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## FINAL REPORT

MOYEN CHARI AGRICULTURAL DEVELOPMENT  
AND FARMER TRAINING PROJECT

PHASE II

Submitted to: United States Agency for International  
Development/N'Djaména (USAID/N'Djaména)

Submitted by: American ORT Federation/N'Djaména (ORT/N'Djaména)  
[ORT: Organization for Rehabilitation through  
Training]

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## I. INTRODUCTION

### A. Background

This is the final report for the MOYEN CHARI AGRICULTURAL DEVELOPMENT AND FARMER TRAINING PROJECT, financed under Cooperative Agreement 677-0051-A-00-1042-00. This project was one subproject of the USAID PVO Umbrella Project.

A Cooperative Agreement was signed in October 1991, to implement the LAKE CHAD AGRICULTURAL DEVELOPMENT AND FARMER TRAINING PROJECT - PHASE II : MARKETING AND TECHNOLOGY DISSEMINATION. During the period August 1991 - July 1992, the project made significant progress towards meeting project outputs, under adverse conditions, but given continued security concerns in the project area, we were unable to assure that any proposed workplan could be respected. In August 1992, a decision to phase out activities in Ngouri and close the project site, was made by USAID.

From September through November 1992, the technical assistance team investigated prospects for an alternative site. Given that time was of the essence, only sites which appeared promising based on information available were considered. Primary criteria were: an acceptable level of security and preexisting dynamic vegetable production and activities. Visits were to sites along the Logone and Chari Rivers, Karal on the south shore of Lake Chad, and in the southwest (Sarh, Moundou, Léré).

Following these reconnaissance missions, the consensus of the ORT technical assistance team was that the Sarh-Léré Axis, was the zone where our efforts were best redirected. Of course, only certain elements of the existing technical package would prove to be appropriate to the conditions of an alternative site. The project objectives remained valid, but specific project outputs were modified and tailored to meet the specifics of the new project area.

The use of délégués techniques as an extension technique and primary method of exchange of information was transferred, even while the specific technological content was adapted. Our strategy remained that of working with farmers to prioritize their constraints and combine their skills with ours to identify practical solutions.

The trip reports, concept paper, and detailed proposal can be consulted for additional details concerning decisions and actions relevant to the project transfer. The last quarterly report for the Lake Chad project site was for the period October-December 1992; that report detailed activities up until the transfer of the project. The summary section of that quarterly report is provided in annex to the present document.

## II. PROGRESS TOWARDS PROJECT OUTPUTS

This section summarizes specific progress towards project outputs, across project components accomplished by the project. This supplements information which was presented previously in quarterly progress reports. Additional details of project activities and complications are discussed by component in section III. OBSERVATIONS.

Overall, the participants are better off than they were before the project. They have certain specific skills and means that they did not have before: information and knowledge about options that were not previously available. The conclusion is that the project did a lot in a limited amount of time, but that much remains to be done.

1. options for sustainable private-sector supply services for agricultural inputs are established:
  - ▶two local merchants furnished motorpumps to participating groupements
  - ▶tools are supplied by a local merchant
  - ▶fuel is supplied on credit to groupements by a local merchant
  - ▶a seed supplier from N'Djaména has contacted farmers and local merchants; a local merchant has bought and sold seed to farmers
  - ▶the Unions de Groupements has been in contact with the Ferme de Gassi as a source for seed
  - ▶local artisans have manufacture crates and woven sacks for improved packaging
  - ▶outstanding credit was transferred from individual groupements to the Unions de Groupements; these organizations received training in how to manage the revolving fund thus constituted
2. post harvest value-enhancing crop technologies (including marketing strategies and techniques) for fruit and vegetable products are tested, evaluated, and introduced:
  - ▶two sessions on onion harvesting techniques were conducted for 28 participants
  - ▶three sessions on onion handling (drying before storage) techniques were conducted for 61 participants
  - ▶three sessions on onion storage techniques were conducted for 61 participants

- ▶ nine sessions on potato harvesting techniques were conducted for 139 participants
- ▶ crates are used by women's groupements (94 participants) for improved tomato packaging during transport
- ▶ woven sacks are used by the Union in Koumra (14 participants) for potato transport
- ▶ two sessions on tomato processing (concentrate, juice, jam, drying, sauce) were conducted for 350 participants
- ▶ two sessions on preparation of onion leaves were conducted for 21 participants
- ▶ five sessions on potato processing and preparation (fries, dried, mashed, cooked, salad) were conducted for 350 participants
- ▶ three women's groupements have obtained push carts to transport their produce and for rent and one women's groupement obtained an ox cart; these two techniques benefit 94 participants
- ▶ women's groupements have organized purchase and sale of products to new markets outside the immediate project area (seven trips to date)
- ▶ women's groupements have organized marketing of produce together
- ▶ the union marketed the potatoes which were produced by member groupements together

3. improved water-lifting and water management techniques are identified:

- ▶ 13 tubewells were dug, benefitting 150 participants, and allowing irrigation of 4.42 hectares
- ▶ 9 wells were improved, benefitting 70 participants
- ▶ 9 motorpumps were installed, benefitting 121 participants, and allowing irrigation of 2.69 hectares
- ▶ 4 shadoufs were installed, benefitting 30 participants, and allowing irrigation of .12 hectares
- ▶ 17 irrigation networks (canalization and gravity flows) were laid out, benefitting 222 participants, and allowing irrigation of 5.15 hectares

4. improved agronomic and agroforestry techniques identified and introduced:
  - ▶ four sessions on integrated pest management techniques (tobacco, garlic, piment, neem) were conducted for 26 participants, resulting in application on 88 ares
  - ▶ live fencing using three species were planted benefitting 36 participants, for a length of 1400 meters
  - ▶ two irrigation techniques were demonstrated, benefitting 268 participants, and resulting in 3 hectares in production
  - ▶ 220 fruit trees (mangoes) were planted benefitting 163 participants
  - ▶ four soil improvement techniques (composting, improved fallow with legumes, manuring, and application of cotton residues) were demonstrated to 237 participants on 37 ares
  - ▶ one session on onion seed production was conducted
  - ▶ off season production was demonstrated to 19 participants on 5 ares
  - ▶ onions, potatoes, and garlic culture were, benefitting 359 participants, and resulting in 2.21 hectares in production
  
5. improved farmer extension services-- professional and volunteer are available in the zone:
  - ▶ délégués techniques, project personnel, ONDR personnel, and farmers have received extension training (technical and methods): farmers participated in 27 sessions and professional staff participated in 20 sessions during the life of the project
  - ▶ the project worked in 15 sites, with a population of 8,539 benefitting 982 were vegetable growers
  - ▶ the project worked with 34 groupements (15 women's groupements and 19 men's groupements)
  - ▶ technical manuals were prepared for extension personnel and instructional manuals were prepared for délégués techniques as well as participants in conjunction with formal training sessions
  - ▶ project personnel are in the process of creating an independent organization to continue certain project activities; they have contributed their own money as start up and are preparing a proposal to seek additional funding

### III. OBSERVATIONS

Hindsight is both valuable and dangerous. If we had known at the time that we were proposing to transfer our activities, that USAID funding to ORT specifically and overall in Chad would definitely end with the current Cooperative Agreement, our proposal (and likely USAID's reaction) probably would have been different.

It was certainly valid at the time for ORT to propose a pilot activity; but a pilot activity remains valid (and worthwhile) only if that experience can be subsequently exploited. While ORT intends to seek additional funding, there will almost assuredly be a significant period of interruption in activities of 6-12 months between financing. The length of that interruption as much as any residual impact of previous project activities will influence later results. Our assumption had until the last minute been that somehow the project would continue. Any anticipated program will have to address with past and future participants the issue of trust and commitment.

Once we knew that there was no assurance of additional funding, our programming decisions were further compromised. We sensed pressure to demonstrate results and impact, rather than "just" a pilot activity. We accelerated our activities and in the end compromised some basic principles of development and extension in particular. There is always a trade off between push for results, and luxury of having the time necessary for fully understanding the soci-cultural, economic, and environmental context. We tried to do in approximately a year what the initial phase of our project did in three years.

A project itself is not sustainable, by definition it has a life cycle, dependent on funding. It is the activities and impacts that need to be assured. For example, how can participants continue to do what they have done thanks to a project when the project is no longer there? They received training, but do they have access to necessary resources to use the knowledge gained? How can they build on what they have mastered? It remains to be seen, but our assumption and approach has been that training in conjunction with other activities at least assures that participants understand techniques.

When the site transfer was proposed, there should have been effort to bring together as many of the potentially available resources as possible. Instead, we were told that there would be neither an extension of time or funds. Based on our pipeline analysis at that point, we could have easily financed an additional 3-6 months of activities with the funds that were obligated in our cooperative agreement. Instead, only the funds in the revised budget were committed and we were later not allowed access to these earmarked funds.

## A. Administration

The distances involved presented communications problems. The Chief of Party was based in N'Djaména, the site supervisor was based in Sarh, and the project was implemented in two zones. The Chief of Party visited regularly, (monthly on average) however, each visit was brief. The information which passed between the project sites and the administrative seat in N'Djaména was selective.

In the scopes of work, the Chief of Party had administrative as well as a training function. That really wasn't practical, although both needs were correctly anticipated in the project paper. One person really can't be so fully involved in two places. There was a tradeoff between responsibilities, and the balance was difficult to achieve.

The mix of expatriates as well as Chadian technicians worked well. In doing the initial staff recruiting, we switched an expat and Chadian post so that the best technician for each position could be hired.

## B. Marketing Component

Our approach adapted from the Lake Chad project zone of addressing marketing issues from the standpoint of inputs as well as outputs continued to prove valid. This strategy put the issue in its widest context, and ideally allows the technical assistance team to grasp more completely the priorities and practices of the participants.

Let's take an example from the project and follow how this approach leads to a strategy adapted and appropriate to the situation. In our initial reconnaissance to the zone, farmers stated that returns to their efforts were minimal: they did not earn enough for the amount of work they put in. We noted that there was seasonal overproduction and an overall lack of diversification of production. Too many people were cultivating the same products at the same time. At certain periods of the year there were more tomatoes than the marketing region could consume or market fresh.

We have taken a systems approach to marketing issues. So that a very broad set of activities emerges as the overall strategy. We have tried to take into account the specific as well as broader context of the problem: inputs, outputs, with production in between. How to assure that farmers can get maximum benefits? First try to learn how and why they are doing what they already do, and ask them where they see the problem. The range of interventions that we have undertaken include: identify new markets (improve transport and packaging, as well as the organization of marketing), improve quality, diversification of production, off season production, post harvest treatment (processing and storage to add value as well as to lengthen the marketing campaign).

### C. Transfer of Technology

The technology component of the project was dependent on the marketing strategy, and is a means of addressing production issues related to marketing constraints. This component has been largely the "means" for addressing those constraints which are not either organizational or post harvest. Coordination between these components has been a challenge. The project paper for Lake Chad was very tight, and profited from several years base of experience and knowledge. That could not be expected for the Moyen Chari pilot activity; the contrast between the project documents for identifying clear lines of initiative and responsibility for specific activities is glaring. Most of this was sorted out in practice, but not always smoothly.

One of our main reasons for selecting the Moyen Chari as project zone was the lack of extension services in the area. We noted early on that there was a broad range of experience and knowledge of vegetable and fruit tree cultivation. We successfully put this to our advantage by orchestrating farmer visits. This facilitated formal and informal informational exchanges. Our participants were and remain exceptionally motivated. Both (luckily) tolerant of our fumbling and appreciative of our abilities.

Technical soundness is rarely the main issue in determining appropriateness of techniques or mechanics. Time which would have allowed us the luxury of some experimental design was really a key element that was lacking. As a result, we were not able to sufficiently recognize and address issues of the organization of work: communal vs individual; via new or pre-existing groups. We did not have the seasons required to go from trials to demonstrations to extension.

### IV. RECOMMENDATIONS

It should be noted "avant tout" that these recommendations are primarily the view of the Chief of Party, the principal author of this document. While intended to be accurate and objective, they do not necessarily reflect the view of the expatriate team as a whole, ORT or USAID. Structural issues of how the project was implemented and organized as well as specific issue of approach and technical emphases are addressed.

The farmer training project was almost totally dependent on USAID funding. While enjoying the luxury of generous funding, the arrangement resulted in a dependence that was not sufficiently recognized. The issue is not whether or not USAID had a country strategy which was valid, but that as a PVC with a program with a single source of financing, ORT could not function independently. In effect, this relationship undermines one of the assumed strength of implementation via a PVO. That the PVO has the knowledge, experience, and commitment in a specific locality to work effectively.

By being primarily responsible to a single donor, ORT was not able to exercise latitude in defining its own country program

and set of priorities, even if that were their prerogative. There is little distinction then in the operation than if ORT was a contractor with specific project, as opposed to a program.

A donor always defines its priorities. There is a certain rigidity of donor which is unavoidable. As a result a contradiction emerges: we seek participation from the beneficiaries, but there are built in limits to flexibility and therefore responsiveness of any large donor (aka bureaucracy), the PVO cannot respond to beneficiaries' legitimate assessments. It should be no surprise that a community's assessment of their needs would include more than fruits and vegetables. When a PVO has one donor, it is too easy to lose objectivity and self direction.

For assuring that the PVO can remain responsive to a range of participant's needs and to assure that activities can continue after any one funding source is exhausted it is highly recommended that funding be diversified. This keeps programming options opened as well as flexible, and assure that the PVO remains knowledgeable (and politically competent) to deal with other donors.

#### A. Structural

##### 1. Home office

The project was supported by the home offices of ORT in London and in Washington. While the cooperative agreement was signed with American ORT, the World Union is the parent organization. There is no problem with that per se in the relationship with USAID, however, the responsibilities for decision making and tasks should have been clearly defined. The instances of poor management (fund transfers) combined with micromanagement (equipment procurement) particularly from the London coordinator were a frequent hinderance to the in country implementation of the project. It is recommended that there be only one line of communication/administration, and that the coordinator or manager be qualified and charged with being both an advocate and a liaison for the project vis-à-vis the home office. In any case, the home office needs to recognize the strengths and weaknesses of coordinators and assure that adequate support is provided to the field operations.

Benefits provided to the technical assistance team should be consistent not just with what other organizations provide, but consistent with the needs of people assigned to Chad. In choosing to work for a PVO benefits are not be the motivation, but.... It is reasonable that certain improvements to the ORT personnel policy be considered, at least: COLA, given the actual and potential problems of inflation and additional freight allowances (an amount per family member rather than per employee).

##### 2. In country

We did a team building at the beginning of Phase II, but there was no follow on when the project was transferred to Sarh.

Given that there were many personnel changes, and changes in our work/lifting situations this should have been done. This was left by the wayside in order to maximize funds available for activities. Team building at the beginning as well as a retreat at mid-term should be anticipated in any new project design.

a. Personnel

The Chief of Party's scope of work should be administrative in nature, with responsibility for monitoring project activities. The person should be experienced in the technical domains of the project, but should not have a major technical role to fulfill. Those technical needs which are identified should be met by persons who are assigned to the project area.

It is recommended that the Chief of Party be based in the capital, and visit the project site regularly. The major role of the Chief of Party should be as liaison between the project and donor agency, and home office. The Chief of Party should have logistical responsibilities; the person's role is to facilitate project activities and to assure that the project runs smoothly. The Chief of Party's technical competence assures that she can adequately and accurately monitor activities.

The Chief of Party as project director should be delegated broad discretionary powers to make decisions concerning project implementation, to guard against micro-managing from either the home office or from the donor agency. The in-country team receives the credit or blame, so they should have the responsibility of professionals for implementing the project.

A mix of personnel of different nationalities and positions in the project organigram is a strength that should be maintained. It is ideal that there be expatriate and Chadian technicians who are of equal responsibility in the structure of the project. This creates a good balance for everyone to learn from. The staffing should be structured so that expatriates have a counterpart, either technically or structurally in the project.

It is not recommended that the program be integrated per se into the GOC structures (ie ONDR), but closer collaboration should be sought. The initiative for this has to come from the project, and needs to be seen by project personnel as a priority. It is recommended that this question of collaboration be addressed at all possible levels: locally (sector and zone), as well as at the National Direction. It is the project's role to make all effort to interest the GOC in its activities. For example bonuses or overtime should be paid to encourage GOC participation. The justification is not just to provide a bribe by any other name, but in recognition of inadequate and regular salary payments. Motivation can be addressed from several directions, without being unprincipled.

Given a situation like ours where the project ends abruptly, (even if it was in the original plan), it becomes obvious that the state institutions, albeit flawed are more enduring. Government services are one source of further training, or at

least information for participants. Government services should also be where former project personnel could be employed.

Similarly, the personnel should take the lead in initiating and encouraging collaboration with other projects and organizations. In the Moyen Chari project area, this was difficult, as there were very few other similar activities. That was one of the reasons why we proposed this area. The recommendation remains valid, as this could change.

Participant involvement in planning, execution and evaluation was and has always been an element of our approach to working in a community. This should remain a key element in any proposed project design. However, these are skills which needs time and nurturing. Project staff need to recognize the value and importance of community participation. Participants need to recognize the value of their contribution. Therefore, participatory methods should be a formal part of staff orientation and in-service training.

#### B. Marketing Component

Personnel for this component should incorporate the following expertise: micro/macro marketing, credit, post harvest handling. It was a positive improvement in the staffing to hire a woman as assistant, (if not the expert), as this reflects the traditional D.O.L. in post harvest activities.

The major role the project played in providing/assuring inputs should be lessened. It is a difficult line between assuring inputs in the immediate and assuring that there is a system to assure that materials can be obtained. We spent too much time being expeditious, and looking at the short term needs, rather than the long term mechanisms. In the same way, credit should reflect not just equipment which is perceived as needed but ability of participants to pay back. If they can not pay it back, then the flaw in the cost/benefit analysis must be identified and addressed. As Reid accurately points out in the Replicability Study, credit to farmers should be for what is "proven"; the project takes risk, not the participants.

The women's marketing activities: carts, packaging, processing, and trading have been impressive. One main reason for this success is that the identification of issue and solutions really came from their own experiences. (This is not as much the case for production activities.)

#### C. Transfer of Technology

The key element lacking in this component was time. Time to complete trials, time for demonstrations, time for leaders to emerge from participants.

We accelerated our work, in order to have results within a very limited time frame. As already mentioned, this engendered compromises in how activities would otherwise have been approached. If we look at the pilot campaign during the last

cold season, the consequences of these compromises are glaring. We extended credit to allow participants to purchase inputs and to complete the season. Three crops were promoted: garlic, onions, and potatoes.

A major credit activity was not in our original proposal for the Moyen Chari. When we did the reconnaissance people indicated that they would be able to purchase inputs, or even obtain credit from other sources. As the season approached, it became clear that cash was a major constraint, and that people were going to have problems purchasing the minimum that they already needed, let alone any unanticipated equipment or planting materials. We did a cost benefit analysis, based on assumed costs of production, yields, and value of production. We used high average for costs and low average for yields and benefits. On paper it looked fantastic, and based on this by mutual decision (project and USAID) we barged ahead.

Costs were higher than we had anticipated, in part due to the devaluation in January and the associated speculation. Fuel was a particular problem; prices fluctuated and there was hoarding and gouging. It was originally intended that recurrent costs such as fuel would be the responsibility of the participants. Merchants would not sell small volumes of fuel, nor would they extend credit as assumed. So, the project had to intervene again; we bought barrels of fuel and on a case by case basis either increased the credit to participants or resold the fuel to them in increments.

There were pest problems; crickets attacked some of the onion nurseries and ants were a problem in some potato fields. The IPM techniques (neem and tobacco preparations) were effective, but the problems were not anticipated. So the "cure" had to wait for participants to learn what to do. We had done several varietal trials for onions, and onions are grown in the sudanian zone, so there were few agronomic problems. In contrast, production of potatoes and garlic was overall disappointing, highlighting the need for varietal and other agronomic trials. The potato yields were less than what was planted in some cases. Overall, yields were much lower than estimated in the cost-benefit analysis. Sales were disappointing because the individual tubers were very small. There was some rotting of the tubers, the cause of which is unclear. The results of garlic production were mixed; one key factor was the timing of production. The strategy of production of high value crops such as onions, garlic, and potatoes is sound, but the necessary trials were not conducted. In short, too much was assumed.

Another factor which effected the campaign was the farmers' ability to work and organize. The yields of staple rain fed crops was poor, so people were short of food. They were understandably preoccupied with trying to purchase and/or conserve grain. The shortages were acute in some villages, and work suffered. This also made it hard for participants to meet their obligations, such as assuring repairs to pumps or operating costs. Some of the groups had a history prior to participation in the project; this had mixed effects on how well project

activities were executed. For some, this as a definite advantage, people knew how to work together and what they could undertake. For other groups, their history was but a complication. These are differences that could only be accurately perceived with time, and addressed based on more intimate knowledge of specific dynamics of the group in question.

The project also worked with a number of individuals. Their results were impressive. But, in the future the project needs to reflect more on who it works with and why. Are the successes of an individual worth the effort it takes of project inputs; and is the project advancing the cause of someone who is able to help himself? Issues of social equity should not be dismissed as too complicated!

Future project design should also look at changes in land use. Irrigation results in extensive closing off of land that had other uses. This modification has several effects. Most importantly is the change is fallowing. Fallowing is important as a low cost means of regenerating soil fertility. Fallowing also puts land back as pasture for open grazing. There are environmental consequences of closing off the land. Other means of improving soil quality can compensate and should be part of the program. The increasing tensions between herders and farmers was an issue beyond the scope of the present project. However, there have been a number of projects begun in the Sahel to grow and conserve fodder crops. This could be a component of a future project. Herders would have access to fodder, and therefore open pasture would not be as important a resource. Farmers would have another potential cash crop in the fodder; in addition cover crops could be leguminous with obvious benefits to the soil.

The availability of water was a technical issue which was resolved during the course of the season. However, plants were stressed during their development, and this certainly effected their susceptibility to other problems, and ultimately yields. With time, the shadouf and possibly the bidon verseur would have been intermediate alternatives between motor pumps and hand drawn water.

The method side of the transfer of technology was subject to a trade off of the problems and advantages of hiring agents who were previously trained but of mixed experience. This is in contrast to the farmer trainers in the Ngouri project who had motivation and few other skills, and were trained exclusively by the project. We did well to hire women agents who are at the same level in organization, as well as salary and benefits. It is recommended that no distinction in job title be made in the future. Further, it is recommended that a trainer be hired, who would oversee all formal training session of staff as well as participants. This need is great, and would best be met by someone who was permanently based in the project area.

The *délégués techniques* method was transferrable, as we had assumed and hoped. The problems noted by Reid could easily have been addressed and rectified if the project had continued. Specifically: timing and preparation for visits to fields. In

retrospect, extension personnel spent a lot of time in the fields, but not a lot of quality time with the farmers.

Participants contributed to the identification of training themes, however they were not sufficiently informed of the program. For example, extension personnel knew that harvest and storage would be themes, but the participants did not know the whole "curriculum" and as they watched the onions mature, were concerned. They stating that they did not know when to harvest or what to do with the produce; this kind of concern can easily be addressed by letting people know the what and when of the training which has been planned (with their input). A simple solution would be for the first session to be an overview, including an outline of topics to be treated on a subject. The participants would know where things were going, and have an opportunity to make suggestions/modifications. The process of "recyclage" should be continual, and informal as well as formal.

#### D. Monitoring and Evaluation

Data collection during Phase I was over ambitious. It was improved during Phase II, but not sufficiently. The result is that quality data was collected, but the project did not have the resources (time) to adequately exploit the data. It would be better to design a more restrained monitoring data collection that could contribute to programming in a timely fashion. We too often found ourselves doing analysis long after the data could really have helped us understand (or justify).

The evaluation of the extension approach (aka replicability study) has an as yet unexploited potential. It could not have been done sooner, given the history of the project, however, it should be consulted if/when the project is restarted.

## ANNEX A: SUMMARY OF PROJECT OUTPUTS/LAKE CHAD

### 1. sustainable private-sector supply services established:

- ▶ Spare parts continue to be sold by merchants in Dibinintchi and Ngouri. Two village mechanics also provide parts.
- ▶ Mechanics trained by the project provide repair services in the wadis.
- ▶ Fuel and oil for the motorpumps are available through market channels in the project zone.
- ▶ The animal traction teams are completely privatized.

### 2. sustainable private-sector supply systems are developed for water-lifting equipment:

- ▶ The motorpump credit group operates independently and is able to meet the local demand for pumps. The motorpump credit group will provide credit for farmers to purchase the bidon verseur once that becomes available.
- ▶ A local individual completed training in the manufacture of the bidon verseur. This activity will be taken in charge by SODELAC, using equipment transferred to them by ORT.
- ▶ The project replaced key equipment lost by the tubewell enterprise during the unrest in December. They are now able to continue installing tubewells, and operate independently.
- ▶ 8 mechanics have been trained, and they provide repair services to motorpump users.

### 3. value enhancing crop storage, harvesting, and packaging technologies are tested, evaluated, and adopted:

- ▶ Traditional methods for onion harvest practices in the project area were evaluated systematically. Specific recommendations have emerged, and an extension bulletin was prepared.
- ▶ Evaluation of different onion varieties for their storage capacity were completed.
- ▶ Storage of onions on shelves is now widely practiced in parts of the project zone.
- ▶ Locally manufactured crates continued to be tested with the produce of the season. We note that individual farmers have ordered crates.
- ▶ Locally manufactured woven sacks were tested with onions in comparison to the jute sacks commonly used. Onions

transported to N'Djaména in the woven sack were bought immediately upon unloading. The following advantages were noted: the quality of the onions could be observed with minimal effort, and the onions stored better in the woven sacks (if necessary).

4. value enhancing techniques in off-season production and crop diversification are adopted on a test basis and evaluated:

Beets, carrots, and cabbage were grown during the hot season by several farmers. Their successful sales attracted the attention of other farmers, who stated their intention to plant these crops next hot season.

►Tomatoes were planted in mid-July; these early plantings resulted in tomato harvest beginning in early November, several weeks earlier than traditionally. This allowed tomatoes to be marketed in advance of the glut, and thereby earn farmers higher returns.

►Rainy season production of onions has spread.

5. trial shipment of non-traditional crops organized, tested, and evaluated for profitability:

►Trial shipments have been organized for the following crops: beets, carrots, and cabbage.

6. improved water-lifting technologies adopted:

►Two additional pumps were installed during this reporting period. A total of 45 pumps have been installed, benefiting 68 farmers.

►Demonstrations of 6 bidon verseur continued. There are 20 orders for bidons verseur pending.

►One additional tubewell was dug during this period, bringing the total to 19.

►14 additional wells were improved. At present there are 379 improved wells, benefitting 291 farmers.

7. improved agronomic and agroforestry techniques replicated by farmers:

►361 farmers (of 561 participants) have adopted at least one new technique.

►An adaptable methodology for measuring yields of extended period long harvest crops.

►Improved traditional basins technique has spread.

►Trials with alfalfa as a cover crop to improve soil and provide forage were begun

8. integrated pest control methods introduced tested, and evaluated:

►Demonstration of methods for combating ACMV have continued. These methods include: use of healthy cuttings for planting; use of live fencing and windbreaks; and rouging of young diseased plants and replace with healthy cuttings.

►Onion varieties resistant to thrips and the identification of local varieties of okra which are resistant to OLCV (Okra Leaf Curl Virus) and OMV (Okra Mosaic Virus) have continued.

9. improved extension services professional and volunteer available in region:

►At this time the project works in 54 wadis. There are 561 direct participants.

►There are at least 2 délégués techniques in each wadi who have been trained to provide extension services on a voluntary basis to fellow farmers.