # 9: The mother should physically assist the child in eating when he/she rejects the food, or leaves it on the plate.** Adoption of this recommendation has been minimal to date. Mothers assume that if the child does not finish the food on the plate then he/she is full. The act of assisting the child when he/she can already eat on his/her own was never practiced before and extensionists are finding it difficult to modify this habit. In some cases the extensionist has convinced the mother to implement the recommendation when the extensionist is present, and during that attempt the child has continued to reject the food. The tendency in these cases has been for the mother to find this recommendation useless and not attempt to implement it a second time.

! **Recommendation # 10: The mother should stimulate the child who is refusing to eat** by using songs, telling stories, or providing foods the child prefers, but not threatening the child. To date, this is being implemented to a limited extent, with the most common technique used being to provide a food the child likes.

- ! **Recommendation # 11: The mother should wash her and the child's hands with soap, sand or ash and water before eating and after defecating.** We have observed that mothers almost always remember to wash their and their child's hands before the meal. Unfortunately, they rarely use soap and even more rarely ash or sand. The main reason for not using soap is the lack of purchasing power. Moreover, in isolated parts of Catale, even when the household has funds, there is no place to buy soap within a reasonable distance. During the third household visit, the use of ash or sand is being emphasized, and the results will be assessed in the fourth visit.

- ! **Recommendation # 12: Boil the water given to the reference child,** if this water is collected from a hole. Although the majority of mothers are not implementing this recommendation, those that have done so have noticed that the child has not fallen ill with diarrhoea. The major constraints reported have been the lack of cooking pans to boil the water, the time requirement to boil, and many times the mothers say that they are just lazy.

C. Agricultural Extension and Research

The agricultural extension program has faced special challenges in the second half of 2003 and first half of 2004 due to insufficient rainfall. In the study zone, the first growing season begins in November, and is normally characterized by heavy rainfall particularly in January, February, and March. Sweet potato is normally planted on upland soils during this time as rainfall is adequate to sustain the crop. Sweet potato has two key periods when adequate rains or sufficient residual soil moisture are needed: at establishment of cuttings and at 4-9 weeks after establishment (to encourage new roots to be transformed into productive storage roots as opposed to non-productive pencil roots). Once the plant is well established it is fairly tolerant to subsequent drought.

The start of the second growing season can occur anywhere between March and July, depending on when rice is harvested in the dambo areas (*zonas baixas*). Rainfall is less but usually significant through July enabling establishment of the sweet potato crop in the lowland areas where in normal years soil moisture is retained throughout the second growing season.

In contrast to the same period in 2002, the second season of 2003 was unusually hot and dry, with lower than normal rainfall. In study sites with poorer access to humid valley bottom land, sweet potato vines often dried out. Moreover, the practice of maintaining a small watered plot of planting material near the house, though commonly practiced in other countries, met with limited acceptance in our study area. In some cases, farmers did not harvest roots in some of the mounds planted, with the perspective of waiting until the next rains to stimulate the root to sprout. Extension agents report that this technique works to obtain sufficient material to initially multiply when the rains begin.

In Mopeia District, the main rains began in late November, continued for one week, and then stopped for 3-4 weeks depending on the area. Sweet potato vines planted in new fields during these brief rains were mostly lost. The rains began in earnest only in mid-January. To guarantee that we would have sufficient material to replace the losses

plus expand production, the project installed three treadle pumps. Two of the pumps were installed in multiplication plots managed by project extensionists. One was sold to a farmer's group on credit, with the group paying 1/3 of the cost before receiving the pump, and 2/3 at the end of the growing season. The treadle pumps cost under \$140 USD, are portable, and are operated by leg power. TSNI partner World Vision became quite interested in expanding the use of treadle pumps and plans during the remaining part of 2004 to sell at least 30 more pumps to communities to further pilot the technology.

During the previous year, the farmers planted OFSP (orange flesh sweet twice — once as part of the group plot and once latter in the year on an individual plot.

This year, the extension plan for the first growing season was to promote staggered planting as a strategy for increasing the availability of sweet potato in all months of the year. Beginning in December 2003, extensionists discussed a proposed calendar with each farmer group, showing how staggered planting would spread out the period of production and increase the frequency with which sweet potato was available for consumption. Moreover, if additional beds of sweet potato were planted each month of the rains, total production would increase, enabling households to have a surplus to dry as well as additional OFSP to sell. Households are being actively encouraged to have 500 square meters of sweet potato under production by the end of May. It was estimated that each household would have to access 14 kgs of sweet potato planting material to achieve this goal. Households which totally lost material would be re-supplied by the project; other households could seek material from their own fields or from other group members who retained significant quantities of material.

Erratic rains have made it difficult to implement this strategy. The Early Warning monitoring system reported that precipitation between 1 November 2003 and 10 January 2004 was 53% of normal in Mopeia District and 20% of normal in Namacurra District. Most farmers in the research area plant rice and/or maize before planting sweet potato. Many rice farmers lost their first plantings due to lack of sufficient rain in December and early January and had to replant rice before planting sweet potatoes. Other farmers began small-scale sweet potato production simultaneously with rice planting activities.

Rainfall recovered between 10 January and 20 February, then became erratic again. Further expansion of area under production is currently underway, as most households have now finished transplanting the rice crop. Given current conditions it is unlikely that the goal of 500 square meters per households will be achieved. As of 31 March, 903 households from 49 farmer groups had planted around 30,000 square meters or 3 hectares of sweet potato, for an average of 33 sq meters per family. However, if rainfall continues prospects for achieving 200-300 square meters per household are good as Abril/May is a major period for planting.

The second season trials of SARRNET/INIA varieties are characterized by much lower production levels than seen in the first season. However, mean results (tons/ha) shown below still indicate that with two exceptions (440031 and Costanero) the new varieties produced better than the predominate local variety under the harsh conditions of this particular year.

Varieties	Flesh Color	Yield (tons/ha) in Site:	
		Mexixine	Posto Campo
420001	orange	3.00	5.29
Zapalo	orange	5.89	6.78
Excel	orange	3.54	1.97
Tib4	orange	7.16	1.32
440215	orange	7.75	2.37
MGCL01	orange	1.29	1.10
Cordner	orange	4.67	2.56
Chingova	light yellow	2.86	1.60
Mozwhite	white	7.83	6.59
440031	orange	0.67	0.18
Costanero	orange	0.51	0.86
SPK004	orange	3.80	1.05
440293	white	4.46	4.51
440287	orange	3.56	1.32
Hernandez	orange	1.78	0.57
440288	orange	1.67	1.40
Local	white	0.90	0.70

There was considerable variation in yields between sites. Several varieties in Posto Campo were affected by monkeys stealing mature roots from the plots prior to the harvest. Of the orange-flesh material, the most promising varieties are Zapallo, 440215, 420001, Cordner and TIB4. Cordner has already been released. Among those varieties, 420215 and TIB4 tended to rank higher than the others in terms of taste preference and Zapallo the lowest.

D. Social Marketing and Commercialization Campaign

In working with HKI consultants and SARRNET/INIA, an attempt was made to combine awareness campaigns regarding the importance of consuming orange-flesh sweet potatoes and other vitamin A rich foods with a strategy to improve the efficiency of sweet potato marketing and encourage surplus production for sale among participating farmer's groups. Three different activities are being pursued 1) Use of radio programs to reinforce messages in study areas and promote greater consumption of vitamin A rich foods throughout the province 2) Village theater on specific topics conducted by volunteers from existing farmer groups during the upcoming dry season, and 3) Painted walls and market stalls within markets with messages to promote greater consumption of orange-flesh sweet potatoes and vitamin A rich foods.

These activities jointly will contribute to raising awareness about the importance of vitamin A in the diet, promoting consumption among consumers both within and outside the immediate study areas. This should lead to increased demand for orange-flesh sweet potato and other vitamin A rich foods within the marketplace, which in turn could lead to increased production of beta-carotene rich sweet potato. Village theater will specifically target men and other relatives (mothers-in-law, for example) who often have considerable influence over child-care decisions and can prevent a desired behavioral change from taking place.

As previously mentioned, a series of six radio programs will be aired for at least two months on Radio Moçambique in Zambézia in Portuguese, Chuabo, and Lomwe beginning in mid-April 2004. The survey instrument implemented in late 2003 contained specific questions regarding listening frequency and preferred times of day.

All households listening to radio reported listening only to Radio Mozambique-Zambézia. Fifty-percent of the study households listened to the radio during the month prior to the survey, and of those who did, 35% were able to listen to a radio in their own home.

During the weekdays, the preferred listening times are from 12:01-14:00, 14:01-16:00, 18:01-20:00, and 6:01-8:00, clearly corresponding to typical meal times. On Saturday, the preferred times are from 6:01-10:00 in the morning, and on Sunday from 12:01-16:00 in the afternoon. Efforts will be made for broadcasts to be aired at these preferred times.

Village theater topics will be designed in May, with performances taking place in June and July.

Within the provincial capital of Quelimane, walls on buildings within markets were considered an excellent promotional space to reach poor- to medium income market consumers. Richer households tend to send staff to make purchases. Two markets were selected: the main Central market and the major secondary market, Brandão. A local artist was contracted to paint murals in each market. One mural shows a family consuming orange-flesh sweet potato, based on a design taken from a SARNET/INIA poster. The second mural, designed by the artist, shows a collection of vitamin rich foods with the message: "What exists that is better for your health? It's clear— Foods rich in vitamin A." An additional mural, also designed by the local artist was included in Brandão market, showing a child surrounded by foods rich in vitamin A with the message: "Have you bought vitamin A rich foods for your child today?"

In addition to painting the murals, the project paid for the rehabilitation and painting of the stalls (*bancas*) where products are placed for sale. In Quelimane, half of the area for selling vegetables was repainted, six *bancas* were painted bright orange, with the remaining *bancas* painted green. The work was coordinated with local market officials to enable sellers of different vitamin A rich products to sell their wares next to each other, as typically all sellers of a certain product are grouped together. A contest was held to award the use of the orange *bancas* to sellers already present in the market. Each winner has access to the selling booth for three months, and was awarded a promotional t-shirt or *capulana* (a cloth used by women as a skirt). During the promotional campaign, the project pays half the daily market tax on the orange booths and the traders the other half. Separate *bancas* were awarded for eggs, fruit, green leaves, carrot/vegetable, and orange-flesh sweet potato sellers. Photographs of the different murals and rehabilitated stalls are included in Annex A. The market stalls were officially presented to the president of the Quelimane City Council on March 9, 2004 and national television covered the event.

In the rural areas, Mopeia district was selected to conduct the pilot initiative promoting greater commercialization of orange-flesh sweet potato. The Lualaba market falls within the study area and has the advantage of being adjacent to the major paved highway in the province leading to the provincial capital of Quelimane. Market officials were very cooperative in arranging a space at the entrance to the market where a stall could be constructed with sufficient visibility to see messages painted on each side of the building. Interviews were held with local traders recommended by market officials to select one to have the right to be the official beta-carotene rich buyer and seller for 2004. Key selection criteria included number of years of experience as a trader,

considerable experience hauling traded goods on a bicycle, and ability to calculate profits. Construction of the stall was completed in March 2004.

After analyzing monthly price data collected in 2003, and taking into consideration the low production of rice expected in 2004, recommended prices were established by the project for the buyer to be offering to OFSP growers in 2004. Two grades were established for purchasing: 1st quality OFSP must be at least 200 grams in size, have no evidence of sweet potato weevil (without holes), and not be cut during harvest. Second quality OFSP must be at least 100 grams in size with cut roots and small amounts of weevil damage permitted. Roots not meeting the second quality criterion will not be purchased. The use of these grades will guarantee that a certain percentage of harvested material remains for household use. The buyer will purchase OFSP every Thursday beginning 6th of May, when the first roots from this season's planting should begin to appear. In March and April, extension agents are informing farmer's groups about the purchasing point and emphasizing the use of improved agronomic practices to produce high quality roots. Roots purchased on Thursday can be easily transported on the main paved roads in time for the weekend sales in Quelimane. It is expected that the rural buyer will liaise with the retail sellers in the urban market stalls to efficiently dispose of his product.

4. Dissemination Activities

The TSNI project participated in the World Food Day Celebration sponsored by the Provincial Directorate of the Ministry of Agriculture and Rural Development in Nicoadala on 16 October 2003. The team had a display explaining the purpose of the project, and displayed pies, puddings, and juice made from orange flesh sweet potato. The project sponsored a drawing whereby to win a t-shirt or *capulana* with a sweet potato design the contestants had to answer three simple true-false questions concerning vitamin A rich foods. The correct answers could be obtained by reading items at the display. The project distributed 10 t-shirts to men and 10 *capulanas* to women as prizes.

On 30 October, 2004 a seminar was held at the Provincial Directorate of the Ministry of Agriculture and Rural Development to present results from the baseline survey to officials from agriculture and health, as well as project partners and other interested parties. Felipe Zano, the project agronomist, presented the results from the agricultural extension and research program and Jan Low presented the findings from the baseline study and a summary of nutrition extension activities.

5. Conclusion

Insufficient and inconsistent rainfall is proving to be a major constraint and if the situation continues is likely to have a negative impact on project results due to the inability of households to produce the quantities of orange-flesh sweet potato needed to ensure adequate vitamin A intake. To meet this challenge, extensionists will emphasize drying sufficient quantities of sweet potato (which must be done in the shade to prevent beta-carotene loss) to extend its availability during the dry season.

Several pieces of data analysis are currently underway, and a report looking at the determinants of nutritional status in the baseline population should be ready by mid-May. Felipe Zano is also finalizing reports on investigating sweet potato marketing

channels and research trial results for 2003. Analytical time has been limited due to management demands of the project.

In May, high priority will be given to undertaking a preliminary analysis of the production data for 2003, to understand the performance of different OFSP varieties particularly in regard to ability of each variety's vines to survive under low rainfall conditions and thus, assure planting material for the coming season.

Finally, there is good news on the financial front. Additional monetary resources were awarded from the HarvestPlus (Biofortification Challenge Program) project to cover the purchase of motorcycles for nutrition extension staff, unforeseen administrative costs and additional staff time for data cleaning and analysis. The contract between MSU and HarvestPlus is currently being finalized.