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PILOT PROJECT FOR  
FRUIT AND VEGETABLE MARKETING

A

REVIEW OF  
1991-1992 PROJECT ACTIVITIES

(Interventions - Evaluations - Recommendations)

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## INTRODUCTION

This report reviews the activities involved in implementing the project's nine marketing interventions and assesses their potential effectiveness. This document examines the potential for making a people level impact with the resources available to the project. These evaluations take into account the sociological, economic and technical considerations that would lead to technical and organizational diffusion of the interventions and their long term sustainability. The conclusions of these evaluations provides a rationale for allocating project resources for the 1993 Karal harvest season.

This analysis is based on the information and experience that the project has gained since it began in late 1990. However, because of the political instability and administrative problems in early 1991, the project was not able to test marketing interventions in that harvest season. Many of the project's early activities that year were focused on developing a rapport with the farmers of the Karal project area and assisting in establishing a federation of groupements which would provide a foundation for farmer participation. It was only in the 1992 season that the project was able to begin its market analysis work and to implement marketing interventions. The project strategy for the 1992 season was to test nine market related interventions to determine which were most effective in improving marketing efficiency and were acceptable to farmers, to traders and to retailers.

The project paper had identified tomato, melon, watermelon and okra as the principle horticultural crops on which to focus. Of the four, tomato is the most important cash crop and the one that farmers feel that they have the most marketing problems. Responding to this felt need, the project developed its interventions with tomatoes as a prime consideration, but made the interventions broad enough to be relevant to the other three crops.

All of the interventions that were tested by the project are evaluated in the following pages, but discussions of two of them, Harvest Maturity, and Sorting and Grading, have been combined because of their similarities. In this document, the interventions are termed "programs" because various types of activities were undertaken to implement them.

The goals and objectives are shown for each program. There is a summary discussion of the activities and their results. Following this, there is an assessment of their effectiveness and recommendations for the 1993 harvest season.

## BACKGROUND

There are two important elements of marketing efficiency which are outside the scope of this project: The first is the cost of transport as a function of the distance from the producing area to the N'Djamena markets. The second is seasonal price variations as a function of the length of the harvest season.

### Transport costs

The project area is located about 100 kilometers north of N'Djamena along the southern perimeter of Lake Chad. The major horticultural production zone extends about 60 kilometers on a east-west axis from the Chari river. It is estimated that traders must travel about 250 km from field pick-up areas to N'Djamena and return. The distance from N'Djamena to the production area, and the in-field distances make the cost of transport significantly greater than other producing areas that supply the N'Djamena fresh produce markets.

### Seasonal Price Variations

The seasonal price variations for the project's highly perishable products are partially a result of farmers planting the same crop at about the same time, and planting varieties with about the same maturity period. The vegetable growing period is fixed by dependance on a recessional type of culture for soil moisture and a cropping calendar in which the cereal growing season is fixed. In the Karal area, soil moisture for cultivation is not provided by rainfall or irrigation, but by receding rain water in shallow depressions and by receding lake water.

The timing and intensity of the rains and the seasonal ebb and flow of the lake determine the amount of area that can be planted in vegetables and the cropping period. The crops harvested late December through February are grown in areas where rain water has collected and receded. Vegetables harvested in March through June are grown in the areas where the lake waters have receded. Solutions which would lengthen the harvest season include: a) irrigation which would provide more flexibility in the dates of planting, b) introducing varieties that mature earlier or later, and c) planting varieties that are more heat resistant. However, the introduction of irrigation and different varieties of vegetables are outside the scope of this project.

### Economic & Social Change

There is anecdotal evidence given by the farmers in the area that in a relatively short period of about 8 years there have been profound economic and social changes in the Karal area resulting from increased production and marketing of fresh produce in N'Djamena. The drought of the early 1980's brought an influx of displaced persons into the Karal area. These new settlers were encouraged by SECADEV and ONDR to grow vegetables. There were already farmers who traditionally exported the surplus cereals

from the area to N'Djamena and they also began to grow vegetables and send their surplus to the N'Djamena market.

Although some of the new settlers became producers, many did not obtain sufficient land to sustain themselves and became part of a growing wage earning labor force that became available to work in vegetable production. Another effect of increased horticultural production was increased employment for women in the vegetable fields. Although some women obtained their own vegetable fields, most of them work in family plots. Although women of farm families have not become involved in marketing in N'Djamena, the increase in surplus vegetables have increased women's opportunities to sell horticultural products in the local markets.

The profitability of selling in N'Djamena stimulated the growth of this off-season (between cereal crops season) agricultural activity and the desire of farmers to expand production beyond the capacity of family labor accelerated the monetization of the local economy. Farmers needed cash to pay for high quality seeds and to hire non-family labor to build thorn fences, prepare the land for planting and harvest the crops. Cash was also needed to pay the produce transport costs to N'Djamena. As the demand for "up-front" cash payments increased, producers became more conscious of finding ways to reduce their risk of losses: better quality seed, more reliable transport scheduling and more reliable market prices.

#### Competition and Changing Strategies

As information spread in the Karal area about the profitability of selling vegetables in N'Djamena production increased. The increase in demand for labor and transport raised the prices of these services and the increase supply in the market reduced prices. Additional competition came from outside the area. In the early 1980's irrigation pumps were installed on the Logone and Chari rivers South of N'Djamena and the farmers from these areas soon began shipping substantial supplies of good quality tomatoes from their irrigated fields to the N'Djamena market. Not only did the increased supply of tomatoes in the market reduce prices, but the general quality of Karal tomatoes produced in the January and February season was inferior to those produced in the irrigated perimeters and prices of Karal tomatoes fell.

Vegetable marketing conditions in N'Djamena continue to change and farmers must adapt if they are to remain competitive. The Karal farmers are facing competition in marketing from increased supply from their own area and irrigated perimeters. The simple market strategy of planting with what ever quality seeds are available from last year's harvest, using only family labor and shipping everything possible to N'Djamena regardless of quality is now a strategy for financial loss.

The GOC and donor organizations are addressing marketing problems through initiatives to improve marketing information, post harvest technology and infrastructure. These interventions can be integrated into the marketing strategies of farmers in the various producing areas to increase marketing efficiency. This will sustain the profitability of producers while at the same time making fruits and vegetables more available to consumers in N'Djamena.

### Project Response to Farmers' Felt Needs

When the ACDI technical assistance team met with farmers to discuss their market related problems three general areas of "felt needs" emerged. The first needed improvement was in post harvest technology. This was manifest in poor quality produce reaching the market because of inferior genetic stock (plants), mechanical damage through transport and a short market life (shelf life) resulting from harvesting when the produce was over ripe and marketing varieties that do not transport well. The second needed improvement was in marketing information. Because of the constant flow of traders from the project area to N'Djamena and back again, information about wholesale prices is passed from trader to trader. However, much of this information is superficial in that it pertains only to the prices for specific loads brought to the market on a specific day. The broader scope of information needed for informed decision making is not available. The third needed improvement was the organization of the agriculturally oriented groupements into an effective federation through which the project could diffuse its post harvest technology, develop marketing strategies, and develop an organizational structure to sustain these improvements in marketing efficiency.

The project's strategy for the 1992 January - June harvest season was to test the nine market related interventions to determine which were most effective in improving marketing efficiency and were acceptable to farmers, to traders and retailers. To implement the interventions, the project identified those groupements and individuals that showed the most interest, willingness and ability to participate in the project's activities.

The project began its activities by establishing a viable Federation of Groupements. This would enable it to interact with a broad cross section of groupements and farmers to determine marketing needs and to introduce the following interventions to improve marketing efficiency:

- 1) At the top of the marketing cycle, the project encouraged the production of the most marketable variety of produce (for the Karal area) and the improvement of the genetic quality of tomatoes, melons and watermelons.

- 2) A late date tomato planting program attempted to lengthen the harvesting season which would reduce the mid-season glut and increase the supply of tomatoes in May and June.
- 3) The harvest maturity program addressed the traditional practice of transporting fully ripe produce to the fresh market in N'Djamena. The project began training farmers in early maturity harvesting and showing them the economic advantages of shipping produce with a longer market life.
- 4) The harvest maturity program was supported by a follow-on intervention which encouraged farmers to sort and grade at the field level. The purpose of this was to improve the quality of produce, thus reducing transport losses and improving price and at the same time, reducing the overall supply reaching the fresh market and strengthen prices.
- 5) Increased frequency of field pick-up by transporters would help reduce post-harvest loss caused by over-ripe produce and increase the market price/transportation cost ratio.
- 6) The issue of an alternate to the traditional tea case for tomatoes and melons was addressed by testing a half size tea case. The project tested farmer and retailer acceptance of a half crate constructed by cutting a case in half and using the lid of the original as the bottom for the second half.
- 7) A market hanger and vegetable storage complex for Karal producers at the Cholera market in N'Djamena was initiated by the project as a point of sale and storage for grain and vegetables. It will also be a focal point for project training and market information.
- 8) The project began an attempt to expand the dried tomato and dried okra industry in the Karal area. This was the missing link in the marketing cycle for the Karal farmers who needed to find economic use for culled tomatoes that should not be transported to the fresh market in N'Djamena.
- 9) The objective of an effective marketing information system is to provide accurate, timely and relevant information to the users. The market price information disseminated on a daily basis is aimed at producers and traders who are involved in daily selling during the harvest season. Historical data is collected and analyzed for use in planning.

## **EVALUATION OF 1992 INTERVENTIONS & RECOMMENDATIONS FOR THE 1993 HARVEST SEASON**

### **FEDERATION OF GROUPEMENTS**

#### **INTRODUCTION**

One of the early activities undertaken by the project technical assistance team was to develop an understanding of the farmer marketing "felt needs" and to establish communication linkages with the farmer groupements, government and non-government organizations working in the project area. The ACDI team met with representatives of groupements and with resident representatives of SECADEV and ONDR in the area to discuss their experiences with the groupements. Out of these meetings came a clear understanding that the marketing of horticultural products was one of the major concerns and that the farmers felt they needed a strong association of groupements to develop coordinated marketing strategies.

#### **ACTIVITIES**

Informal marketing groups, based on village associations of groupements, were formed in 1988 to attempt to develop strategies to raise prices that were falling because of high levels of production that year. Representatives of these groups met in N'Djamena and agreed to attempt to reduce the mid-harvest glut on the market by establishing a transport rotation system so that each zone in the area would have its turn at the market. This cartel type action was unsuccessful as there was no effective enforcement mechanism.

The project began working with SECADEV and the ONDR agents to form a federation of groupements which were interested in finding ways of solving marketing problems. The formation of the federation began to accelerate when the ACDI marketing project brought in its resources to construct a building that would provide a physical focal point for the Federation. The project also brought much needed marketing expertise and combined them with the community organization program of SECADEV and the extension program of ONDR. SECADEV and ONDR had long encouraged the concept of forming a strong association of farmers across the southern tier of the lake region, however, it was only with the mix of technical, management and material resources of the three organizations that this was made possible. The project feels that one of the critical factors in coalescing the efforts of all those involved was the construction of the "Federation Building". The efforts at organizing the construction and its preliminary use as a meeting place have been a focal point in the development of the federation.

Description of AGDERUMKA: In a general meeting in Karal on October 15, 1991 the farmers formally declared the establishment of a federation of 51 men's groupements and 9 women's groupements. They gave it the name Association de Groupement pour le Developement Rural de Mani-Karal. It is known by the acronym AGDERUMKA. The member groupements are located in 10 villages stretching from the village of Mani in the extreme West of the project area to the village of Sidje on the extreme East. The federated groupements have about 1,000 farmer members.

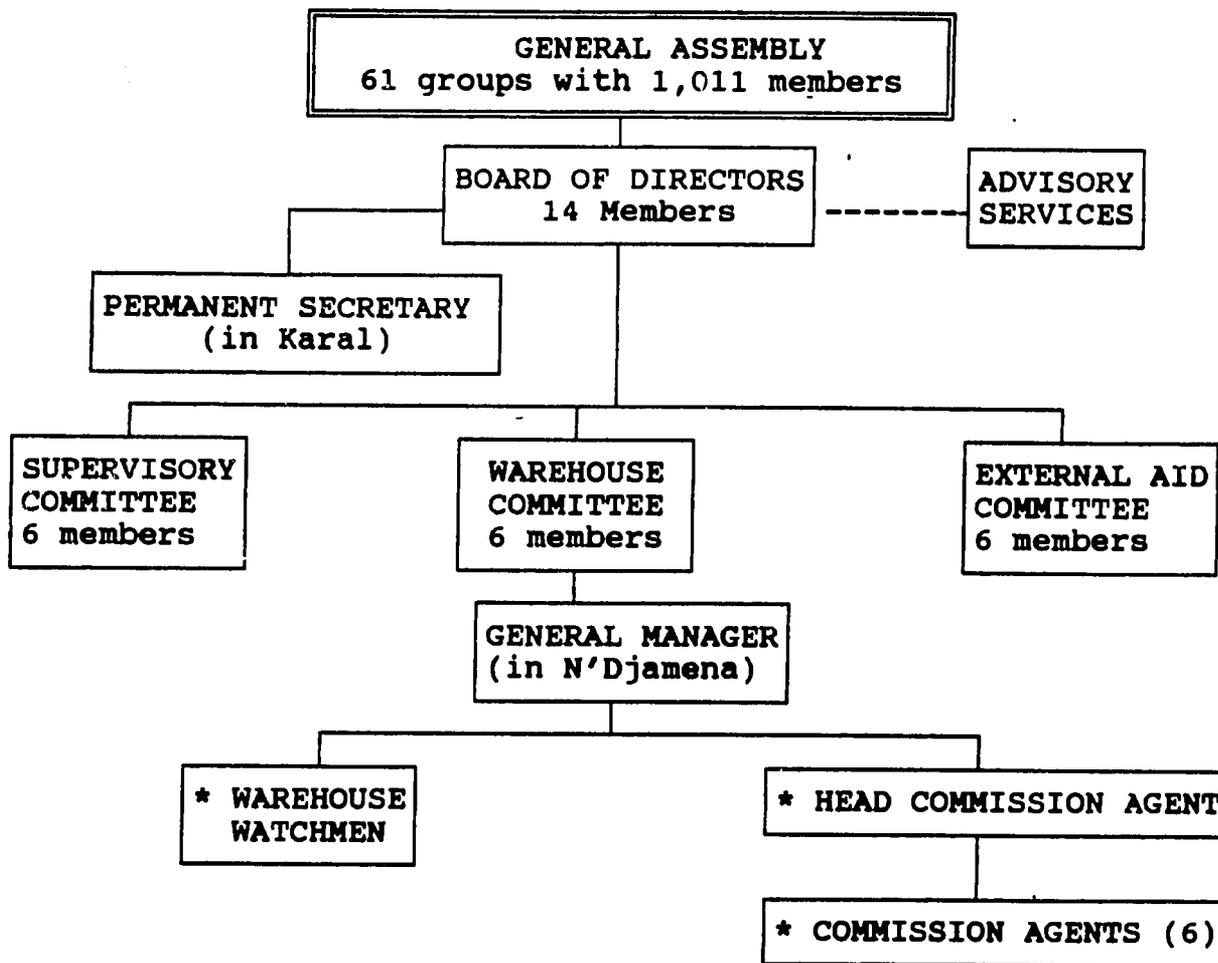
AGDERUMKA charges a groupement membership a fee of 16,980 CFA for men's groupements and 10,000 CFA women's groupements. In addition, AGDERUMKA charges a 2,000 CFA subscription fee for each individual member.

Legal Status: The Federation has been registered with the Ministry of Commerce and Industry, Direction of Industry and Cooperatives as an Association of Groupements requesting status as a cooperative. The procedure is for the Ministry to evaluate the worthiness of the Association and eventually accord it the status of a Cooperative.

**Structure of AGDERUMKA:**

The existing structure of the Federation has largely been created by the farmers themselves in response to their felt needs. This structure is still evolving and the functions of the officers and members are still being identified.

**ORGANIZATIONAL CHART OF AGDERUMKA**



\* Denotes non-members

**The General Assembly:** The General Assembly meetings, where at least half of agricultural groups must be represented forms, the base of AGDERUMKA and is the final arbitrator in all matters. In theory, decisions are made by the general assembly on the principal of one member, one vote, majority rule. In practice, most decisions are arrived at through the more traditional method of consensus. This process of informal consensus insures that decisions taken are more likely to be followed since everyone and not simply a majority has adopted the decision. However, this process often excludes younger, lower status members and women who are unlikely to contradict the sentiments of the older high

status men. In practice, younger low status men are present only in small numbers and the nine women's groups are rarely represented.

The Board of Directors: Elected directly by the General Assembly, the Board of Directors has played an active role in all the activities of the Federation. The Board of Directors usually only meets formally at the monthly general assembly meeting or to receive outside guests interested in AGDERUMKA such as USAID or SECADEV officials. None of the directors receives monetary compensation for his work and all spend extensive time away from their personal fields on Federation business. The Board of Directors is composed of a President, Vice President, Secretary, Treasurer and two accounting commissioners (to oversee expenditures).

Permanent Secretary: The need for an established presence at the Federation seat in Karal lead the Board of Directors to create the non-remunerated position of permanent secretary. The member who filled this position has a long history as a respected leader in agricultural group activities. The secretary controls the Federation cash box kept in Karal, issuing receipts and recording transactions. He also maintains the membership/dues register. Normally these tasks would fall to the Treasurer, however, the man who holds the position of treasurer cannot fulfill his responsibilities at the moment. It is anticipated that the permanent secretary will also participate in any business ventures that AGDERUMKA undertakes in the Karal area, especially seed supply and dried produce 'banking'.

Supervisory Committee: This committee composed of federation members charged with auditing the federation and regulating and disputes which might arise.

External Aid and Transportation Committee: Created at the same time as the supervisory committee the External Aid committee has as its primary task the coordination of transport during harvest periods. For the coming season the External Aid committee will take the lead in designing and attempting to enforce the tour schedule. This committee is also responsible for enforcing AGDERUMKA's decree requiring all members to wholesale their produce in the Federation operated Cholera Market warehouse.

Warehouse and Subscription Committee: Committee members have begun work on the creation of a detailed business plan for the warehouse that will include the objectives and a budgetary/financial analysis of the facility. After formulating their informational needs in the business plan members will begin to create and implement a simplified accounting system in Chadian Arabic. Work in this area is being undertaken with the consultation of ACDI staff.

**Warehouse General Manager:** In the organizational structure the Manager is directly responsible to the Warehouse Committee and he will actively participate in the creation of the Warehouse business plan. The manager receives a salary of 25,000 CFA per month.

**Goals, Purposes, Activities:** The purpose of the Federation is to improve the quality of life in the Federation's zone of influence through rural development activities. However, the members' primary concern is with agriculture and most specifically with marketing. In December, 1992 the farmers outlined an agenda of activities that included:

- Market Information
- Point of Sale Hangar
- Transport of Agricultural Products
- Farm-Market Roads
- Availability of High Quality Seeds
- Problem of Plant Disease & Pests
- Cost of Agricultural Equipment

**Participation of Women's Groupements:** When the Federation was established, SECADEV encouraged women's groupements which were involved with or wished to be involved with agricultural related activities to become members. Most of the village women are involved in the cultivation and harvesting of the family vegetable fields and some women have their own plots. The production and marketing decisions concerning these crops have a direct impact on them. The project is encouraging expanded drying of tomatoes and okra by women's groups and tying this into a "Dried Produce Bank" concept similar to the Cereal Bank concept organized in the area by SECADEV.

**Income Generating Activities:** One of the major activities of the Federation was the construction of a point of sale hangar in the Cholera market in N'Djamena. This provides marketing services for farmers and an income generating activity for the Federation. In September, 1992 the Federation embarked on a vegetable seed distribution program for area farmers. The Federation obtained seeds at cost from ONDR and sold them at a profit.

**ACDI's Role in Federation Management:** One of the main tasks of the project in establishing the Federation has been in management training. The project has provided a staff member to assist in inventory control and monitoring of hangar activities. The project provided a short term cooperative management expert for a four week consultancy. This provided training to Federation board members and the ACDI staff members that are assisting the Federation in management of the hangar.

## CONCLUSIONS

- The initiative and independent actions taken by the farmers in establishing the federation indicate that they see it as a vital element in the development of the area. The level of attendance at monthly meetings and ACDI sponsored training sessions indicate an on-going interest in continuing the association.
- The point of sale services from the hangar and the seed distribution service in the producing area will have a direct economic impact on the farmers in the area.
- The federation provides an effective structure through which ACDI can introduce marketing efficiencies. Progressive and cooperative farmers can be identified through whom the project can introduce improved post harvest technology and marketing strategies.
- The farmers' experience in cooperating with each other and coordinating economic activities will enable farmers to increase their power (empowerment).

## RECOMMENDATIONS

### Strengthening the Federation:

- Establishing a functioning office in Karal: office furniture & equipment, office supplies, office procedures.
- Management training: accounting, group building/personnel organization, numeracy/functional literacy.
- Establishing accounts: opening a bank account, ledgers for various activities.
- Setting goals, determining activities and priorities.

### Management of the Cholera Market Hangar:

- Training a manager: accounts, inventory control, personnel management.
- Develop price schedule for marketing services.
- Develop system and procedures for the hangar activities.

Most of the skills to be transferred to federation members are already possessed by the ACDI staff. The major area of weakness is the ability to effectively transfer these skills. To address this, all of the ACDI staff who will be participating in the management training should under-go a brief training of trainers.

INADES Formation, a local NGO, can provide this service.

Outside assistance could be used in the following areas: Cooperative accounting and management, Group building/personnel organization, functional literacy/numeracy. It is preferable that any assistance come from locally based organizations that are familiar with the region and will be available on a long-term basis.

**PROGRAM TO ENHANCE MARKET QUALITY OF PRODUCE THROUGH IMPROVED SEED**

**GOAL:** Improve the genetic quality of vegetables grown in the Karal area.

**OBJECTIVES:** 1) Encourage the production of varieties of produce which have good market acceptance 2) Develop a program for systematic field selection of seed plants and processing of seeds with market preferred genetic characteristics by Federation farmers. 3) Train farmers in selection of seed plants and procedures for processing the mature fruit for seed.

**SUMMARY OF PROGRAM ACTIVITIES:** In the project area one of the most often repeated needs by farmers is for access to better quality seeds. There are a few merchants who specialize in good quality vegetable seeds in N'Djamena, but it is difficult for many of the Karal farmers to make contact with them. Farmers often wait for seeds from ONDR or from SECADEV, but in some instances seeds arrive too late in the season for effective planting or are not the preferred varieties. No specific standard for seeds has been set by governmental or non-governmental agencies, nor has there been any attempt to control the quality of seeds.

There are three main supply systems in the project area:

- 1) Seeds produced by the farmer for his own use
- 2) Seeds bought through organizations (ONDR, SECADEV)
- 3) Seeds bought through local retailers

The supply percentages are:

| own seeds | bought | bought & own | NA |
|-----------|--------|--------------|----|
| 25        | 56     | 13           | 6  |

Among farmers that bought seeds, the percentage buying seeds locally or in N'Djamena is the following:

| N'Djamena | local | N'Djamena & local |
|-----------|-------|-------------------|
| 5         | 62    | 33                |

The farmer has no means of verifying the quality or even the variety of the seeds that he buys if they have been packaged by local dealers. Farmers often complain about buying packets of seeds with low germination rates and plants of poor genetic quality. The tables above show that about three quarters of the farmers buy seeds. Many farmers buy these seeds from sellers in the Karal area who bring the seeds from Nigeria, Cameroon and N'Djamena.

The data above show that more than a third of the farmers use seed from their previous harvest. Although farmers are aware of the importance of good seed, they often save seeds from second quality produce (deformed, rotten etc.), without regard to the genetic purity and quality of the plants. As a result, production is poor and the genetic quality degenerates.

During November and December 1991 a TDY post-harvest specialist, investigated the potential for improving the genetic quality of tomatoes, cantaloupes and watermelons. He recommended high quality varieties of Roma tomato seeds, Netted cantaloupe seeds, and Charleston Grey watermelon seeds to be used for seed reproduction by the farmers in Karal. Samples of these were shipped by seed distributors from the USA to the project in Chad. The project also purchased some Charantais melon and Roma tomato seeds of French origin from Chadian traders in N'Djamena for distribution to farmers. Selected farmers were to receive these seeds free of charge. At harvest, they would keep 10% of the seeds as labor payment and give the remaining seeds to the Federation to sell for the next season to the farmers in the area.

The watermelon, cantaloupe seeds from the United States and tomato seeds purchased in Chad were distributed to farmers in late January and early February (The American tomato seeds did not arrive in Chad until the middle of March). The seeds were sown between the 2nd and 13th of February which is considerably later than the traditional agricultural calendar where planting begins with the recession of Lake Chad toward the end of November.

The project solicited the assistance of SECADEV agents and the ONDR agent in identifying the farmers to participate in this exercise. The farmers selected were to be experienced with larger than average holdings and were interested in trying new varieties.

Participating Farmers:

| <u>Name</u>   | <u>Village</u> | <u>Product</u> | <u>Field</u> | <u>Date</u> |
|---------------|----------------|----------------|--------------|-------------|
| AlHadj Outman | Sidje          | Cantaloupe     | 403 m2       | 13/02/92    |

|                   |           |                 |        |          |
|-------------------|-----------|-----------------|--------|----------|
| Mahamat Abdoulaye | Sidje     | Watermelon      | 64 m2  | 04/02/92 |
|                   | Sidje     | Cantaloupe      | 200 m2 | 02/02/92 |
|                   | Sidje     | Watermelon      | 110 m2 | 04/02/92 |
| Doungous Mahamat  | AlGuissim | Watermelon      | 323 m2 | 13/02/92 |
| Malloum Mahamt    | AlGuissim | Watermelon      | 384 m2 | 13/02/92 |
| Hassana Sacko     | AlGuissim | Cantaloupe      | 264 m2 | 03/02/92 |
| Mahamat Haroun    | AlGuissim | Cantaloupe      | 299 m2 | 08/02/92 |
| Oumar Ramat       | Baltram   | Watermelon      | 360 m2 | 03/02/92 |
| Oumar Ali         | Baltram   | Cantaloupe      | 360 m2 | 06/02/92 |
| Abakar Adoun      | Malloumri | Cantaloupe      | 580 m2 | 03/02/92 |
|                   |           | Watermelon      |        |          |
|                   |           | Tomato (French) |        |          |
|                   |           | Melon (French)  |        |          |
| Al Hadji Ousman   |           | Melon (French)  |        |          |

Tomato seed (French origin) was distributed to three farmers who planted them in nurseries. However, the plants did not survive transplanting because of the heat.

Each of the farmers who received imported seeds participated in a brief field training on the purpose of the activity and the special requirements of the variety. The training covered the following topics: Within row spacing, Between row spacing and field isolation. Melons and watermelons were to be isolated two kilometers from the nearest local melons or watermelons to avoid cross-pollination.

The farmers were able to follow the training guidelines in all cases except for field location. Only the fields in Sidje and AlGuissim were adequately separated from neighboring plots. In the other villages the layout of farms was such that it was impossible to isolate the fields. In these cases, a field location was chosen that was as isolated as possible and situated to the north of nearby fields to avoid the cross pollination with the local varieties. During the pollination period the prevailing winds in the region blow from north to south.

**PROGRAM RESULTS:** The fields were not entirely planted until the middle of February, much later than the traditional agricultural calendar. This late planting, with high temperatures and low soil moisture, meant less than ideal growing conditions. Despite this, the germination rate averaged between 85% and 90% for the tomatoes, watermelons, and cantaloupes. However, after germination, the plants did not grow well because of the high temperatures and low soil moisture. Also, at this period there was an abundance of weeds which considerably restricted the growth of watermelons and cantaloupes. The tomatoes seedlings did not survive transplanting because of the harsh climatic conditions. Under these unfavorable conditions, melons and watermelons sown late in the season could not produce mature fruits. Also, plants that are stressed from lack of water are more susceptible to disease which may account for diseases

attacking the project supplied varieties and traditional varieties of melons. Farmers from the area said that fungus disease and insect infestation was higher than normal this year. At the end of May, almost all of the melons and watermelons in the area were destroyed by insects and diseases.

Two watermelon fields in Sidje had sufficient yields to permit seed collection. However, only one field produced enough watermelons for a proper yield evaluation. That field had 126 plants over a surface area of 64 m<sup>2</sup>, or an average of 2 plants per square meter. Each of the Charleston Grey Watermelon plants produced up to 28 watermelons. Local varieties typically produce about 12 watermelons per plant. Despite the low yields by USA standards, the producers seemed to find the seeds preferable to the local varieties. Ten watermelons were collected from these fields and transported to the Federation building in Karal where the seeds were extracted and preserved following the methods proposed by Dr. Gull. As each watermelon contained up to 300 seeds enough seeds were produced to seed several farms next season. These were stored at the Karal office of AGDERUMKA.

The project had planned to form seed committees to identify and process harvested seed, but this was not possible because of the lack of yield from project introduced seed and from lack of project staff to organize field days.

#### CONCLUSIONS:

- The technical personnel available to the project was not sufficient for undertaking an intervention of this magnitude. The project had only one local technician at the Karal office. Also, the collaboration of the SECADEV and ONDR agents was very limited. As a result, participating farmers were not selected with appropriate care and there was insufficient follow-up of the areas planted.
- The late planting of seeds invalidated this as a reliable comparative test of the seeds from the USA.
- The weak performance of the introduced varieties was probably a result of the harsh climatic conditions during plant growth. As the agriculture in the Karal area is not irrigated, it depends on the residual soil moisture for all water needs. In case of late sowing, the root system could not follow the descent of the water table, which in April is around 100-150 centimeters. With the arrival of high temperatures in March, the plants' evapo-transpiration was probably higher than the amount of water the root could draw for good growth. The highest water needs for the melon and watermelon, is at the stage of flowering and fruits development. This fell in the middle of the hot season (April-May).

As the evaluation of the effectiveness of new varieties in the Karal area will require at least two years and the project has only one more cropping season in its planning horizon, it will not attempt to introduce new varieties to the area. Any introduction of new varieties should be through ONDR, GASSI or other government or parastatal organizations.

**RECOMMENDATIONS:** The availability of high quality seeds continues to be a matter of great concern to the farmers. The experience of farmers with government organizations suggests that the best course is for the Federation to establish direct linkages with local traders specializing in seed import or with export companies in Europe.

In the 1992 planting season the project should coordinate procurement of seeds with ONDR and SECADEV to avoid competing with these organizations. These two organizations can help the project determine the amount of seed that will probably be required and advise on procedures for purchasing and distribution.

The project will work closely with the Federation in seed procurement and distribution in the 1992 season. The Federation must have an integral part of all activities as this is to be on-the-job training for the Federation in this activity.

The project must inform farmers that sufficient quantities of high quality seed will be made available through the Federation on a timely basis. Farmers should also be informed that the Federation seed distribution program is replacing that of ONDR and SECADEV.

The consumer preference for Roma type tomatoes during the March-May season, as shown by the higher prices paid to producer/traders by retailers, argues strongly for the project to continue to encourage project zone farmers to crop this variety during the late recession season. The project should also encourage production of the Charleston Grey type watermelon and the Charantais melon or netted cantaloupe which are well known to farmers and are generally preferred by marketers and consumers.

One of the first activities of the project should be to canvass the groupements to determine the amount of seed required.

Many farmers use their own harvested seed to some extent and it is doubtful that this will be discontinued in the near future. Because of this, there is a continuing need for training growers in the systematic selection of good seeds and in improved techniques of seed selection and production. The project should establish a program for theoretical and practical training at the Federation building and in the field. This would include

periodical visits to the farmers by the project personnel and visits and meetings between Karal area farmers and others areas farmers.

To implement this activity, the project should focus on some "progressive" farmers and help them in plant selection and seeds processing.

### LATE DATE TOMATO PLANTING PROGRAM

**GOAL:** Lengthen the Karal harvest season for fresh tomatoes sold on the N'Djamena market.

**OBJECTIVES:** 1) Harvest a greater portion of the tomato crop later in the season when farm gate prices are higher. 2) Reduce the end of season retail price of tomatoes to consumers by increasing the fresh market supply from Karal as a substitution for the imported tomatoes from Cameroon and Nigeria.

**SUMMARY OF PROGRAM ACTIVITIES :** The goal of the activities was to test the Roma tomato under late planting conditions in the project intervention zone.

Large quantities of tomatoes arrive on the N'Djamena market from January to March causing low prices. The project is interested in trying to produce tomatoes during the other months principally after May when prices are very high.

The concentration of production during a brief period of time is due principally to agronomic and climatic factors.

The traditional calendar in the Karal area is the following:

| TOMATO      | START OF PLANTING | END OF PLANTING | START OF HARVEST | END OF HARVEST | CYCLE (days) |
|-------------|-------------------|-----------------|------------------|----------------|--------------|
| RAINFED     | August            | September       | December         | Feb.           | 120<br>150   |
| RECESSIONAL | November          | Mid-Jan.        | March            | June           | 150          |

The crops are not irrigated and the soil moisture in the rainfed areas is enough to complete the production cycle of the plant.

From November 8 through December 5, 1991 an expert in post-harvest technology was in Karal advising the project. He suggested testing tomato varieties that are adapted to high temperatures.

However, the project was not able to obtain these varieties in time to test them.

The consultant also suggested using the Roma variety tomato for

upgrading the quality of the fruit for the market, and for seed production. These seeds arrived in Chad in mid-March, which is late in the tomato season. Even though this was not a heat resistant variety, the project decided to use these seeds for the late date tomato planting program.

The 13 farmers participated in this activity were chosen with the help of SECADEV and ONDR.

**Participating Farmers:**

| Name                 | Village    |
|----------------------|------------|
| Moussa Hassana       | Al Guissim |
| Emma Youssouf        | Al Guissim |
| Mahamat Haroun       | Al Guissim |
| Al Hadj Haroun       | Sidjé      |
| Brahim Outman        | Sidjé      |
| Adoum Issa           | Sidjé      |
| Mahamat Soumaine     | Djani Ile  |
| Barka Adoum          | Toloba     |
| Kouzi Hassana        | Alkouck    |
| Abbounassib Babbouka | Karal      |
| Djidda Ali           | Karal      |
| Mahamat Aboud        | Baltram    |
| Abakar Tom           | Baltram    |

The seeds that arrived in Chad in mid-March were immediately distributed to the farmers through SECADEV agents.

After the distribution of seeds,

- eleven of the thirteen farmers immediately planted the seeds;
- one farmer from Baltram, Mahamat Aboud planted in mid-April and then gave the tomato plants to the areas SECADEV agent who then transplanted them into his field;
- one farmer from Djani Ile, Mahamat Soumaine, planted at the end of May;

With the July arrival of the project agronomist in Karal, visits were made to the Roma tomato test fields. The agronomist also visited fields of traditional crops in order to collect data on the project areas' agricultural calendar.

In addition to the monitoring of the results of project seeds distributed to farmers in mid-March, the project monitored the marketing of tomatoes in N'Djamena from the project area during May and June which is the end of the harvest season. Information

was collected daily on quantities, prices, variety (Marmande & Roma) and sub-zone of production in the project area.

**PROGRAM RESULTS:**

**Germination and Nurseries:** Although the project does not have precise data on the ratio of germination, according to farmers and SECADEV agents it was good. In the case of the planting that was done in 11 nurseries in March, only the one at Sidje was not destroyed by insects. The nurseries that were planted in April and May at Baltram and Djani Ile were not attacked so heavily by insects. All the surviving plants were transplanted.

**Culture:** At the end of July, only three fields were cultivated with the varieties furnished by the project:

| VILLAGE   | FARMER           | DATE SEEDED | DATE TRANSPLANTED | SURFACE CULTIVATED |
|-----------|------------------|-------------|-------------------|--------------------|
| Sidje     | Adoum Issa       | 21/03       | 27/04             | 102 m <sup>2</sup> |
| Baltram   | Mimit Aloui      | mid-April   | mid-May           | 175 m <sup>2</sup> |
| Djani Ile | Mahamat Soumaine | end May     | end June          | 190 m <sup>2</sup> |

The two surviving fields can be divided into two groups that are different principally due to the height of the water table and the date of seeding and planting:

Group 1 (G1), Baltram and Sidje: in July the water table was at 200 cm and in March-April, when the tomato plants were transplanted, it was between 100-150 cm.

Group 2 (G2), Djani Ile: G2 : In July the water table was at 100 centimeters and in June, when the tomato plants were transplanted, it was between 50 and 100 cm.

(G1) Because there was not enough water for the plants and because of the high temperatures, they suffered from hydric stress, had slow growth, and were unable to go into the flowering and production stage. With the arrival of the rainy season, the growth restarted and the plants began to produce flowers. Unfortunately though, after a period of 20 days without rain in August, there was again lack of growth and no flowers. Damage by pests was also observed.

The very good soil humidity and the climatic conditions at the moment of transplanting permitted the plants to establish a good root system, unlike G1. This also permitted the plants to grow

normally and without stress during June and July. Flowering began at the beginning of July. Although the plants suffered lack of water in August, which had an effect on the flowering, it was minor compared to G1. In August, the field was greatly damaged by viruses or by nematodes.

In summary: late tomato crops in the project zone, face three principal problems:

- 1) High temperatures which result in lack of flowering and fruit production;
- 2) Insufficient quantity of water for good growth and production;
- 3) Damage by insects and disease.

The project has continued to follow the marketing of tomatoes through May and June. In May, there was a total of 4,114 cases of tomatoes shipped from the project area. During this period many of the farmers were sorting by variety and 34% of these cases were the Roma variety. The average price per case of Roma tomatoes during this month was 6,537 CFA, and for Marmande tomatoes 4,814 CFA; a 36% price difference. Seventy percent of the tomatoes in this month came from the Alkouk/Sidje zones within the project area.

#### CONCLUSIONS and RECOMMENDATIONS:

The program suffered because of lack of technical personnel in the implementation and follow-up activities of this program, and because the limited collaboration with ONDR and SECADEV. Given that only 3 fields were able to be planted with seeds distributed by the project, there is not enough viable data to either correctly evaluate nor to arrive at any real conclusions about the program.

- a) Because the agriculture in the project area is not irrigated, the possibility of tomato production in the dry season, using heat resistant varieties, could be attempted in particular areas where the soil humidity remains sufficiently elevated during the dry season for the needs of the tomato plant.
- b) In view of the project's scheduled termination in June 1993 the project cannot do another trial of late date tomato planting.
- c) Late date planting is not suggested under present circumstances. It is impossible for the normal varieties of tomato plant to produce blossoms in the hot season. There are insects problems as well as phytosanitary problems in both the dry and rainy seasons. Planting could be possible if it includes

the use of heat resistant varieties, irrigation and the use of pest and disease control.

d) As the project is already contacting various seed producers, it could recommend varieties of tomatoes adapted to the hot season for ONDR or SECADEV to test in the project zone.

e) For the 92-93 season, the project could look for and introduce varieties of tomatoes that are already being used in the project area, or varieties that are similar (Roma, Merveille des Marchees, etc.) and that have early and late maturity, to help extend the harvest period.

f) A few farmers in Karal are able to produce limited amounts of tomatoes for the N'Djamena market in the months of June and July using traditional seeds and cultivation practices. The very high prices of tomatoes in this season make it worthwhile for the project to investigate whether it is possible to expand this production.

#### **HARVEST MATURITY PROGRAM & PROGRAM FOR SORTING AND GRADING AT THE FIELD LEVEL.**

**NOTE:** Though outlined in the work plan as two separate interventions the sorting and grading, and harvest maturity programs will be evaluated together due to their symbiotic nature.

**PROGRAM GOALS:** Improve the general quality of produce offered for sale on the fresh market in N'Djamena. Reduce post-harvest loss through mechanical injury during transportation and retail market losses by rotting.

#### **PROGRAM OBJECTIVES:**

- 1) Increase profit margins throughout the marketing chain by increasing the portion of high quality produce that is transported and sold on the fresh market in N'Djamena.
- 2) Reduce marketing costs by reducing transportation of spoiled and rotten produce.
- 3) Train farmers in the principles of sorting and grading vegetables for quality and harvesting vegetables at an optimal point of maturity for transportation and sale on the fresh market in N'Djamena.
- 4) Establish retailer acceptance of tomato purchase at a mature-green stage.

**SUMMARY OF PROGRAM ACTIVITIES:** Sorting and grading is already performed to a limited extent by area farmers, and the project

activities have been aimed at systematizing and expanding the scope of these traditional activities and introducing harvesting at an earlier stage.

Work on the harvest maturity program and the program for sorting and grading at the field level was initiated in the 1991 season in Djani and Sidje. During the 1991 rain-depression season in November, the ACDI staff in Karal and some Karal area tomato farmers were trained in sorting and grading and mature harvesting techniques. Meetings were also in Baltram, Djani, Sidje, Gredaya and AlKouk, which are the major tomato producing regions of the project zone.

During the 1992 lake recession season, the ACDI staff carried out a series of day long field training sessions in area tomato farms. The ACDI staff in Karal conducted a total of five training sessions in Sangaria, Djani-Ile, Malloumri, and Sidje. Two separate training sessions were held in Sangaria.

Farmers participating in training sessions:

Sangaria: Abba Kachallah  
Achadi Ousmane  
Adoum Kachallah  
Mahamat Oumar  
Abba Cantana

Djani-Ile: Mahamat Oumar  
Adoum Adjid  
Adoum Khamis  
Ahmat Djibrine  
Gondja Mahamat  
Mahamat Soumaine

Malloumri: Issa Younous  
Hadji Akhaye

Sidje: Abakar Issa  
Faki Harroun

PROGRAM RESULTS: Before beginning the training, the farmers were reluctant to adopt extensive sorting and grading of produce before sending it to the fresh market in N'Djamena. In the farmers eyes, poor quality tomatoes that were culled out amounted to losses. The farmers were hesitant to remove the stem and leaves from the tomatoes as they were used to the traditional system of cutting the tomato with the stem attached.

After the initial training in Djani-Ile and Sangaria and the results of sales of the cases marketed in N'Djamena were known, the farmers reluctance to sort their tomatoes was partially overcome. However, farmers were still concerned about the culls

not marketed and the amount of work involved in sorting. Farmers from other villages came to the ACDI staff asking them to conduct training sessions in their villages. At the request of village farmers Malloumri and Sidje were added to the training schedule.

Cases of tomatoes that had been sorted, graded and sent to the N'Djamena market were quickly identified by retailers and were sold more quickly and at a higher price than accompanying cases that had the traditional quality mix.

Example in Sangaria: The producer was only willing to sort a single case of tomatoes. The case was subsequently sold in the Cholera Market for 3,000 CFA. Other non-sorted cases of tomatoes sold that day in the Cholera Market received 1,750 CFA.

It was not possible to harvest tomatoes at the "breaker point" (when the first tinge of red can be seen). The persons harvesting (mostly family members or hired labor) were unwilling to pick at this level of maturity. However, the project trainers were able to induce them to pick the tomatoes a little greener.

Retailer acceptance of the cases that had been sorted were monitored by the project market surveyors when they were offered for sale in the market. Cases of premium quality tomatoes were sent to the market on four occasions and offered for sale as part of the truck load. Each time retailers bid up the price of the sorted cases above those of the others in the truck load.

Retailers will accept tomatoes that are partially green, if they can be expected to ripen by the end of the day or by the next day.

#### CONCLUSIONS:

The project was not able to obtain statistically reliable information on the general increase in prices resulting from sorting and grading because of the small number of cases sorted and problems in monitoring sorted cases reaching the market. However, the prices of the sorted cases that were monitored were significantly higher than the unsorted. The retailers immediately recognized the quality differences and purchased them quickly and at a higher price. The Bougoumene farmers have taken the initiative in sorting and grading tomatoes for quality, and their consistently high prices show the potential economic benefits of a regular supply of high quality produce.

There is some sorting of tomatoes by variety in the mid-March - June season. This shows that there are no cultural inhibitors against this. However, there is still a great deal of reticence on the part of most farmers to undertake more extensive sorting

and early harvesting until they see for themselves that there is a substantial financial gain. One of the economic constraints to culling produce is the farmers desire to market all of his produce. Integrating sorting and grading activities with drying provides an economically advantageous solution to this reluctance to cull.

The sorting and grading to increase price is most effective in the middle of the harvest when there is a glut of tomatoes on market. However, this is also a period of peak activity for area farmers making labor scarce and expensive. Labor will continue to be a constraint to expanding sorting and grading activities.

### **RECOMMENDATIONS:**

**Test Sites:** To effectively transfer the technical skills of sorting and grading and to collect pick-up loads of sorted cases for trial shipments, the test sites should initially cover no more than four villages. The villages of Sangaria, Djani-ile, Sidje and Baltram are the most suited as focus areas for sorting and grading activities. Limiting the number of zones covered would allow systematic and continuous monitoring, which in turn would permit a more comprehensive evaluation. The results of these evaluations can be extrapolated to other areas in the work zone.

**Master Farmers:** In order to best carry out the training and monitoring in each of the test sites, a master farmer should be identified in each village. These master farmers should be recruited from the village or the immediate area in which they will be working and should ideally be an active member of one of local agricultural associations. Once selected these farmers should undergo a short term training to familiarize them with the project work and to prepare them for their roles as agricultural educators. After the initial training, regular meetings and supplementary training sessions should be held to facilitate the extension work. These agents would participate in the entire spectrum of interventions and not simply be limited to post-harvest sorting.

For the villages that are not part of the test sites, less extensive evaluations could be carried out by the methods currently being used, i.e. field visits, interviews and observations. If successful, the number of master farmers should be selected from other villages in the work zone.

**Training:** The project staff together with the master farmer should design a participatory training program to transfer the harvesting technology and demonstrate to farmers tangible economic benefits of employing the technology. The training programs should be developed and tested in small field trials held during the rain depression tomato season. Then, during the

main recessional season, the fully developed program can be applied to larger numbers of farmers in the test villages.

This training should be integrated with the women's groups in Sangaria, Djani-Ile and Sidje to coordinate with their tomato drying activities. Sufficient numbers of farmers should be involved to allow the shipment of a vehicle loaded entirely with trainee sorted and graded produce. With each shipment some of the trainees could travel to N'Djamena to observe the effects of quality on price and the general functioning of the marketing system.

The Monitoring Information System team should monitor all sorted produce arriving in N'Djamena to enable detailed price comparison and calculation of value added. A sample of sorted cases should be inspected to determine percentage of spoiled and damaged produce to quantify reduction in losses.

#### **IMPROVED TRANSPORT SYSTEM PROGRAM**

**GOAL:** Improve the effectiveness of transport organization in moving produce in a timely and cost-effective manner.

**OBJECTIVE:** 1) Determine the effectiveness of farmer proposed transport rotational system. 2) Facilitate communication about transportation needs between producers and traders. 3) Determine optimal inter-field routing for transporters. 4) Evaluate the feasibility of alternative short-haul transport to assembly points.

#### **SUMMARY OF ACTIVITIES:**

Farmers in the Karal project have long complained about transportation problems for shipping their agricultural products to the N'Djamena market. Transportation is the largest single marketing cost, and during peak harvest season, there are an insufficient number of vehicles to provide timely transport to the N'Djamena markets. As a result there are losses from over-ripe produce.

One of the first transportation activities undertaken by the project was to investigate the possibility of alternate types of short-haul transport from individual fields to a central collection point in the producing area. The purpose of this was to determine it would be possible to significantly reduce the vehicle time in the field making a shorter turn-around time between field and market. This would increase the effective amount of transport and lower the cost of transport. The project surveyed the production areas and held discussions with farmers to determine sites for field level assembly points to be used as depots for produce collections. Farmers were interviewed about their use of animal draft transport: donkey carts and bullock

carts. SECADEV agents who have a program to furnish carts and make credit available for purchasing carts were also interviewed about farmer interest in expanding the use of carts.

To evaluate the feasibility of improving the more frequently used roads from the producing area to the improved highway to N'Djamena, the project obtained the volunteer services of a roads engineer attached to OFNAR to visit the Karal area to evaluate the conditions of the farm-market road from Dandi to Karal with respect to the possibility of reconstructing the road. A second observation trip was made to investigate the conditions of the direct route from Dougia to Karal. Although these roads are relatively short (Karal-Dandi: 10KM & Karal-Dougia: 17KM), they are frequently impassable after heavy rains during the rainy season. The rainy season is also the harvest season for sweet potatoes (wholesale gross revenues from this area for sweet potatoes are about 120 million CFA and fresh okra about 70 million CFA). Poor roads impede the transport of highly perishable fresh okra causing field losses and causes erratic supply of sweet potatoes which causes large daily swings in the price of sweet potatoes reaching the market.

In April and May 1991, the project surveyed transporters bringing horticultural products to N'Djamena to determine if there was price collusion among the transporters and to identify ways in which the project could increase the efficiency of market transportation. In December 1991, the project met with farmers, local traders and transporters to assist in developing a transport schedule which would ensure that all areas in the project would be covered and to establish alternate day transport where there was the problem of two or more areas shipping produce on the same day and thereby flooding the market one day and having only a small amount reach the market the next day.

In March, 1992, the project began monitoring all horticultural transport coming into the N'Djamena wholesale markets. Market surveyors recorded the vehicle number, the area it came from, and type of produce carried and the amount of produce. This information includes transport from areas other than the project area.

**PROGRAM RESULTS:** Farmers show little interest in using draft animal carts for even short-haul transport of their highly perishable horticultural products. The project has counted only 12 donkey carts and 13 horse drawn carts in the project area. In the six years of the SECADEV program to supply carts and to provide credit for their purchase, only a few carts have been sold. In the Western part of the project area there are some bullock carts in general use, but not for transporting vegetables. In the Eastern part of the project area, farmers say that the extremely sandy soil makes transport with animal pulled carts difficult. However, the main reason for not using animal

drawn carts for N'djamena produce marketing is that harvested products must be picked up by the trader's vehicle and sent to market as quickly as possible. Transporting produce by animal cart would increase the time between harvesting and marketing and increase losses.

The project encouraged a transport rotation system which would reduce the daily variations in supply to the market. Preliminary results of an analysis of transport through the project zone shows some alternating daily pick-ups from competing production zones which reduces the variations in daily supplies.

During peak transport demand period trucks based in areas close to N'Djamena (e.g. Linia and Drouballi) often transported produce to market on successive days, though most skip at least a day or two between trips. Trucks transporting produce from the project zone are frequently able to make the trip from the field to N'Djamena and then back again in twenty four hours time. This allows them to deliver produce to the market on successive days. More commonly there is a gap of two or more days.

Individual transporters and vehicle owners do most of their business in the villages in which they reside. Vehicles from the project zone tend to be associated with a certain village or area. Only occasionally will a truck that services one area enter another.

At the beginning of the tomato season in March, 45 or more trucks transported produce to the wholesale markets from the project zone. Many of these trucks made only one or two trips. The bulk of the produce was hauled by a core fleet of 20 - 25 trucks. During the high season period of April and May, over 115 different vehicles carried produce from the project zone to market. As in March, many of these trucks made only a single voyage or two.

Even at the height of season there were rarely more than 20 trucks from the project zone in the market at any given time. The high season averaged some 15 trucks a day.

Alkouk has six vehicles at its disposal on most days. However, even during its high season in April, it sent an average of only four vehicles to market each day. The highest number of vehicles arriving from this region in a single day was eight.

Baltram seldom uses more than three vehicles in a day and has never sent more than seven at once.

Karal routinely sends eight vehicles during the middle of the season, though rarely any more than that.

Sidje can send six or seven vehicles daily during the May tomato season, averaging about five.

### CONCLUSIONS

- There is no farmer interest in expanding the use of animal drawn carts for short hauls of fresh produce. Without the availability of more carts it is not practical to establish strategically placed field assembly points to reduce the distances traveled by motorized vehicles.
- The importance of transporting fresh produce as quickly as possible from the field to market makes the use of animal transport impractical.
- There is no evidence of systematic price exploitation of farmers by transporters. In the past season transport prices rose and fell according to the level of demand. The relatively high level of transport competition in the project area has led to efficient use of resources given the difficult road conditions.
- The availability of transport is sufficient to meet producers needs except at the height of the tomato harvest season.
- The four zone transport rotation system attempted by the farmers was not effective. The rotation schedule used in two sub-zones of the major tomato producing areas for the March - May season shows potential to reduce market glut for the two major tomato producing areas.

### RECOMMENDATIONS

- Because of lack of farmer interest, the project should no longer pursue attempts to develop alternate types of transportation nor establish centrally located assembly points for produce. SECADEV continues its program to supply animal drawn carts for farmers who want them.
- As the problem of the level of transport prices is not organizational, but is a function of transport distances and vehicle and maintenance cost the project should not allocate resources to attempting to address this.
- To the extent possible the project should encourage the improvement of farm-market roads in the area.
- The project should continue to monitor information on vehicle arrivals.

## **PROGRAM TO EVALUATE FIELD-MARKET CONTAINERS**

**GOAL:** Minimize revenue loss caused by the type of container in which produced is transported.

**OBJECTIVE:** Determine the best overall type of container(s) to transport vegetables grown in Karal from the field to the fresh market in N'Djamena.

**SUMMARY OF PROGRAM ACTIVITIES :** The tea chest is the preferred container for transporting fresh tomatoes and melons to market. The tea chest is readily available at acceptable prices, and if treated with care, can last throughout the harvest season. However, the size of the case, carrying up to 60 kg of tomatoes, makes it difficult to load and unload. Also tea case height of 46 cm without ventilation holes retains heat and speeds the ripening process which often results in a high percentage of spoilage. To avoid these problems, the project designed several different prototype field containers for use during the 1991 season. However, these were found to be less durable and more expensive than the tea chests currently used.

In interviews with retailers it was found that they would be receptive to purchasing produce in units smaller than the tea case. The weight of a full case of tomatoes makes transport difficult and smaller retailers often find it difficult to sell a full case a day.

To determine the producer and retailer acceptance of a smaller container, the project tested the economic and technical feasibility of a 1/2 size tea case. This 1/2 size case is manufactured by cutting a tea chest in half and using the lid of the original as the bottom of the second half. These containers were fabricated from two distinct types of tea chests: red wood cases and white wood cases.

The red wood cases measure 46 cm a side for a volume of .097 m<sup>3</sup>. These cases are reinforced along the outside seams with metal tape that has been stapled into the plywood sides. The bottoms of the cases are further reinforced on the inside with 4 wood strips. Red wood cases can be purchased "new" for 750 CFA in the Central Market in N'Djamena.

The white wood cases were fractionally larger than 46 cm a side with a correspondingly slightly higher volume than the red wood cases. These cases are reinforced on the outside with small corner clips. The inside of the case is reinforced along the seams with firing strips. White wood cases can be purchased "new" for 500 CFA or less in the Central Market in N'Djamena.

The project undertook the manufacture of 12 prototype containers. Once constructed, the 1/2 cases were turned over to Hassan

Abderhim, a farmer from AlGuissium, a tomato producing village between Sidje and Djani.

**1/2 TEA CHEST TESTING**  
FARMER: Hassan Abderahim  
LOCATION: AlGuissium  
NUMBER OF CASES: 12  
NUMBER OF TRIALS: 10+

Hassan used the 1/2 tea case to ship fresh tomatoes to N'Djamena to be wholesaled in the Central and Cholera markets. Each case was shipped to N'Djamena and returned 10 times or more.

**PROGRAM RESULTS:** Trials conducted by the participating farmer indicate that the 1/2 sized tea case (with the original bottom) is more durable than the full sized one. The farmer using the cases reported a general weakening of the 1/2 tea chests after about ten market runs, but none of them had been badly damaged. The full sized chests are usually severely damaged or destroyed after 10 trips. The 1/2 tea chests where the bottom was fashioned from the cover proved less durable than those which retained the original bottom. From time to time the bottom of these chests would come loose, requiring the farmer to carefully move the bottom back into the correct position each time this problem occurred.

**Retailer Acceptance:** The trader testing the 1/2 size cases says that at first retailers were a little hesitant in purchasing the 1/2 tea chests, as they were unsure of the amount of produce they contained. However, once satisfied that the volume was in fact 1/2 that of a full sized chest, there was a high retailer acceptance. There were three identifiable advantages for retailers: Retailers who have trouble selling a full case a day prefer the 1/2 case. As prices rise, the small case selling for approximately 1/2 price is more affordable, retailers believe that market life is longer for tomatoes in the smaller cases.

**Producer Acceptance:** The producer/ trader testing the 1/2 cases believes that they are more durable than the full size case. Produce suffers less damage and is attractive to retailers. Because the size of the 1/2 tea is exactly half that of the standard size case, it poses no loading problems.

The white wood cases proved less sturdy than the red wood with the sides splitting easily and the case giving way under rough handling. The farmers using the containers expressed a preference for using the red wood cases despite their higher initial cost.

The 1/2 tea case generated considerable interest among area producers. In the test village of AlGuissium some 20 farmers have asked about the 1/2 tea cases and have said they are ready

to purchase them. Additionally many villagers from outside AlGuissium have heard about or seen the 1/2 cases and have asked ACDI staff about acquiring them.

Hassan Abderhim, the farmer conducting the trial shipments, reported being satisfied with the 1/2 chests and states that he intends to use them next season to ship all of his tomatoes to market. In addition to Hassan, several other village farmers began using the 1/2 cases to transport their tomatoes to N'Djamena. The farmers of AlGuissim have collected purchase orders for some 400 1/2 cases to be used next season.

### CONCLUSIONS:

Project Considerations: The farmer selected by the project to test the half cases kept careful track of the cases throughout the season. His reputation as a respected and progressive farmer had a positive influence on producer acceptance of the new containers. The containers were supplied early enough to allow them to undergo a full season of use.

Unfortunately some of the cases supplied by the project were poorly designed resulting in an unnecessarily shorter life. Due to poor communication between Karal and N'Djamena the wholesale selling price for the 1/2 case was not carefully monitored.

Sociological: As the half case is a variation on existing technology rather than a completely new method of packaging it is easily accepted at all links in the marketing chain. One indication of this acceptance is the fact that several of the cases were stolen during the marketing cycle and are currently being used by persons not associated with the project.

Economic: The 1/2 cases could be manufactured on the village level. The carpentry skills required are minimal and the necessary materials are readily available. However, village level manufacturers would only be able to serve a limited number of persons within the environs of the village. N'Djamena area manufacturers would be able to produce higher volume and, as it is the current point of sale for empty tea cases, would be accessible to all farmers. Unless the price is significantly higher than that of the unmodified tea chest, the farmers possess the means and desire to purchase the 1/2 cases.

An arrangement has been worked out with transporters, commission agents and the Sultan so that marketing costs for the 1/2 cases are exactly half that of the full sized case.

| TEA CHEST MARKETING COSTS, for producer |                |
|---|----------------|
| Transportation                          | 1,000 CFA      |
| Commission Agent                        | 250 CFA        |
| <u>Sultan's Fee</u>                     | <u>100 CFA</u> |
| TOTAL                                   | 1,350 CFA      |

| 1/2 TEA CHEST MARKETING COSTS, for producer |               |
|---|---------------|
| Transportation                              | 500 CFA       |
| Commission Agent                            | 125 CFA       |
| <u>Sultan's Fee</u>                         | <u>50 CFA</u> |
| TOTAL                                       | 675 CFA       |

**Technical:** As has been previously noted, the major structural problem with the 1/2 cases is the tendency of the bottom to give way in those 1/2 cases constructed from the top of the tea case where original lid served as the bottom. Upon examination of the remaining cases and discussion with the farmers testing the cases it was clear that these bottoms had never been properly secured to the sides of the case in the first place. The carpenters had simply tacked the lids on at the corners, one nail for each corner, with no reinforcement of the seams whatsoever. This problem can easily be solved by reinforcing the lids and attaching them to the sides of the case with a sufficient number of nails or staples.

In general, the smaller size of the half case makes it sturdier than the full sized cases. Specifically, the reduction in size of the case sides seems to go a long way toward reducing the breakage of sides which the farmers identified as the major problem associated with the larger cases. This, coupled with strength given by additional interior reinforcement, extended the life of the cases to an estimated 10 or more trips.

**RECOMMENDATIONS:** For the following season the project has a role to play in three key areas. 1) Improving the design of the 1/2 case. 2) Facilitating the timely production and supply of high quality half cases to interested farmers. 3) Monitoring the 1/2 cases to determine the benefits.

### Design

- o The major problem encountered during the 1992 season was the structural weakness of the 1/2 chest fabricated from the top half of the tea chest. It is essential to improve the design of the 1/2 chests that are produced using the top half of the original tea chest. The fabricated bottom should be at least as sturdy as the original.

- o Only the sturdier red wood cases should be used in the manufacture of 1/2 cases.

#### **Production & Supply**

- o The project should not become the source of supply for the 1/2 tea chests. Rather the project should locate entrepreneurs in N'Djamena interested in fabricating 1/2 tea chests on a commercial basis. The entrepreneurs must be able to produce high quality, standardized cases at an acceptable price.
- o Canvass the farmers to know the exact number of 1/2 chests wanted.
- o Place interested area producers in contact with the manufacturers.
- o Any farmers planing on using the 1/2 cases for the 1993 rain depression season will need the cases in December 1992.
- o Farmers wishing to use the 1/2 cases for the 1993 recessional season will need to be in possession of the cases by February 1993 at the latest.

#### **Monitoring**

- o Continue the monitoring of the 1/2 chests with selected farmers to determine an accurate amortization rate.
- o Conduct follow up interviews with farmers and retailers using the 1/2 case to determine any advantages or constraints.
- o Systematically monitor the prices of all 1/2 tea cases wholesaled in N'Djamena.
- o Periodically compare 1/2 case and whole case spoilage rates. This, together with pricing information and amortization rates, will allow an accurate appraisal of value added, if any.

#### **FEDERATION POINT OF SALE HANGER FACILITY**

**GOAL:** Establish an economically sustainable a farmer owned and operated market facility in N'Djamena.

**OBJECTIVE:** 1) Enable producers/traders to temporarily hold vegetables at the market (3-4 days) to wait for improved daily price. 2) Hold tomatoes for ripening. 3) Provide an opportunity to sell directly to retailers--with special emphasis on meeting

specific quality requirements for different retailers. 4) Test feasibility of farmer management of point of sale marketing organization. 5) Provide a meeting place to hold training sessions for producers, traders and retailers.

**SUMMARY OF PROGRAM ACTIVITIES:** In December 1991, The representatives of AGDERUMKA, the newly organized federation of 51 groupements from the project area, approached the project with a request for assistance in establishing their own hangar as a "Point of Sale" outlet in one of the major markets of N'Djamena. After discussions with the project staff, the federation representatives decided that the best course was to test the concept in the Cholera market.

The Federation took the initiative in constructing and funding a 10M X20M, walled hangar to be used for storing dry cereals and as a area for selling fresh vegetables. The project funded the construction of a 10M X 6M mud brick storage room connected to the hangar. This provides enough space to store 128 tea cases of tomatoes or melons, the equivalent of four pick-up loads of produce. The construction of the vegetable storage room was completed, but the evaporative cooler which was planned to cool the vegetables was not installed because of the very high price quotes for obtaining electric and water connections. The project is involved in negotiating a reduction in price with the city utility organizations responsible for water and electricity.

One of the purposes of constructing the vegetable storage room was to give the producer/traders arriving in N'Djamena more flexibility in putting their produce on the market, it is not an attempt to "lengthen the season" by holding the tomatoes or other perishables for a long period as onions might be held. The producers in Karal have organized a rotational transportation schedule in which farmers must harvest and transport their produce to N'Djamena when it is their turn for transportation. By having a storage area in N'Djamena, they have the option of holding their produce off the market several days if they feel that the price will increase.

The storage room will enable farmers to hold their mature green tomatoes at the market until they are ripe enough to be acceptable for retailers to display to consumers. Mechanical injury during transportation and a short market life is caused by tomatoes and melons being picked when they are too ripe. The project is implementing a program to encourage farmers to harvest tomatoes when they are in the early turning stage (from green to light rose color) and ship them "mature green" to the market. Farmers understand that this will reduce loss and increase the value of their field packs, but they point out that consumers prefer red ripe tomatoes and that they need a place to hold their tomatoes until they ripen.

The farmers believe that the services provided by the intermediary who negotiates the price between the producer/trader and the retailers is overpriced or is not necessary. This facility will test the ability of producers to deal directly with the retailers. This competition may cause the intermediaries to reduce their fees or farmers may find that they can establish direct contact with retailers.

The project has found that throughout the city there are numerous, segmented micro-markets (institutions and road side stalls that service specific socio-economic customers) who may wish to buy from producers who can supply their specific needs. This point-of-sale facility provides the potential for developing contacts with these sellers.

There are several trader operated "wholesale cooperatives" in the N'Djamena markets, but this is the only producer owned and operated point of sale organization.

There is a question of whether a farmer dominated organization can be economically sustainable. The AGDERUMKA farmers are proposing this as an economically viable business operation with revenues from user fees for storage and other marketing services and from "petits magasins" and a small restaurant on the premises. The management lessons learned from this activity will be important in future attempts by other organizations to replicate it.

This is an extremely important objective as the success of many of the project's marketing interventions depends upon the understanding of their benefits by the persons participating in the market. Having an appropriate place to meet and discuss marketing issues on a formal or informal basis is critical to gaining their acceptance.

The project has provided a staff member to assist in inventory control and monitoring of hangar activities. A short-term cooperative management expert was brought to Chad for a four-week consultancy to develop a management plan for the federation and the hangar. He also provided training to Federation board members and the ACDI staff members that are assisting the Federation in management of the hangar.

The project has begun management assistance to the Federation with special emphasis on management of the hangar. The project staff in Karal in cooperation with the SECADEV Delegate are working to bring the accounting records of the Federation up to date. In N'Djamena, the project staff is also assisting in the accounts of the hangar. In addition to this, the project is helping the Federation develop a system of storage records and helping to develop a pricing structure for the services provided by the Federation to its members and non-members.

## PROGRAM RESULTS

The hangar was opened for business about mid-April. Cereal grains from different producing areas were brought to the hangar for storage. Karal farmers brought tomatoes, melons and watermelons to the hangar for sale. The Federation was able to employ the services of a "Chief Intermediary" who brought his loyal producer customers to the Federation hangar to sell their produce.

The quotes given by the city organizations for connecting water and electric were very high. The project suggested that a small generator be used until it is clear whether the cool storage concept is viable. At this time the evaporative cooler has not been installed and cool storage for vegetables has not yet been used.

Selected ACDI staff members and Federation board members have received initial training in the elements of a business plan and are helping the Federation to establish a management system.

## CONCLUSIONS:

- The construction of the hangar and storage room in planned, supervised and financed (except for the storage room) by the farmers demonstrates the ability of a farmer group to organize and execute a major marketing facility.
- As the facility only came on-line in April which is the middle of the harvest season, there has not been time to evaluate its economic and organizational viability.

## RECOMMENDATIONS:

- The project should continue to support this facility as part of the Federation activities. This support should be in management training, monitoring marketing services and financial revenues.

## **PROGRAM FOR COMMERCIAL PROCESSING OF PRODUCE**

**GOAL:** To make economic use of produce not suitable for the fresh market in N'Djamena.

**OBJECTIVE:** 1) Evaluate the economic feasibility of establishing produce processing at a field site. 2) Evaluate the technical feasibility of tomato and okra drying (and perhaps milling into powder) and producing concentrate.

**SUMMARY OF PROGRAM ACTIVITIES:** Some economic feasibility research and technical experimentation on canning tomatoes was

done in the 1991 season, but as this did not seem economically feasible it was abandoned.

A study of the social, economic and technical feasibility of tomato drying on a commercial scale was conducted in February, 1992 to determine the existing knowledge, capacity, facilities and attitudes towards tomato drying in the Karal area. About 30 tomato producers, women members of groupements and SECADEV agents working in the area were interviewed in seven project villages in each of the project sub-zones.

In March, three cases of fresh tomatoes were cut and dried at the Federation building to test different drying methods that had been suggested by village women. The project also determined the conversion rates from a case of fresh tomatoes to a sack of dried tomatoes. The potential profitability of tomato drying was evaluated as part of a study on the costs of production for tomatoes in both rain depression and lake recessional fields.

The project selected three test sites for tomato drying in conjunction with sorting and grading at the field. These villages were selected because of their abundant supply of tomatoes, the presence of women interested in tomato drying and their willingness to cooperate in the field sorting and drying.

The villages of Djani Ile and Sangaria, are among the largest tomato producing areas. These villages had expressed their concern to ACDI staff concerning their marketing difficulties. The men's groups, members of the Federation, had already participated in several sorting and grading trials to send high quality truckloads of tomatoes to N'Djamena market.

In Sidje there is an active Women's Group that is a member of the Federation. The project conducted meetings with the women's groupement members to discuss their interest in this activity and the possibilities and requirements for its organization and implementation.

Although the women's groups were interested in drying tomatoes for sale in N'Djamena, this was to be their first venture in this type of enterprise and they were reluctant to commit time and money to it. By the time the women of Sidje had come to an agreement on drying, the wholesale cost of tomatoes had risen to the point that the farmers were unwilling to sort tomatoes which would provide the women with culls. It was, therefore, necessary for the women to purchase cases of tomatoes at normal field prices. To stimulate participation, the project advanced the Sidje women's groupement 25,000 CFA to purchase cases of fresh tomatoes for drying. The women were to dry the tomatoes, store them in the Karal storage facility and sell them in N'Djamena at

peak price. The sum advanced by ACDI will be deducted from the total profit made from the sale of the produce.

The project offered to help the Djani Ile and Sangaria women's groups with a dried tomato bank type system designed to overcome their need for immediate cash returns on their investment/labor. The Federation, through ACDI, offered member groups an advance of 5,000 CFA for each sack of dried tomatoes stored in the storage room in Karal. This represented the price of a sack in N'Djamena at that time. The sacks are deposited in the Federation storage facility in Karal and later will be transported to the N'Djamena market hangar. The owners of the sack pay the storage fees and costs of marketing in N'Djamena (including transport, sacks, commission fees). Upon the sale of the sacks by the Federation, when prices are the highest, the owners will receive the higher price, minus the transport, storage and transaction costs.

In May, two sacks of fresh okra were cut and dried at the project site to determine fresh to dry conversion rates. The potential profitability of expanded okra drying was evaluated. Selected farmers were surveyed concerning their interest in a credit scheme for okra drying similar to that for tomatoes.

#### PROGRAM RESULTS:

Although there is a potential market/demand for canned tomatoes the cost of the containers (jars or cans) and the cost of the fuel required to process the product is prohibitive and cannot compete with the imported canned product on the market.

There was found to be more tomato drying being done in the Karal area than initially expected. The sale of fresh tomatoes remains the priority for area farmers. Based on a small sample of farmers in Karal, an estimated 15% of the February (rain depression) season tomato harvest was dried. None of this product was sold in the N'Djamena market. Part of it may have been consumed by the household, sold in a local village market or sold to Kanembou traders who travel through the area.

Tomato drying was found to be technically, socially and economically feasible. It can be particularly profitable for producers who dry their own tomatoes with family labor. The main constraints to increasing the scale of a tomato drying operation are the shortages of labor for this activity. One solution to the labor constraint is to hire labor, such as the nomadic Fulata who are present in the area during harvest time. Both the time and labor constraints worsen as the tomato season progresses and other priority uses (cereal cultivation) for these resources arise. The need for immediate cash return is seen as a constraint to storing the dried product until prices are highest in December.

In Sidje, the women dried three sacks of tomatoes. They used 18,675 CFA (out of the 25,000 CFA advanced) to buy fresh tomatoes at 200-250 CFA per basin, 3 jute sacks and string to tie them. As the drying activities were started toward the end of the harvest season, the women were not able to dry more because the local supply of fresh tomatoes was exhausted.

Although the women in Djani Ile were interested in drying tomatoes, the tomato harvest in their area was nearly finished by the time that they began attempting to find tomatoes for drying. As a result they were not able to participate in the tomato drying activity.

Two sacks of dried tomatoes were produced in Sangaria, but one of the sacks was sold during the month of June because of an urgent need for cash for food and to hire labor for field work. The amount of tomatoes dried were small because of the limited supply of tomatoes and the increased labor constraints due to the beginning of the corn planting season. No up-front cash investment was necessary in Sangaria because farmers used their own culled tomatoes. However the project provided a cash advance of 5,000 CFA per sack as incentive for the women to store the dried tomatoes and sell at higher price later in the year..

The four sacks of dried tomatoes produced by the women of Sidje and Sangaria are being kept in the Federation storage facility in Karal. The plan is for the sacks to be sold when prices rise to about their highest, usually in December. The original plan was to sell them in the N'Djamena market, but there is also a possibility of selling them to local traders and thereby avoiding the cost of transporting them to N'Djamena.

#### CONCLUSIONS:

- The project was not able to fully test the tomato drying intervention as the drying activities did not get under way until past mid season when the price of fresh tomatoes was beginning to rise rapidly. This meant fewer tomatoes available for drying and less incentive for women to organize this activity.
- All of tomato drying was done as a project activity with little involvement on the part of the federation. While it was appropriate for the project during the first year, the Federation needs to become more involved.
- Definite inroads have been made towards changing tomato producers' attitudes regarding the idea of tomato drying as a profitable income generating activity. Women and farmers in the area are becoming interested in what they have done and that the information is spreading to neighboring villages. Next season, the women of Sidje plan to plant a

communal tomato field and those in Sangaria will hire labor to help with the drying. However, tomato drying is still seen as a women's activity, that must compete for scarce labor with higher priority activities such as cereal cultivation.

- Large scale commercial production and marketing of dried tomatoes is a new enterprise for most people in this area and it will take some time and proof of profitability to convince people to invest the necessary time and labor and for this information to spread throughout the area.

There is considerable seasonal variation in the wholesale price of dried tomatoes. ACIDI market information shows monthly averages falling between 4,800 CFA and 12,500 CFA. The highest prices for dried tomatoes occur some six months after the end of the Karal harvest. For five months of the year, the wholesale price of dried tomatoes averaged more than 8,500 CFA. For two of those months the price was over 11,000 CFA.

The fresh dried conversion rate for tomatoes is calculated at six cases fresh for every one sack dried.

Wholesale Marketing Costs for Tomatoes (Karal to N'Djamena)

|                      |                  |                      |                  |
|----------------------|------------------|----------------------|------------------|
| Dried Tomatoes, Sack |                  | Fresh Tomatoes, Case |                  |
| Transport            | 1,000            | Transport            | 1,000            |
| Sack                 | 250              | Case (amortized)     | 100              |
| Commission           | 250              | Commission           | 250              |
| <b>TOTAL</b>         | <b>1,500 CFA</b> | <b>TOTAL</b>         | <b>1,350 CFA</b> |

From the conversion rate and marketing costs the following wholesale price equivalency formula's can be derived.

$$\begin{aligned} \text{Dried} &= (\text{Fresh} - 1,350) \times 6 + 1,500 \\ \text{Fresh} &= (\text{Dried} - 1,500) / 6 + 1,350 \end{aligned}$$

Using these formulas it can be seen that for 5 months of the year where dried prices are at their height, farmers who sold their tomatoes dried would receive the equivalent of at least 2,517 CFA per case. During the two months of peak prices, farmers could expect to receive the equivalent of over 2,934 CFA per case.

These price equivalencies are much higher than the mid-season wholesale price of Karal tomatoes in January - February which were closer to 2,250 CFA.

In their evaluation of this season's activity, the people of Sangaria, Sidje and Djani Ile noted the advantages in terms of economic use of the culled tomatoes and higher prices for dried tomatoes that are stored. Their final judgement, however, will be made once the sacks are sold and the profit is in their hands.

The cases of Sidje and Sangaria show the continued need for assistance in the form of production and/or storage credit to enable them to engage in an activity they otherwise would not be able to do.

Tomato drying has the potential to strengthen women's groupements and provide an extra source of income to women. Tomato banking could provide an incentive for farmers to perform field grading, but this is only during the peak harvest season during when farmgate prices are lower than the cost of production. However, the scarcity of available labor during the peak tomato harvesting season may hinder any attempts at large scale drying.

Drying with several different surfaces was undertaken at the Federation building in Karal. Although techniques resulted in better quality dried tomatoes, they were not practical as most of the drying in the Karal area is done at the edge of the field where it is inconvenient or impractical to provide alternate surfaces. The local method of drying on a mat or on the ground in the sun provides a product that is acceptable in the N'Djamena market and is appropriate to local conditions.

As it is currently organized and operating, AGDERUMKA does not possess the capacity to manage a tomato bank as part of its business activities. The federation possesses the ample facilities in Karal and N'Djamena for the long term storage of dried tomatoes and okra.

Okra Drying: There is interest on the part of local women in increasing the amount of okra that is dried. Women in the Karal area dry okra and selling it to traders for shipment to the N'Djamena market. The traders store the okra in N'Djamena for later sale because the seasonal price variations make it profitable. The Karal women do not store their own okra for later sale because they need the immediate cash flow. They say they are very interested in developing the same "produce bank" concept that the project has suggested for dried tomatoes.

As with tomatoes, dried okra prices exhibit considerable seasonal variation. ACDI market information for 1991-1992 shows monthly median prices ranging from low of 6,000 CFA in December to almost 11,000 CFA in August. During four months of the year the average price exceeds 8,500 CFA.

However, unlike tomatoes, the period of highest dried okra prices overlaps with the Karal okra harvesting season. This means that okra producers do not need to wait a long period of time for the price to rise to optimal levels.

Project research indicates a fresh to dry conversion rate of approximately 9 to 1, i.e. a farmer would have to dry 9 sacks of fresh okra to obtain a single sack of dried okra.

Wholesale marketing Costs for Okra (Karal to N'Djamena

|                  |           |                  |           |
|------------------|-----------|------------------|-----------|
| Dried Okra, Sack |           | Fresh Okra, Sack |           |
| Transport        | 1,000     | Transport        | 750       |
| Sack             | 250       | Sack(amortized)  | 50        |
| Commission       | 250       | Commission       | 250       |
| TOTAL            | 1,500 CFA | TOTAL            | 1,050 CFA |

From the conversion rate and the marketing costs the following price equivalence formulas can be derived.

$$\text{Dried} = (\text{Fresh} - 1,050) * 9 + 1,500$$

$$\text{Fresh} = (\text{Dried} - 1,500) / 9 + 1,050$$

Thus when the wholesale fresh price drops below 1,826 CFA it becomes preferable to sell on the dry market during those months where the dried produce exceeds 8,500 CFA.

RECOMMENDATIONS:

The potential profitability of selling dried tomatoes in N'Djamena for the producer and the income generating potential for the federation in its role as marketing intermediary makes this a program to be followed up on.

There is potential for increasing farmer revenues through wholesaling of dried okra. However, the overlap of the Karal okra harvest season with peak prices means that there is little need for long term storage. For this reason a vegetable banking approach, where dried produce is stored in anticipation of higher prices, is not as appropriate for okra as it is for tomatoes.

Any further interventions in this area should be planned as a joint effort with the Federation. The Federation should approach the tomato banking as a business venture and be prepared to devote a significant amount of time and resources to the development of the business. A committee/ commission charged with managing the tomato bank should be created. There are numerous different ways in which the committee could operate a business of this sort. Three alternatives are examined below.

- 1) The Federation could purchase the dried tomatoes outright during the period when prices are low and retain all the profits from their eventual resale.
- 2) The dried tomatoes could be purchased on credit from area farmers. The farmers would receive a small sum at the time of purchase and the rest of the profit, less cost and fees, when their particular sack was sold.
- 3) A variation on the above system would not track individual sacks but rather give farmers credit for the

number of sacks they banked. In this case farmers would not receive the exact returns from his or her individual sack, but rather an averaged return based on the total profit minus fees and costs divided by the number of sacks.

Of these three options the first is the easiest to administer, but does not meet the goal of increasing farmer revenues. The second option would help the individual farmer but would entail the creation and use of a rigorous inventory control system. The third option seems to be the best fit with the Federation goals and present administrative capacity.

Project Role: ACDI should concentrate its resources on training, organization building, and monitoring of the Federations efforts. During peak activity periods, the project should employ a qualified female member of AGDERUMKA, to facilitate the coordination and participation of the women's groupements.

Establish Committee: In October general assembly meeting the Federation should form a committee for tomato banking. This committee should include representatives from the women's groups involved, and some literate members who would be able to maintain the necessary records.

Management Training: Once formed the committee would then undergo training under ACDI auspices to equip them with the necessary accounting and business skills.

Raise Operating Capital: The committee should decide how to raise the necessary operating capital. Possibilities include; collecting from members, VITA loans, other external grants or some combination of these. In any case, the fund should be available for use by the beginning of the Karal tomato harvest season.

Purchase Dried Tomatoes: During the harvest season the committee would be responsible for stocking the bank with wholesale quality dried tomatoes.

Storage in Karal: Between purchase and sale, the dried tomatoes would be stored in the Federation building in Karal. Periodic checks would be required to insure quality and security of stocks.

Transportation to Warehouse: When the prices reach acceptable levels the committee would transport the stock to the Federation warehouse in N'Djamena.

Sell at Warehouse: The stocks would be sold during peak prices at the Federation Warehouse.

Distribute Profits: Once all the stock has been sold the committee will distribute profits, less costs and fees, to participants in the bank.

### **MARKET INFORMATION SYSTEM**

GOAL: 1) Improve the reliability and usefulness of fruit and vegetable market information to producers and market persons.

OBJECTIVE: 1) Disseminate timely, accurate and relevant market information to producers and market persons on which short-term (daily) supply decisions can be made. 2) Develop a set of historical data for long-term planning.

### **PROGRAM SUMMARY:**

#### **Data Collection:**

The MIS collects statistical data in the three major wholesale markets in N'Djamena.

1) The Central Market: This is the largest wholesale market. It specializes in goods from Abeche- dried tomatoes, onions and garlic. It is also the main wholesale market for fresh tomatoes, fresh pepper, white onions and specialty vegetables.

2) The Millet market: As the name implies, it is the principle cereals market, but in terms of vegetables, it specializes in sweet potatoes, dry okra and cucumbers. This market also contains four mills that process dried tomatoes into powder.

3) The Cholera market: This is the smallest of the three markets. The Karal Federation of Groupements (AGDERUMKA) has its point of sale warehouse in this market wholesaling fresh vegetables and storing dry cereals. In the past, this market has sold small amounts of a wide variety of products, but specialized in melons and watermelons. However, since the opening of the Federation point of sale facility, the volume of wholesaling has increased.

There are several other very small (community) wholesale distribution points, some of which appear only when a particular product is in season.

#### **Products Monitored:**

Dried tomatoes  
Fresh tomatoes  
Melons  
Watermelons

Fresh pepper (Cayenne)  
Sweet Potatoes  
Fresh okra  
Dry okra  
garlic  
Abeche onions  
White onions  
Cucumbers

Prices collected:

There are two levels of "wholesale" prices collected by the MIS: 1) transactions directly between the field level trader and retailer for highly perishable products and 2) transactions between a wholesaler (who has purchased the product from the field level trader) and retailer for products that can be stored.

For highly perishable products such as fresh tomatoes, melons and fresh okra, the product is brought from the field by producer/traders and sold directly to retailers through a commission agent. Ownership of the product changes directly from the field trader (who is also often a producer) to the retailer and the price reflects the money that goes to the field trader.

For less perishable products such as onion, garlic and dried products, a wholesaler buys from the producer/trader, stores it (may sort & grade and repack) and then sells it to the retailers. It is this wholesaler-retailer price that is recorded by the MIS. It should be noted that this is not the price received by the field trader/producer.

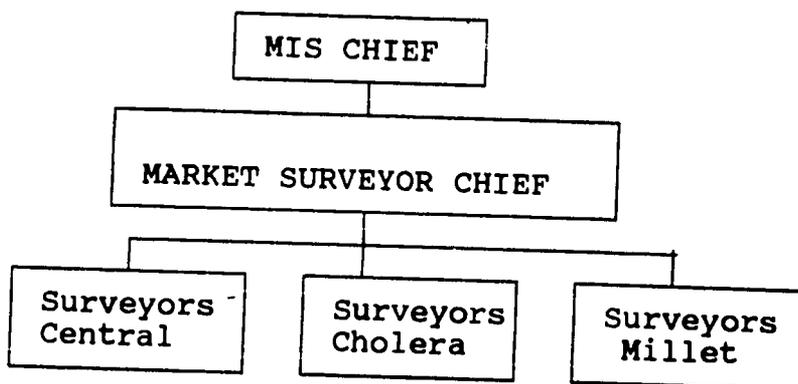
Daily prices reported by radio to Karal are median prices for products arriving on that day. It is easier for producers to understand median prices as they are reported in 250 CFA units. Highs, lows and medians are recorded for each selected products and the data is available by production region. As an example of how this can be used, in the future, the project will report Karal prices to Karal. Prices of products recorded in the Monthly Wholesale Price Bulletin and most of the special marketing reports are weighted average prices.

The quantities (supply) collected: All quantities reported by the MIS are arrivals (counts of product arriving on a particular day). For highly perishable products the daily prices correspond to product arriving on the same day. For stockables (dried products, onions, etc), quantities recorded are also arrivals. Note that for stockables, the MIS does not record the total amount of product in the market.

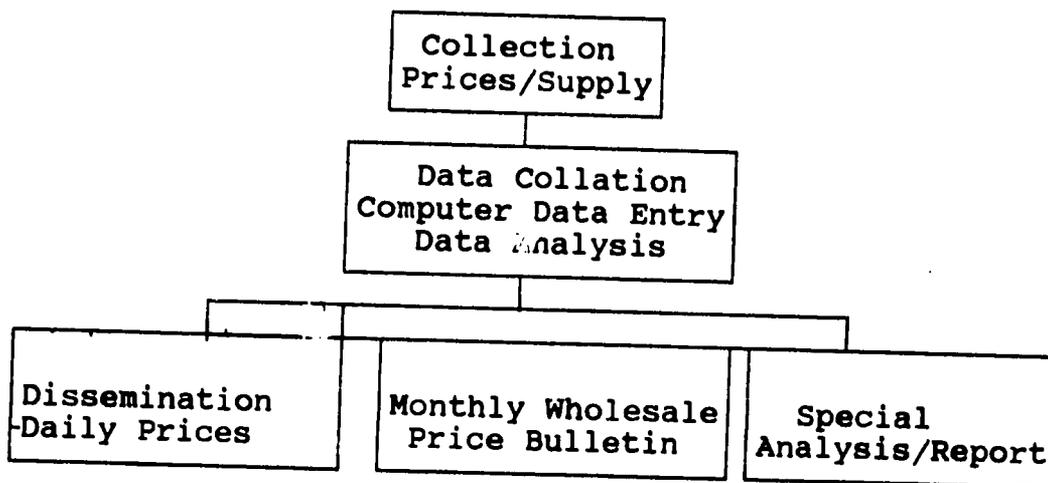
Frequency of data collection: Market surveyors are in the market seven days a week. When there is a request for daily information, it is collected every day. If there is no demand for this frequency, it is collected Mondays, Wednesdays and Fridays.

Time of day data is collected: Surveyors arrive at the market site at 6 AM and leave about 10 AM. They then return to the ACDI to collate their information.

**MIS Structure:**



**MIS Function:**



**PROGRAM RESULTS:**

**STATISTICAL DATA COLLECTED:**

**Data that the MIS is currently collecting:**

**Prices**

Arrival Price  
Second Day price (Perishables)  
Storage/Retailer Price (Stockables)  
Gross Revenue (P X Q)

**Daily Supply**

Arrival Supply  
Second Day Supply  
Origin of Production

**Vehicles**

Number (Daily arrivals)  
Size/ Capacity (of vehicle)  
Produce carried  
Quantity of produce carried  
Vehicle license number  
Time of arrival  
Value of produce carried on vehicle

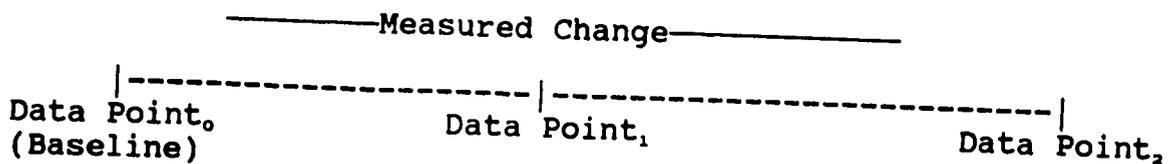
**QUALITATIVE DATA COLLECTED:**

**Data that the MIS is currently collecting:**

Market Channels  
Market Costs  
Structural Characteristics (selling areas, storage, transport to other markets, etc)  
Functional Characteristics of the Specified Wholesale markets (product specialties, producer areas, price differentials for products, etc)

**RECOMMENDATIONS:**

**Monitoring & Evaluation (People Level Impact):** The MIS collects data specific to the ACDI project interventions, but also includes information relevant to horticultural marketing efficiency from the other areas. The MIS is collecting information on 12 major horticultural products from all of the major producing areas that send their produce to the N'Djamena wholesale market. This gives the MIS the capability to analyze and document changes in marketing efficiency by product, by producing area and over time (day, month, season, year).



The information collected by the MIS can be used to measure change in statistical values at various data points. Some examples include:

Measurements of Central Tendency

|             |          |                 |
|-------------|----------|-----------------|
| Mean (S.D.) | Prices   | by Product      |
| Median      | Quantity | by Region       |
| Mode        | Revenue  | by month/season |

- Total Marketed Quantity.
- Total gross Wholesale Revenues.
- Percentage Changes

Documentation of Improvements in Marketing Efficiency:

- . Wholesale prices can be a valid proxy indicator for change in Producer prices, and when multiplied by quantities produced, change in revenues: Because highly perishable produce is sold directly to retailers by field level traders who are also producers, the price received by these traders is a good indicator of the price level received by producers of these products.
- . Increased availability of produce to Consumer: The MIS collects information on:
  - a) Physical availability of quantities marketed.
  - b) Affordability (price levels throughout the year) of products marketed.
- . Information on marketing costs:
  - a) Transport
  - b) Transactional costs
  - c) Storage
  - d) Other (unloading, City tax, etc)

Developing Marketing Strategies for Producers:

Intervention-->Strategy-->Implementation (of strategy)-->Evaluation of Impact

Data collected by the MIS can be used to develop marketing strategies that will enable producers to take advantage of interventions improving marketing efficiency. Technical assistance provided by PVOs creates better marketing information, improved post harvest technology or infrastructure and

organizational changes such as increased storage facilities or new wholesale facilities. It is important that the PVOs help to develop strategies that integrate the new conditions into marketing activities so that the producers can act quickly on the improvements. When this occurs, the impacts can be evaluated by USAID.

The MIS data can be used to develop strategies using a theoretical framework based on the equation which indicates that price is a function of supply and quality.

$$\text{Price} = f(\text{Supply, Quality})$$

Supply strategies

- Dates to supply
- Quantity to supply
- Storage Options
- Point of sale (Market locations)

Quality strategies

- Varieties (Consumer preference & market life)
- Sorting & grading

Market Differentiation (Products focused on specific markets)

- Domestic North
- Domestic South
- Export Regional
- Export Overseas

An example of a supply-quality strategy based primarily on MIS data comes from a request by Karal farmers for ACIDI to help them form a cartel to limit the supply of tomatoes in the market to raise prices. Using MIS data, ACIDI found that a large portion of the demand curve for tomatoes was highly elastic and price was not very responsive to quantity. On the other hand, MIS data showed that prices were highly sensitive to quality. This information encouraged ACIDI to recommend that farmers continue production and marketing tomatoes, but to ship only first quality tomatoes to the market. An ACIDI feasibility report showed that it was economically feasible for women's groups to dry the culled tomatoes from Karal for sale in N'Djamena or to local Kanembou traders for sale in the lake area.

**Transport Improvement (Roads/Vehicles):**

The information collected by the MIS on the transport of horticultural goods can be used for determining:

- Priority areas for road building & rehabilitation.
- Load capacity of roads.

**Developing Future Marketing interventions & projects:**

The data developed by the MIS can be used by USAID to assist in identifying marketing problems by geographic location, for specific products and the type of interventions which will be most effective.

- Identifying specific marketing problems
- Identifying geographical locations
- Identifying specific products

The following are some of the special services that the MIS can provide to USAID, PVOs and projects:

- Increase in products monitored
- Wider dissemination of daily prices
- Custom data collection (Statistical/ Qualitative)
- Elementary statistical analysis
- Consulting with PVOs & GOC NGOs on market organization (channels) and anomalies