

LOUIS BERGER INTERNATIONAL INCORPORATED

BALAD PROJECT

Roads -- Water -- Agriculture -- Human Development

GOB and USAID

A PROGRAM
for
IMPROVEMENT OF DATE PALM
CULTIVATION, AND PROCESSING IN
MAKRAN DIVISION

A CONSULTANT'S REPORT

BY

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USAID/BALAD

EXECUTIVE SUMMARY.

The yield and quality of dates in the Makran Division of Balochistan are generally far below the standard average due to many constraints such as lack of high yielding, better quality date varieties, infestations with pests, high mortality rate of offshoots, failure to identify good male plants, shortages of pollen, alternate bearing, lack of application of chemical fertilizers, mishandling during harvest, use of improper ripening stages for curing in a primitive way, non-hygienic methods of processing, primitive packing, absence of farm to market roads and the absence of research, training and extension programs. All these constraints have resulted in elevating the cost of production thereby making the marketing of dates locally and for export extremely difficult. Accordingly there is an urgent need for technical assistance to identify and outline the necessary interventions to be undertaken to solve the major problems confronting cultivation and processing of dates. The technical assistance required for both BALAD and the newly proposed Government Date Research Farm Turbat is presented in the report.

Outlines of short-term and long-term Research programs needed for the Date Research Farm at Turbat are also presented in the report.

In order to remedy the situation until research findings become available, short-term interventions to be carried out by BALAD are proposed along with the necessary guidelines.

The short-term interventions include: use of mechanical pollinators to overcome shortages of pollen and skilled man power, improvement of the propagation methods to reduce the mortality rate of the offshoots, application of chemical fertilizers and pest control to increase yield and quality and implementation of date-based farming systems research.

Based on the outcome of the short-term interventions and the duration of any Phase II of the BALAD Project, some of the short-term programs may be converted to long-term programs. However, screening of male plants, establishment of a pollen bank, coordination with the on-going activities of the tissue culture laboratory at NARC and modified methods of irrigation are specifically proposed as long-term interventions.

Both the short-term and long-term interventions, if properly implemented, will have a significant impact on the livelihood of date growers in Makran Division of Balochistan.

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I - INTRODUCTION

The Balochistan Area Development Project (BALAD) which is located in Makran Division with total cost USAID grant \$ 45 million and total GOB share Rs. 77.9 million started work physically in April 1986, with a view to improve the Socio-Economic conditions of the people of Makran Division through the construction and improvements of roads, watercourses, education and training.

Despite all the changes that have taken place in the Makran in the last two decades, a few things will probably be difficult to change, a Makran without date palms and a Makran with an optimum sufficiency in irrigation water is a Makran hard to imagine.

The Agriculture component of the BALAD Project was completely ignored until the responsibility of the project was transferred from the Office of Engineering late in 1988 to the Office of Agriculture and Rural Development (O/ARD) of United States Agency for International Development (USAID) at Islamabad.

In January 1989 the USAID office of Agriculture and Rural Development sent a team of an Agronomist and a social anthropologist to conduct a preliminary study on the problems and prospects of Agricultural production and marketing in the Makran.

Another consultant was recruited through the USAID Management of Agriculture Research and Technology Project (MART), Winrock International Institute for Agriculture Development, to Pakistan Agriculture Research Council (PARC) for three months (March 5, 1989 to June 6 1989) to carry out a study on the status of Agriculture in the Makran Division, its constraints, solutions, and future development.

In February 1989 a local Chief of Section, Agriculture was appointed to the Project Planning and Management Unit (PPMU) to work with the BALAD Project.

An agriculture and irrigation engineering oriented Chief of Party (COP) joined the project in April 1989 and an expatriate agronomist commenced his activities in June 1989.

Since dates have been and will continue to be the main cash crop in the Makran Division, an in-depth investigation of the Makran Cooperative Date Growers Mill Society Ltd. (Shah and Sons date processing factory) was carried out by another local consultant during December of 1989 in order to develop a reasonably accurate estimate of the date factory's

potential. The study covered the status of the factory as well as its future expansion and implementation of new machinery and equipment.

Similarly, the present consultancy was carried out in order to identify and prioritize the most pressing problems in date cultivation and post-harvest processing which should be addressed by BALAD, to recommend short-term and long-term interventions which can be implemented during the life of the project and assist in designing detailed programs for the improvement of date production. Furthermore, in the light of the possibility of extending BALAD activity beyond September 1990, the present consultancy might be useful in shaping a potential Phase II of the BALAD Project.

The duties included but were not limited to:

- 1) Meeting with the project resident agricultural specialist and local government of Balochistan Agricultural representatives to obtain an overview of the constraints facing agricultural development and date production in particular in the Makran Division of Balochistan.
- 2) With the resident agriculturist, developing a methodology to assess the problems facing date, cultivations and preparing a workplan to achieve the goals set out by the task order (appendix A).
- 3) Visiting representative date production areas of the three districts of the Makran Division, discussing date production practices and identifying problems farmers perceive to be limiting their date production.
- 4) Making an independent assessment and report of the problems whether perceived by the farmers or not which limit the capacity for efficient date production.
- 5) Collaboratively identifying interventions to be undertaken by the BALAD Project which have a high degree of likelihood to yield short-term and long-term benefits to the date farmers.
- 6) Where possible, designing programs for implementing these identified interventions taking into consideration the physical, social and political constraints which exist in the Makran.
- 7) At the end of the consultancy, submitting a detailed report of activities and recommendations for submission to USAID through the BALAD project.
- 8) Any other task as may be required by USAID and mutually agreed to by the consultant, BALAD, and USAID.

However, in the light of the discussion with the Director General of Agriculture, GOB a need to identify a program for obtaining technical assistance required by the new Date Research Station was expressed by him as urgently needed.

II - MATERIALS AND METHODS

In order to identify and prioritize the most pressing problems in date cultivation and post harvest processing which should be addressed by BALAD and recommend short-term and long-term interventions which can be implemented during the life of the project and assist in designing detailed programs for the improvement of date production, the consultancy was carried out as follows:

- 2.1 Reviewed the available literatures on dates.
- 2.2 Carried out meetings with the project's resident agricultural specialist and local government of Balochistan Agricultural representatives. (Appendix C).
- 2.3 Visited representative date production areas and interviewed farmers.
- 2.4 Visited the Makran Cooperative Date Growers Mill Society Ltd. (Shah and Sons Date Processing Factory).
- 2.5 Assisted in the procurement of date palm pollinators and the chemicals needed to preserve and test the viability of pollen grains.
- 2.6 Developed guidelines on pollination, propagation, fertilizers and pest control. (Appendix G)
- 2.7 Showed video-cassettes and slides to farmers.
- 2.8 Carried out demonstrations.

III - RESULTS AND CONCLUSION

3.1 The Status of Date Palm

Balochistan is considered one of the main date producing province in Pakistan. In the absence of reliably accurate statistics, it is very difficult to determine the area under date palm cultivation, the number of trees and their total production. However, according to PC-1 of the Date Research Station at Turbat, the area of date palm in Balochistan is approximately 12,000 hectares and the total number of trees is 513,000 out of which 72 percent are bearing. The total production is about 100,000 tons. Whereas, the 1987-88 Agricultural Statistics of Balochistan has indicated that the area is 9,470 hectares with total production of 85,605 tons of dates.

According to the 1987-88 statistics, the main date producing areas in Balochistan is the Makran Division with an area of 7,053 hectares and total production of 63,520 tons of dates. The Makran Division includes the Ketch valley 150 meters above sea level and 25° north, the Rakshan valley 1,000 meters above sea level and 27° N. Although Turbat and Panjgur are the main date producing centers, there are scattered date palm areas in Kharan, Khuzdar and Dhadar.

Henry Field in 1959 recorded the names, and very brief descriptions of the color and fruit size of 109 date palm varieties.

In 1988, Zidan Abdel-Al surveyed most of the existing date palm germplasm in Balochistan and gave complete descriptions of the fruits and the vegetative growth of 90 varieties along with colored illustrations and video cassettes. He also identified some promising rain resistant germplasm.

At present the Department of Agriculture is claiming that Begum Jhangi accounts for 143,000 trees, Kharaba 105,000 trees and Gunzali 31,000 trees. These varieties, besides Hillini and Mozati, are considered the main varieties in the Makran.

The planting pattern of dates in the Makran is entirely different from the rest of the country. The majority of farmers are planting their date palms as windbreaks around their fields at a distance of 3 to 5 meters which is very close thus allowing for a build-up of humidity which detrimentally affects both yield and quality. This is particularly evident when the entire field is intercropped with lucern (alfalfa), rice, broad bean, okra, muskmelon, watermelon, grapes, etc.

Farmers usually do not apply chemical fertilizers to their date palms. The proper ratio between male and female date palms is not practiced by the majority of farmers.

The yield and quality of dates are generally far below the standard average due to many constraints such as:

- 3.1.1 Lack of high yielding and better quality date varieties.
- 3.1.2 Lack of application of chemical fertilizers to date palm
- 3.1.3 Infestations with date palm weevil (borer), scales, fruit fly, lesser date moth, mites and rats as well as infection with Graphiola leaf spot.
- 3.1.4 Failure to maintain the proper ratio between the green fronds and the fruit bunches.
- 3.1.5 Failure to identify good male plants and shortages of pollen and skilled manpower to carry out the pollination efficiently in a timely manner.
- 3.1.6 Use of uncertain viable pollen grains stored in a primitive way under mango trees for one year.
- 3.1.7 High mortality rate of the offshoots (suckers) after the detachment from the female mother-trees due to lack of know-how with respect to proper weight, size, age, method of detachment, handling, time of planting and care of offshoots after field planting.
- 3.1.8 Mishandling during the harvesting of dates due to uneven maturity and hand picking the fruits one by one over a relatively long harvesting season (normally from July to September).
- 3.1.9 Use of primitive methods of sun ripening and curing of different ripening stages of dates. Thus exposing it to dust and insect infestations and eventually inferior quality, particularly in the absence of field fumigation and sorting.
- 3.1.10 Absence of research, training and extension programs.

All the above mentioned constraints have resulted in elevating the cost of production (and eventual return) due to improper orchard management. Furthermore, the non-

hygienic methods of processing, primitive packing, and absence of farm-to-market roads have made marketing of dates extremely difficult both locally and for export as well.

In view of all the above mentioned constraints and in order to remedy the situation to produce high quality dates capable of competing in the international market and increase the income of date growers, a decision by the Government of Balochistan to establish a Date Research Farm at Turbat has evolved.

3.2 Date Research Station

A PC-1 for a Date Research Station at Turbat was approved. The total cost of the Date Research Station is Rs.37,665,800 for five years.

The objectives are:

- 3.2.1 Exploration study and exploitation of the present date cultivation system.
- 3.2.2 Seek and improve methods of propagation.
- 3.2.3 Study the water physiology of various date varieties.
- 3.2.4 Develop pest management practices for higher production and protection.
- 3.2.5 Conserve quality and quantity through post harvest technology investigation.
- 3.2.6 Develop and select the present date varieties for local and export consumption.

The Date Research Station will be established on 200 acres adjacent to the old Turbat Date Farm. The irrigation water will be supplied from 5 open surface wells fitted with diesel engine and five water tanks will be constructed.

Agricultural machinery, farm, laboratory, office equipment and vehicles will be provided.

A colony consisting of 21 bungalow quarters will be constructed for the staff.

The Research Station will be administratively looked after by a horticulturist assisted by technical research staff officers covering food technology and horticulture. One Agriculture Officer and five research officers will support field and laboratory staff. Other supporting staff consists of 78 members.

Careful examination of the PC-1 indicates that a highly scientific experienced expatriate may be required to provide technical assistance, coordinate and advise on the establishment and operation of the Date Research Farm. Such Technical assistance may be sought through either the on-going USAID projects or the FAO of the United Nations. Furthermore, there is no provision for research in the budget for research and no work-plan has yet to be clearly spelled out. These issues were discussed with Mr. Z. Ali Khan, Director General of Agriculture and he requested the consultant to submit a technical assistance plan, identifying the technical assistance needed, possible programming of such and suggest potential sources where this needed technical assistance may be obtained.

3.3 Makran Cooperative Date Growers Mill Society Ltd. (Shah and Sons Date Processing Factory).

Mr. Mohammad Aslam Shah, the leasor of the Date Factory at Turbat, has managed to repair and bring into partial operation the abandoned Date Factory. He has carried out certain processing operations such as sorting, washing, grading, fumigation and packing of dates for the local market. At present he has 15 daily laborers working for 8 months from August up to March. They are paid on monthly basis Rs. 1,000-1,500.

He procured 120 tones (3,000 maund) of Begum Jhangi during August to October, 120 tones of Gogna during August and September and 32 tones of Mozati from Panjgur during September and October 1989.

The average procurement price for Begum Jhangi, Gogna and Mozati was Rs.250 - 350/maund, Rs. 100-110/maund and Rs.450-500/maund respectively.

He sold 80 tones of Begum Jhangi as loose dates to Mr. Saleem the grandson of Kari Abdul Raheem a major date exporter who procured an additional 800 tones of Begum Jhangi from Turbat for export to U.S.A., West Germany, Denmark and Australia. The export price for pitted dates packed in 20 kg box was U.S. Dollars 1,000-1,100/ton.

He preserved 2-4 tones of Mozati in Kahraba date syrup and the remaining 29.6 tones of Mozati are kept as loose dates to fetch the high price during the fasting month of Ramazan (April 1990) where a high demand for dates is anticipated. So far, he has made a reasonable profit. The reason he did not go into export business may be attributed to lack of experience.

The technical assistance on processing provided to him through BALAD was appreciated. However, in his opinion, he feels that such technical assistance should materialize

towards a practical approach of problem solving. Accordingly, he is requesting an additional expatriate technical assistance of two weeks to focus on actual demonstrations of grading, packing and the standards of dates required to meet the demand of foreign countries.

The Consultant visited the date factory and examined the date quality and the different operations being carried out. He found that there is an urgent need to determine and adjust for the moisture content of dates after washing to avoid any spoilage. Furthermore, dates should be fumigated particularly after washing and exposing it to dry out for a week under room conditions. The consultant advised that the laborers use gloves and hair covers and convenient working tables to pack dates instead of the factory floor be provided.

The consultant has observed that there is a wide range of different quality dates within Begum Jhangi, the main commercial variety, which is attributed to harvesting dates for curing in different ripening stages such as doka, half doka-half dung, full dung and over ripening of dung. Accordingly, a need for additional consultancy during the peak of the harvesting season (15 August to 15 September) to demonstrate to farmers the importance of ripening stages on quality, field fumigation, and improving the conventional method of curing dates to avoid dust and insect infestations and eventually improve the quality of dates for future packing for export deemed necessary.

Improvement of date quality in the field through demonstrations and training of farmers on harvesting at the proper ripening stage for curing and field fumigation besides the need for practical training of date processing factory personnel on grading for different quality standards and the determination of moisture content of dates were highlighted and discussed with Mr. M.M. Irani, a date inspector, Mr. J. Schoof, COP BALAD and Mr. D. Bradbury the BALAD agronomist.

All are agreed that the necessary technical assistance should be provided to overcome such constraints in the Makran including Panjgur where a great potential for processing top quality Mozati dates exists.

3.4 Proposed Technical Assistance Programs

As already mentioned, there is an urgent need for technical assistance to identify and outline the necessary interventions to be undertaken to solve the major problems confronting cultivation and processing of dates which have an impact on marketing.

Such technical assistance may be obtained through the appropriate channels from countries known to have developed their date industry on a sound, scientific basis.

3.4.1 The technical assistance required for the Date Research Station may be outlined as follows:

3.4.1.1 Technical assistance required before and during the course of the implementation of the PC-1.

Such technical assistance may be required for three months during February, March and April to procure the offshoots and farm machinery, design and implement the layout of the farm, develop proper orchard management, supervise all the operations, and train the technical staff.

3.4.1.2 Technical assistance to identify and procure laboratory equipment and pilot processing plant.

Such technical assistance will be required for a duration of three months during August, September and October. The scope of work will focus on:

The identification, the specifications, the design, source of procurement of soil, food technology, pest control, fumigation, storage, quality control and pilot processing plant equipment.

3.4.1.3 Technical assistance needed to design the research programs.

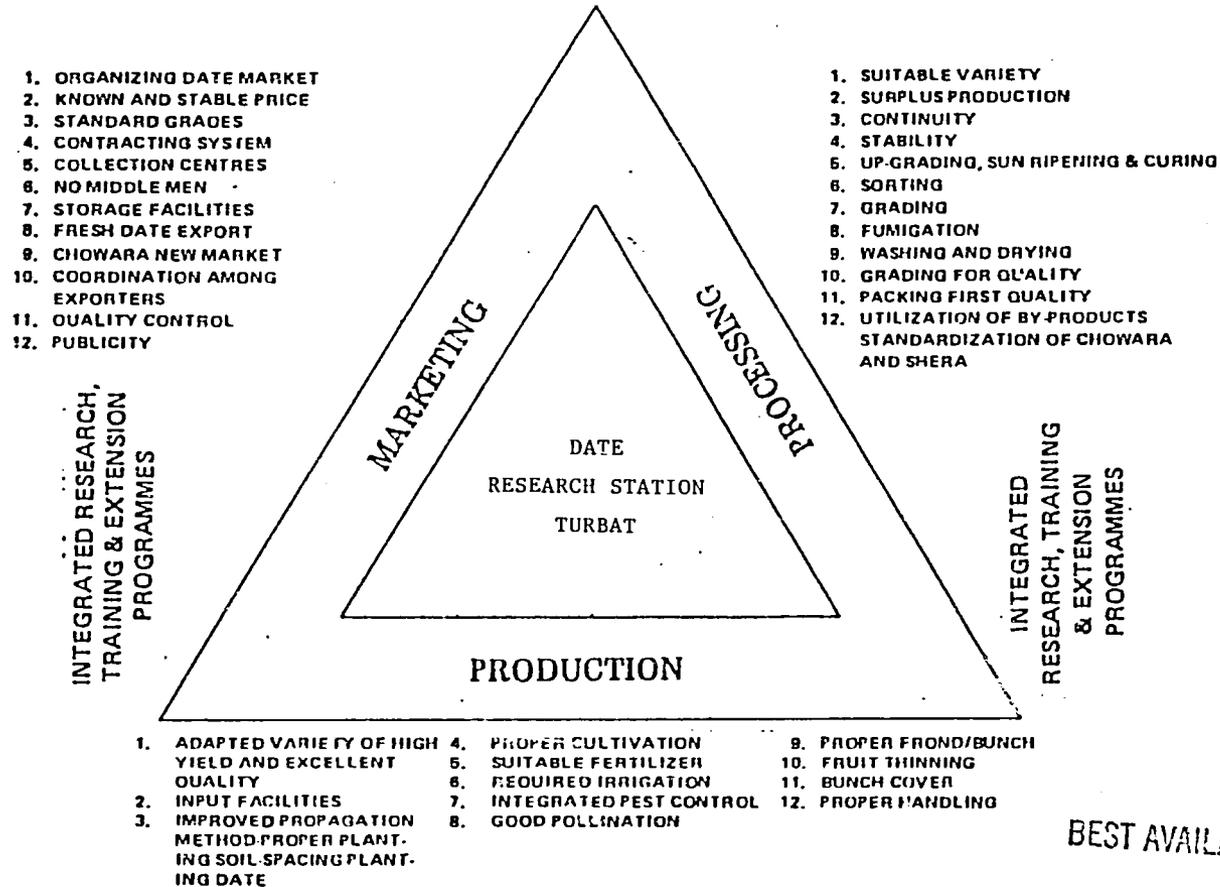
Such technical assistance is needed for a duration of two months and should focus on short-term and long term research programs. The diagram in Fig (1) may be used as a guideline. However, a brief outline of the main features of such programs include but are not be limited to:

3.4.1.3.1 Short-term Programs

3.4.1.3.1.1 Screening of date palm male plants, storage of pollen, the use of different pollen concentrations, frequency of pollination, and use of mechanical pollinators.

FIGURE (1)

**INTEGRATED RESEARCH, TRAINING AND
EXTENSION PROGRAMMES**



BEST AVAILABLE DOCUMENT

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- 3.4.1.3.1.2 Propagation of date palm to determine the effect of age, size planting method, the use of root promoting substrates or substances on the mortality rate of the offshoots.
- 3.4.1.3.1.3 Cultural practices of date palm may focus on the method of application, quantity, time and the frequency of the application of (NPK) fertilizers.
- 3.4.1.3.1.4 The proper pest control of lesser date moth, mites, date palm weevil, scales and graphiola leaf spot.
- 3.4.1.3.1.5 The control of the physiologic disorder of blacknose and checking of Dandari, Hushkingh and Pappo varieties and crosscuts of Begum Jhangi.
- 3.4.1.3.1.6 Determination of the appropriate ratio between the number of green fronds and the number of fruit bunches of major varieties either through pruning of fronds or bunch thinning.
- 3.4.1.3.1.7 The effect of the different ripening stages of Begum Jhangi on the quality of tamur.
- 3.4.1.3.1.8 Studies on the storage of fresh dates.
- 3.4.1.3.1.9 Studies on the improvement of the present curing method.
- 3.4.1.3.1.10 Screening of different fumigants with respect to safety, effectiveness, cost, kind, concentration, time, temperature and frequency of treatment.
- 3.4.1.3.1.11 The quality of chohara (boiled and sun dried dates) as affected by water quality, duration of boiling, chemicals used during processing and degree of khalal maturity at processing time.

3.4.1.3.2 Long-term Programs

Depending on the research results, some of the short-term research programs already mentioned may continue as long term programs.

The long term programs may include but not be limited to:

- 3.4.1.3.2.1 Establishment of a pollen bank to make pollen available to farmers at critical times.
- 3.4.1.3.2.2 Micropropagation of rain resistant, high yielding, better quality dates through tissue culture and coordination with the on-going activity of the tissue culture laboratory of NARC.
- 3.4.1.3.2.3 Collection of commercial date palm varieties from other provinces of Pakistan, rain resistant germplasm from Panjgur and Turbat already identified by the consultant and the introduction of new germplasm from similar conditions.
- 3.4.1.3.2.4 Establishment of a date syrup industry for extraction of syrup from inferior dates unfit for packing purposes.
- 3.4.1.3.2.5 Improvement of picking, packing, packages, storage, development of local and foreign standards and quality control.
- 3.4.1.4 Training
- 3.4.1.4.1 Foreign training of (10) newly recruited technical staff of Date Research Station in date producing countries such as Egypt or Iraq for a duration of 3 months during the harvesting and processing season (September-November) is urgently needed.

The training should include orchard management, harvesting, handling, processing and marketing of dates.

The training may be divided into 2 or 3 groups. Each group will be trained in a separate year.

The estimated cost of foreign training may be outlined as follows:

1. Tickets	Rs. 180,000
2. Daily allowance	Rs. 900,000
3. Cost of Training	Rs. 180,000

Grand Total	Rs.1,260,000

- 3.4.1.4.2 On-the-job training. Short term consultants of the proposed technical assistance programs outlined in 3-4 may be required to carry out on-the-job training in their respective fields.

To ensure practical implementation of all the different components of the PC-1 on Date Research Station at Turbat, supervise, provide guidance and monitor all the activities of the technical assistance required as outlined under section 3-4, it might be appropriate for the Government of Balochistan to seek the assistance of an experienced expatriate to undertake a five year assignment as Chief Technical Adviser to the Research Farm.

3.4.2 Technical Assistance Required for BALAD Project.

- 3.4.2.1 There is a need for a short-term expatriate consultant for a duration of one month (15 August-15 September) to prepare guidelines, determine, train and demonstrate to farmers the different ripening stages of Begum Jhangi and their corresponding Tamur quality, the frond/fruit bunch ratio and its effect on fruit quality and alternate bearing, field fumigation and an improvement of the primitive method of curing dates.

- 3.4.2.2 Similarly, an expatriate consultant (for a duration of two weeks) in October-November is required for Shah and Sons processing Date Factory to demonstrate and Train Labores on grading and packing of Begum Jhangi and Mozati to meet the required quality standards of U.S.A., Canada, West Germany, Denmark and Australia.

3.4.2.3 Foreign Training

Chief of Agriculture Section, and two agricultural assistants of the BALAD Project should receive foreign training in Egypt or Iraq for a duration of 3 months during September to November.

The subjects of training may include but not be limited to: orchard management, harvesting, handling, processing and marketing of dates. The estimated cost may be outlined as follows:

1. Tickets	Rs. 60,000
2. Daily allowance	Rs. 270,000
3. Cost of training	Rs. 60,000

Grand Total	Rs. 390,000

3.4.2.4 On-the-Job Training:

Short-term consultants outlined under sections 3.4.2.1 and 3.4.2.2 may be requested to carry out on-the-job training for the Chief of Agriculture and the two agricultural assistants of BALAD.

3.5 Proposed Short-term Interventions by BALAD for the Improvement of Date Palm Production:

3.5.1 Pollination of Date Palm:

Pollination of date palm is of paramount importance and the key element for the improvement of production and the quality of dates. Substantial yield increases can be accomplished through proper pollination.

Earliness of maturity, increase of fruit size or weight, development of proper fruit color and improvement of quality depend mainly on proper artificial pollination.

Since there are acute shortages of pollen from known, tested, good male date palm plants and the skilled manpower to carry out such pollination, the use of mechanical pollinators which were introduced to the Makran by the consultant in 1988 can overcome such constraints.

It is therefore highly recommended that BALAD procure such pollinators for demonstrations and training of farmers.

The know-how of collecting, handling, storage and the testing of the pollen viability as outlined in

(Appendix G) is therefore needed and should be made available in Balochi to Field Assistants and farmers.

The consultant is of the view that significant improvement of yield and better quality dates can be accomplished by BALAD through the proper demonstrations and training of farmers and Field Assistants on the know-how of mechanical pollinators as follows:

- 3.5.1.1 Procure 200 mechanical pollinators
- 3.5.1.2 Demonstrate and train field assistants and progressive farmers on the procedures of collection, preparation, handling and storage of dried pollen as outlined in Appendix G.
- 3.5.1.3 Demonstrate and train field assistants and progressive farmers on the use of mechanical pollinators.
- 3.5.1.4 In full collaboration with the Deputy Director of Agriculture and EADA of Turbat Date Farm, it is suggested that demonstration and training may first take place at Turbat date farm.
- 3.5.1.5 Distribute cost-free mechanical pollinators to the trainees who attended the demonstration and record names and their villages for future follow-up.
- 3.5.1.6 Request each progressive farmer to pollinate one date palm at his orchard using the pollinator and observe the result.
- 3.5.1.7 Based on the result obtained, let the progressive farmer decide by himself without any interference.
- 3.5.1.8 In the next season, visit the progressive farmers who received training and the pollinator and let them carry out demonstration and further training at fields for their neighbouring farmers.
- 3.5.1.9 Choose some progressive trained farmers as contact farmers to help in future demonstrations and training of their neighbouring farmers.
- 3.5.1.10 Repeat steps 3.5.1.1 to 3.5.1.9 over a period of 5 years until you cover 1,000 farmers.
- 3.5.1.11 The total estimated cost over 5 years is Rs. 500,000.

3.5.2 Improvement of the Propagation Method

The high mortality rate of the offshoots used in the propagation of date palms is considered one of the major constraints. Several factors such as age, size, weight, method of detachment, handling, time of planting and care of the offshoots after field planting are the main contributing factors to such high mortality rate. In the absence of research results under Makran conditions, it might be appropriate to demonstrate to farmers the recommended practices already adapted under conditions similar to the Makran. Accordingly, guidelines presented in appendix G should be made available in Balochi to Field Assistants and farmers until research results will be available in the future. The demonstrations may be carried out as follows:

- 3.5.2.1 Choose (10) progressive farmers who have offshoots that meet the requirement in appendix G.
- 3.5.2.2 Use offshoots of the main commercial varieties such as Begum Jhangi, Mozati and Hillani.
- 3.5.2.3 Make sure that moist soil is kept continuously around the base of the offshoots for at least one year.
- 3.5.2.4 Use polythylene bags around offshoot base with either moist soil or moist wood shavings as another treatment.
- 3.5.2.5 Following guidelines in appendix G, detach, treat, handle, and plant the treatment along with farmers practice side by side
 - i.e. Treatment (1) offshoots from soil kept around its base for one year.
 - Treatment (2) offshoots from polythylene bags with moist wood shavings.
 - Treatment (3) farmer's practice.
- 3.5.2.6 Use (10) offshoots for each treatment.
- 3.5.2.7 Record the mortality rate every 3-6 months after field planting.
- 3.5.2.8 The estimated annual cost is Rs. 30,000.

3.5.3 The Application of Fertilizers:

As already mentioned, farmers do not apply chemical fertilizers to the date palms. However, farm yard manures are generally applied to the intercrops. The planting pattern of date palms as windbreaks around the field either in the water channel or along its side should be taken into consideration when fertilizers are to be applied to the date palms.

The consultant believes that the application of nitrogenous fertilizers to the date palms will improve both the yield and the quality. Until research findings are available, the guidelines on soil-fertilizers and irrigation of date palm presented in appendix G should be made available in Balochi to Field Assistants and farmers along with demonstration at farmers field as follows:

- 3.5.3.1 Choose (200) progressive farmers either with regular orchards or orchards where you can make a basin around each tree.
- 3.5.3.2 Use common containers familiar to farmers such as milk, oil or ghee cans to measure the quantity of Urea to be applied to each tree according to the soil type and the age of the tree.
- 3.5.3.3 Always leave an equal number of date palms without fertilizers as control per comparison.
- 3.5.3.4 Train some progressive farmers as contact farmers to help in future demonstrations.
- 3.5.3.5 Try to cover 1,000 farmers over a period of five years.
- 3.5.3.6 The total estimated cost for five years is Rs. 600,000.

3.5.4 Pest Control

According to a preliminary survey carried out by the consultant in 1987-88, it appears that the most serious pests attacking date palms in the orchard are: date palm weevil (Borer), Graphiola leaf spot, lesser date moth, scales and mites. Pest infestations of dates in the storage will be addressed in the next report through training and demonstration of fumigation.

Although methods and pesticides for the control of various pests are changing rapidly, the guidelines in Appendix-G should be made available in Balochi to Field Assistants and farmers. The collaboration of the Department of Agriculture at Turbat in this regard is useful and strongly recommended. Furthermore, extreme care in handling and applying the pesticides, particularly phostoxin, should be observed.

In the light of guidelines in Appendix-G, BALAD should train and demonstrate the control of date palm and graphiola leaf spot as follows:

- 3.5.4.1 Procure enough pesticides and power sprayers to meet the requirements of training and demonstrations for 200 progressive date farmers.
- 3.5.4.2 First session of training and demonstration may take place at Turbat Date Farm.
- 3.5.4.3 Repeat every year steps 3.5.4.1-3.5.4.2 until you cover 1000 progressive farmers.
- 3.5.4.4 The total estimated cost for five years is Rs.210,000 as follows:

a.	Five Power Sprayers	Rs. 100,000
b.	Five Cases of Phostoxin	50,000
c.	Two hundred litre Dithane M-45	40,000
d.	Work force	10,000
e.	Safety equipment	<u>10,000</u>
	Total	Rs. 210,000

3.5.5 Date-Based Farming System Research (F.S.R.)

The Consultant strongly recommends that Date-base Farming System Research to cover all the activities of the proposed short-term interventions already outlined under 3.5 besides other Agricultural activities should be initiated at a newly established date farm in an area which has potential for future agricultural development such as Kunchiti village. The farm of Dr. Naseer which was visited by COP, Project Agronomist, Chief Agriculture Section, BALAD and the Consultant may be suitable as a demonstration for farming system research. Accordingly, co-ordination between BALAD and the Farming Systems Research component of the MART Project is needed.

3.6 Proposed Long-term Interventions by BALAD for the Improvement of Dates:

Some of the already proposed short-term interventions outlined under section 3-5 may continue as long-term interventions such as Date-Base Farming System Research. This will depend on the outcome of the short-term interventions and the anticipated duration of any Phase II of BALAD Project as well.

Outlines of other long-term interventions which might have significant impact on the improvement of dates are as follow:

3.6.1 Screening of Male Date Palms:

The objectives of such screening is to carry out a preliminary survey of male plants used by progressive farmers to identify and determine those males that can bring about significant improvement particularly:

- a) Early maturity of the fruits
- b) Increase of fruit weight or size, shape and color
- c) Reduced or limited rain damage
- d) Yield increase

The procedures are:

- 3.6.1.1 Identify and mark the most outstanding male plants used by the progressive farmers during the pollination season.
- 3.6.1.2 Record farmer's name and locations of male plants.
- 3.6.1.3 Assign and pollinate with one male spathe from each identified male plant to one of the female spathe (bunch) of Begum Jhangi at Turbat Date Farm.
- 3.6.1.4 Assign and pollinate with another second known male spathe of another second known male to another separate female spathe on the same tree of Begum Jhangi as in Step 3.6.1.3.
- 3.6.1.5 Repeat step 3.6.1.4 for another third male spathe on another separate female spathe of the same tree of Begum Jhangi etc.

- 3.6.1.6 Testing of (10) different male plants can be carried out on one female Begum Jhangi at one time to reduce experimental errors.
- 3.6.1.7 Maximum care should be observed to avoid pollen contamination and hand pollination may be used.
- 3.1.6.8 In case activities of the new Date Research Farm at Turbat commence during the implementation of screening of male plants, coordination is advisable.

3.6.2 Initiation of a Small Pollen Bank

Based on the outcome of screening male plants in 3.6.1, a small pollen bank may be initiated to store pollen of superior male plants to make it available to farmers in due time.

Guidelines on collection, preparation, handling storage and testing of pollen viability are presented in appendix G.

The estimated cost of screening male plants and the initiation of small pollen bank is as follows:

a) Three man-month consultancy during pollination	Rs.600,000
b) Sixty man-month Agric. Officer	600,000
c) Sixty man-month Laboratory assistant	400,000
d) Work Force during pollination season	20,000
e) Laboratory equipment	400,000
f) Spathe of male plants	20,000
g) Laboratory space (BALAD Compound)	
h) Contingency	<u>204,000</u>
Grand Total	Rs.2,244,000

After the screening of male plants and the initiation of a small pollen bank by BALAD, the private sector may be convinced and encouraged through USAID Office of Private Enterprise to take the necessary steps to expand such activity to cover the Makran and other provinces in Pakistan and possibly neighbouring foreign countries.

3.6.3 Tissue Culture of Superior Date Palm Germplasm:

Some superior date palm germplasm already identified by the consultant is no longer capable of producing offshoots for further propagation. Such germplasm may be propagated through tissue culture.

The on-going activities of the tissue culture laboratory at NARC are promising. It is therefore advisable that coordination between BALAD and the tissue culture laboratory of NARC take place to extend its activities to include the Makran as already mentioned in section 3.4.1.3.2.2, train technicians and advise on future co-operation. Furthermore, the private sector may be encouraged at a later stage through USAID Office of Private Enterprise to establish a tissue culture laboratory.

3.6.4 Modified Irrigation Systems:

Since there is substantial misuse of irrigation water in most of the date palm orchards, improvement or modification of existing irrigation methods may be useful. The agronomist and the COP of BALAD should design, install and test suitable, modified irrigation methods to reduce water losses.

TASK ORDER

DATE CULTIVATION SPECIALISTOBJECTIVE:

The objective of this task order is to provide up to four (4) weeks technical assistance by an expatriate Date Cultivation Specialist to identify specific problems which should be addressed by the project and assist in designing programs for implementation by the agricultural component of BALAD having a high degree of likelihood to yield short and long-term benefits to date cultivators in the Makran.

RATIONAL AND JUSTIFICATION:

LBII has been contracted by USAID to carry out BALAD Project activities in the Makran Division of Balochistan. In the spring and summer of 1989, agronomists were hired by the Project Planning and Management Unit and the TA team to address the agricultural needs of the division. The primary cash crop of the Makran has been and will continue to be dates. Date cultivation is the backbone of oasis agriculture, with other crops taking a secondary position by serving primarily as intercrops in the date orchards. While dates are the prime crop, observations and studies have shown that the growers of the Makran are not producing dates in an efficient manner and that there is much room for improvement. Some of the problems which are evident include poor cultivation practices, low pollen availability during flowering, insect infestation and disease problems which result in low yields and inferior fruit quality. These problems are exacerbated by post-harvest handling of the fruit which includes improper drying and storage prior to transport to processors.

The project has the services of two agricultural specialists, one a member of the TA team and the other hired by the PPMU. However, it is recognized that date cultivation is a highly specialized endeavor with few people expert in the field. Therefore, the services of a specialist with a high degree of technical expertise and experience in date production, post-harvest processing and marketing are needed to identify specific problems which should be addressed by the project and assist in designing programs which can be implemented by the agricultural component during the life of the project.

SCOPE OF WORK:

The consultant will travel to Turbat and, under the direction of the Project's expatriate Agriculturalist, identify and prioritize the most pressing problems in date cultivation and post harvest processing which should be addressed by BALAD. Taking into consideration the geographical, social and political constraints affecting all development in the Makran, he will recommend short term and long-term intervention which can be implemented during the life of the project and assist in designing detailed programs for the improvement of date production. His duties will include but not be limited to:

1. Meet with the project's resident agricultural specialists and local GOB agricultural representatives to obtain an overview of the constraints facing agricultural development in general and date production in particular in the Makran Division of Balochistan.
2. With the resident agriculturalist, develop a methodology to assess the problems facing date cultivators and prepare a work-plan to achieve the goals set out by the task-order.
3. Visit representative date production areas of the three districts of the Makran, discuss date production practices and identify problems farmers perceive to be limiting their date production.
4. Make an independent assessment and report on the problems, whether perceived by the farmer or not, which limit the capacity for efficient date production.
5. Collaboratively identify interventions to be undertaken by the BALAD Project which have a high degree of likelihood to yield short-term and long-term benefits to the date farmers.
6. Where possible, design programs for implementing these identified interventions taking into consideration the physical, social and political constraints which exist in the Makran.
7. At the end of the consultancy, submit a detailed report of activities and recommendations for submission to USAID through the BALAD project.
8. Any other tasks as may be required by USAID and mutually agreed to by the consultant, BALAD and USAID.

QUALIFICATIONS:

The consultant should be a person with extensive experience in date production in the lesser developed countries as well as having an in-depth knowledge and understanding of the most up to date cultivation practices used in the United States and other parts of the world.

TIMING AND DURATION OF ASSIGNMENT:

This Task Order provides up to twenty-four (24) days consultancy to begin in mid-January 1990. A six day work week is authorized.

CONSULTANT DESIRED:

Dr. Zidan-E-Abdel-Al is a specialist meeting the qualifications outlined above. A former professor of Horticulture at the University of Alexandria in Egypt, Dr. Zidan has a Ph.D. from Cornell University and is a recognized date specialist in many countries. The holder of a number of awards for his work in the agricultural sciences in Egypt, he has 25 years accumulated field experience including 16 years international consulting with the Food and Agriculture Organization (FAO) of the United Nations. Dr. Zidan has experience in Pakistan both with FAO and USAID. While on an FAO consultancy, and working through the Pakistan Agricultural Research Council (PARK), he identified and inventoried the entire date germplasm of the country. Through the USAID funded MART Project, Dr. Zidan has had a number of assignments in the NWFP and Balochistan including an examination of the status of agriculture in the Makran Division. This blend of education, experience and knowledge of Pakistan in general and the Makran in particular makes him uniquely qualified for this position.

ACKNOWLEDGEMENT

The author wishes to express his sincere thanks and appreciation to Mr. Richard Goldman, Chief Private Enterprise Office (PEO), Mr. Frank Pavich, Chief Rural Development Division, USAID; Mr. John Tucker, Deputy Chief Rural Development Division, USAID, Mr. Karim Nayani, BALAD/USAID Project Officer, COP, BALAD, Mr. Daniel Bradbury Agronomist, BALAD, and Dr. Ahmad Ali Chief of Section, Agriculture, PPMU for their guidance, advice, support and cooperation during this consultancy.

Thanks are also due to Mr. Z. Ali Khan, Director General of Agriculture, Mr. Abdullah, Deputy Director Agriculture Extension, Turbat, Mr. Mohammad Amin, EADA OFWM, Turbat, Mr. Abdul-Hady, Deputy Director of Farms, Mr. Bashir Ahmed, Former EADA Turbat Date Farm.

The valuable assistance of Mr. Qamar-ul-Huda in typing the report and Dr. A.D. Gopang, Deputy Director Research, Crop Production, PARC and Mr. Parvez, Assistant Director Research, Crop Production, PARC in the procurement of mechanical pollinators are also lauded.

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ITINERARY AND PERSONS VISITED

- February 25, 1990 - Left CAIRO for Karachi.
- February 26 - Visit USAID, Karachi and discussion with Mr. D. Bradbury Irrigation Agronomist, BALAD.
- February 27 - Left Karachi for duty station at Turbat.
- Meetings with Mr. D. Bradbury Mr. Mirza Masood, Dy. Director, PPMU, Mr. Yahya Khan, Senior Irrigation Engineer, Dr. Ahmed Ali Chief Agriculture Agronomy Section, BALAD, Mr. Mohammad Hayat, Economist and Mr. Abdul Rashid, Sociologist.
- February 28 - Meeting with Mr. James Schoof, COP, BALAD.
- Advisory assistance on Training procedures for Ehsan Shah and Abdul Rashid
- Review of literature.
- March First - Meetings with Mr. James Schoof, Mr. Abdullah Deputy Director of Agriculture Extension, Mr. Abdul Hady Director of Farms, Mr. Mohammad Amin, E.A.D.A., O.F.W.M.P., Mr. Bashir Ahmed former EADA, Turbat date farm and Mr. Mirza Masood.
- Visit to Turbat date Farms
- March 2, 1990 - Left Turbat for Quetta meeting with Dr. M. Dawson F.S.R. Adviser, MART. Dr. M.G. Van Der Veen, Dr. Robert Hudgens, Consultant WINROCK and Mr. D. Bradbury.
- Assist in the procurement of date palm pollinators.

- March 3, - Meeting with Dr. M. Dawson, Mr. Z. Ali Khan, Director General Agriculture Balochistan and Dr. Bajoi, Director Agric. Res. Inst. Saryab. Discussion on the possibility of date oriented Farm System Research and Workshop on dates.
- March 4, - Meeting with Mr. Z. Ali Khan Director General Agric. Mr. M.I. Azad, Director of Vegetable Seed Research Project, Mr. Mohammad Arshad Dy. Director Planning, Mr. Abdul Hady, Director of Farms discussion on future work plan.
- Meeting with Mr. Karim Nayani, Project Officer, BALAD, Mr. James Schoof, COP, BALAD Mr. D. Bradbury Discussion on terms of reference of present consultancy.
- March 5, - Continue meeting with Mr. Karim Nayani BALAD Project Officer.
- Visit to A.R.I. Saryab
- Visit to Balochistan Agriculture College.
- Left Quetta for Turbat.
- March 6 - Meeting with Mr. D. Bradbury BALAD irrigation Agronomist, Dr. Ahmad Ali Chief Agric. Section, BALAD. Discussion on work plan.
- Meeting with Mr. Mohammed Aslam Shah owner of Turbat Date Factory, to determine the constraints of last season.
- March 7 - Review of Literature
- Visit to Turbat Date Factory to assess the situation of the factory.
- March 8 - Preparation of guidelines on the propagation of date palm.
- March 9 - Visit to Shehkhani and Goodi villages

- Interview Mr. Saleem Jain, date palm grower
- Meeting with Mr. Sayed Hashmi Minister of Agriculture, Balochistan Government (GOB), Mr. Atta Jaffar Additional Chief Secretary for Planning and Development, GOB, Mr. TAJ Naeem Secretary of Agriculture GOB, Mr. Z. Ali Khan Director General of Agriculture, GOB, Mr. Abdul Hady Director of Farms, GOB, Mr. Abdullah Dy. Director Agriculture Extension, Turbat and Mr. Zahoor, Agriculture Officer.
- March 10 - Review of the available literatures
- March 11 - Preparation of guidelines
- Visit Date Factory
- March 12 - Left Turbat for Panjgur with Dr. Ahmad Ali, Chief Agriculture Agronomy Section, PPMU.
- Interview Farmers and visit date palm orchards.
- March 13 - Visit to Kunchiti village Dasht area with Mr. James Schoof, COP, BALAD, Mr. D. Bradbury, Irrigation Agronomist, BALAD, and Dr. Ahmad Ali, Chief Agriculture Section BALAD Meeting and visit the Farm of Dr. Naseer.
- March 14 - Preparation of pollen grains from male date palm spat.
- Drafting the report.
- March 15 - Presentation of slides on different problem of date cultivation and processings.
- Projection of video-cassettes showing, pollination, pest control and application of fertilizers to farmers.

- March 16
 - Left Turbat for Karachi.
 - Meeting with Mr. M.M. Irani. date inspector.
- March 17
 - Meeting with Mr. Schoof COP and Mr. Bradbury Agronomist at USAID, Karachi
 - Left Karachi for Islamabad.
- March 18
 - Visit PARC Islamabad. Meeting with Dr. A.D. Gopang Dy. Director Research, Mr. Parvez Assist. Director Research, Mr. U. Balochi Director Crop protection, PARC, Dr. Bill C. Wright COP, MART
 - Visit F.S.R. at Fatehganj and meeting with the staff.
 - Meeting with Mr. Richard Goldman Chief office of Private Enterprise, USAID and Mr. Frank Pavich, Chief O/RDD, USAID.
 - Visit NARC Islamabad.
 - Meeting with Dr. Azra Qureshi, Hameed, Rashid and Dr. Akbar.
 - Left Islamabad for Karachi
- March 19
 - Left Karachi for Turbat.
- March 20-21
 - Final Draft of the report.
- March 22
 - Demonstrations for farmers.
 - Left Turbat for Karachi.
- March 23
 - Friday
- March 24
 - Meeting with COP, BALAD for debriefing and submission of the report.
- March 25
 - Left Karachi for Cairo.
- March 26
 - Left Cairo for Alexandria.

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GLOSSARY

BALAD	Balochistan Area Development Project
USAID	United States Agency for International Development
GOB	Government of Balochistan
PPMU	Project Planning and Management Unit
O/ARD	Office of Agriculture and Rural Development
MART	Management of Agriculture Research and Technology.
PARC	Pakistan Agricultural Research Council
COP	Chief of Party
FAO	Food and Agriculture Organization of the United Nations.
TA	Technical Assistance
MAUND	Equal to 40 Kilograms
DOKA	or Khalal, fully glossy hard yellow or red ripening stage
DUNG	or Rutab, soft ripening stage of dates. Half-Doka, Half-Dung, Half soft, half hard ripening stage (before tamur).
TAMUR	The generic term for fully ripened dates.
CHOHARA	Boiled fruits in doka stage and sun dried.
NARC	National Agriculture Research Council.

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BIOGRAPHICAL INFORMATION

Dr. ZIDAN E. ABDEL-AL

- Ph.D. Cornell University Ithaca N.Y. U.S.A. 1962.
- Former Professor of Horticulture, University of Alexandria.
- Former Chief Technical Advisor of Food and Agriculture organization of the United Nations.
- Awarded the National Award of the Egyptian Academy of Scientific Research and Technology in 1977.
- Awarded the First Class Medal of Science and Technology by the President of Egypt for the remarkable achievements in the Agriculture Science.
- Planned and Presented 30 Television programs on Agricultural extension.
- Author of 7 Textbooks on Horticulture, 12 Extension Leaflets and 50 research papers on Horticulture.
- Accumulated field experience of 27 years in planning, organizing, implementing, coordinating and managing institutional services. Out of which 16 years of Agriculture reasearch, extension and training were spent on the international level with Food and Agriculture Organization of the United Nations and United States Agency for International Development in tne Arid Zones of the World

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REFERENCES

1. ABDEL-AL, ZIDAN, 1988 Progress Reports on the improvement of date palm cultivation and processing.
First quarterly Progress Report (November-January 1988).
Second quarterly Progress Report (February-April 1988).
Third quarterly Progress Report (May-October 1988).
Pakistan Agricultural Research Council Islamabad and FAO of the United Nations.
2. ABDEL-AL, ZIDAN, 1989 Report on the status of Agriculture in Makran Division. Constraints, Solutions and Future Development. PARC, USAID, MART, Winrock.
3. Djerbi, M., 1983 Diseases of the date Palm. FAO Regional project for Dates Research Center in the Near East and North Africa.
4. Dowson, V.H.W., 1982 FAO Plant Production and Protection Paper 35.
5. PC-1 For Date Research Station at Turbat Makran Division. Agriculture Department, Government of Balochistan.
6. Upreti, B.P., 1989 Agriculture and Society in Makran. A report for Rural Development Division office of Agriculture and Rural Development USAID Islamabad.

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GUIDELINES ON THE PROPAGATION
OF DATE PALM

To obtain true to type (plant like the mother tree) date palm, vegetative propagation by offshoots or suckers is practiced on a large scale by date palm growers.

The offshoot is a bud grown from the axil of a frond near or under the soil surface. The bud takes several (4-6) years depending on the variety before it becomes a suitable offshoot for planting in the field.

The date palm mother tree gives a limited number of offshoots (10-15) during its life depending on the variety.

1. Disadvantages of Propagation by Offshoots

- 1.1 High mortality rate
- 1.2 Slow
- 1.3 Limited number of offshoots can be obtained from the mother tree.
- 1.4 Requires special skill for detachment from mother tree.
- 1.5 Requires special handling and care after planting.
- 1.6 Labor intensive
- 1.7 Expensive

2. Detachment of Offshoots from Mother Tree

- 2.1 Make sure that the base of the offshoots has been in contact with moist soil for at least one year in order to promote root development before detachment takes place.
- 2.2 Polyethylene bags filled with either moist soil or moist wood shavings tied around the offshoot base have been found to promote root development.
- 2.3 Use of root growth promoting substances might be advisable.
- 2.4 Select healthy, high yielding, better quality mother trees with suitable offshoots (weight 10-20 kg or one foot diameter) and good root systems.

- 2.5 Irrigate several days before detachment to help digging and allow moist soil to stick around the root system and form the necessary root ball.
- 2.6 Tie up the leaves of the offshoots with frond string to facilitate work.
- 2.7 Clean and then dig around the offshoot allowing a ball of soil 2 inches thick to remain around the root system.
- 2.8 Use a special crow bar chisel which has a rectangular cutting blade with one flat side facing the offshoot and the other side is beveled so as to form 3 sharp cutting edges facing the mother tree. The blade is $4\frac{1}{2}$ " wide 9" long and 1" thick welded to iron handle 48" long and $1\frac{1}{4}$ " thick.
- 2.9 A mateen bar may be used in the Makran to separate the offshoots.
- 2.10 Make sure that a clean cut takes place at the narrowest point of attachment (hilum) between the offshoot and the mother tree.
- 2.11 Treat the cut between the offshoot and mother tree with a one percent solution of copper/sulphate.
- 2.12 Retain several fronds (leaves) around the terminal bud of the offshoot tied together above the bud with fiber string obtained from a frond and trim the leaves a few inches above the tied point.
- 2.13 Treat all cuts of the fronds with a one percent solution of copper sulphate.
- 2.14 Leave the base of the offshoots devoid of any fronds to at least 2 ft. length.
- 2.15 Prevent the root system of the offshoot from drying out by planting immediately.
- 2.16 In case of a delay in planting for 1-2 day put under shade and cover the roots with moist soil or continuously sprinkle the root system with water or place in water canal..... etc.
- 2.17 In case of transporting or shipping the offshoots to distant places, insure proper handling to avoid damage and wrap root systems with moist old sacks and periodically wet to avoid drying out.

3. Planting Time

- 3.1 Farmers are planting Offshoots either during February-March or August-September. However, Research is needed to determine the optimum planting date of the offshots.
- 3.2 Until research results are available, Offshoots may be planted through the year with the exception of very hot and very cold months.

4. Planting

- 4.1 Dig holes 3x3x3 ft.
- 4.2 Planting distance 30 ft between plants.
- 4.3 Plant and maintain the offshoot at the level of its greatest diameters just above the ground to avoid the accumulation of water around the terminal bud.
- 4.4 Make a basin of 1/2 ft. deep and 3 ft. in diameter around the offshoots for irrigation.
- 4.5 Irrigate immediately after planting.
- 4.6 Keep the soil moist all the time by light frequent irrigation.
- 4.7 Daily irrigation on sandy soils may be required during the summer.
- 4.8 Watering every week on heavy soils may be sufficient.
- 4.9 Protect offshoots against heat or cold weather for one season. Old date fronds or corn stalks may be used.

5. Tissue Culture

- 5.1 Pakistan Agriculture Research Council Scientists have succeeded in propagating date palm through tissue culture. Accordingly, it is expected that all the disadvantages of the offshoot's propagation method will be eliminated in the future.

Reference

- Dowson, V.H.W., 1982 FAO plant Production and Protection
Paper 35.

GUIDELINES ON THE POLLINATION OF DATE PALMS

It is an established fact that proper pollination of date palms increases both yield and quality. Pollen use affects not only the size of the fruit but also the time of ripening.

The following guidelines might be useful and helpful to horticulturists and extensionists before carrying out demonstrations at farmers field:

1. General Remarks

- 1.1 Some male plants are better than others for pollinating certain varieties.
- 1.2 Different varieties require different amounts of pollen.
- 1.3 There are differences in the percentage of viable pollen grains among different male plants.

2. Timing of Pollination

- 2.1 Pollen obtained from the earliest and the latest inflorescence is generally inferior to that from others on the same male plants.
- 2.2 Maximum sets of fruits will be obtained from pollinating within three days after the opening of the spathe. However, different varieties seem to vary in length of their period of receptivity.
- 2.3 Pollination between 10. A.M. to 3 P.M. will result in 10-15% higher set of fruit than those in early morning or late afternoon.

3. Pollen Germination

- 3.1 A temperature of about 35°C (95°F) is most favorable for pollen germination.

4. Handling and Storage of Pollen

- 4.1 Male flower clusters should be cut early in the morning as soon as possible after the spathe breaks.
- 4.2 The spathes can be cut one day before they open.

- 4.3 The maturity of an unopened inflorescence can be determined by pressing the lower portion of the spathe between the thumb and the forefinger. It will produce a cracking noise if it is mature.
- 4.4 Flowers that adhere to the strands without shedding easily are to be preferred.
- 4.5 If fresh flowers are to be used, petals should not be wide open when the spathe first splits.
- 4.6 If fresh pollen is not to be used immediately, it should be dried out promptly.
- 4.7 Dry the inflorescence for 1-2 days by spreading the strands in a thin layer in a shallow tray on which paper has been placed to catch any pollen that falls.
- 4.8 Pollen deteriorate if preserved under glass exposed to direct sunlight or stored near an oven.
- 4.9 If the pollen is well dried, placed in an air-tight bottle and kept in a refrigerator at 4°C, it can be held from one season to the next.
- 4.10 Dried pollen can also be stored at room temperature in an air tight jar over calcium chloride. The ratio of calcium chloride to pollen is 1:5.

5. The Use of Mechanical Pollinators

- 5.1 The use of mechanical pollinators will overcome both labor and pollen shortages.
- 5.2 Mix equal amounts of dried pollen and wheat flour before using the pollinator.

6. In Case of Pollen Shortages and Unavailability of Pollinators

Farmers can practice one of the following methods:

- 6.1 The dried pollen is generally applied by dusting it on cotton and placing one or two pieces about the size of walnut between the strands of the female cluster by using a long stick.
- 6.2 Or crush dried pollen in a small muslin bag (cheescloth) tied to the end of a stick.
 - 6.2.1 Shake the bag over the newly opened female inflorescence and enough pollen will sift through to effect pollination.

- 6.2.2 Water is sometimes sprinkled over the female inflorescence when dry pollen is used to increase adherence.

7. Testing Pollen Viability

- 7.1 In one liter of distilled water dissolve the following chemicals

<u>Chemical</u>	<u>Quantity(gm)</u>
Boric acid	0.5
Calcium Nitrate	0.3
Magnesium Sulphate	0.2
Potassium Nitrate	0.1
Chelated Manganese	0.1

- 7.2 Add 15% sucrose by weight
- 7.3 Add the date palm pollen grains to the solution.
- 7.4 Transfer 3-5 ml of the mixture in step 7.3 to a flask and keep under 75-80°F until germination.
- 7.5 Examine under microscope. Pollen tubes will be observed growing from the viable pollen.

REFERENCE:

- Dowson, V.H.W., 1982, FAO Plant Production and Protection Paper 35.

GUIDELINES ON SOIL-FERTILIZERS AND IRRIGATION OF DATE PALM

The following guidelines might be useful to horticulturists and extensionists during the course of demonstrating the importance of fertilizers and irrigation on date palms at farmer's field.

1. Soil

- 1.1 There is a general agreement among research workers that date palms can tolerate a wide variation in soil types. However, sandy soil should be either close to an unlimited water supply or overlying either an underground water course or a layer of soil relatively impermeable to water and supplied with fertilizers.
- 1.2 Light soil is probably more suited than heavy soil provided that irrigation is frequent.
- 1.3 Date palms are more tolerant than other fruit trees to soils with high contents of lime, gypsum, sulphur and of the usual salts of saline water.

2. Fertilizers

- 2.1 By applying fertilizers, you can produce more and much cheaper dates which will improve your income, the well being of your village, community and nation.
- 2.2 Application of fertilizers should be based on experiments and not on the weight of N, P, K removed from the soil by the date palm.
- 2.3 Five tons of well decomposed farm yard manure per acre can be applied in winter around the trees.
- 2.4 Until research findings become available on light soil, nitrogen fertilizers can be applied in split applications at the rate of 1-2 kg nitrogen for each tree in February and May.
- 2.5 On sandy soil, nitrogen fertilizer can be applied in three equal applications: February, May and July in order to reduce leaching. One kg of nitrogen can be applied in each of these months.
- 2.6 The application of fertilizers should be normally restricted to nitrogen and the quantity needed should be determined by trial in the future.

2.7 Fertilizers should be distributed uniformly over the soil and must be worked in the soil by tilling or ploughing.

3. Irrigation

3.1 The date palm will flourish if it is provided with plenty of sweet water and if the drainage is good.

3.2 The biggest palms in an orchard are those on the irrigation canal.

3.3 Behavior of other crops grown in date palm orchards should be observed. When they wilt, the palms will also need water.

3.4 The frequency of irrigation will depend on soil texture and weather conditions.

3.5 Soil should be kept moist to a depth of two meters.

3.6 Year round irrigation will be beneficial.

3.7 Dates will cure more rapidly on the palm if water is withheld when they are reaching the soft stage. However, the quality of the cured fruit may be inferior when compared to that of palms whose irrigation was not withheld.

3.8 The competition of the fronds for water during ripening should not be overlooked.

3.9 Generally speaking, the amount of irrigation water needed by the date palm is 1/2 liter per minute throughout the year.

3.10 A furrow irrigation system may be used from offshoot planting until full bearing by making two furrows one on each side of the tree. The length of each furrow should not exceed 100 meters.

3.11 Border irrigation can be used by making strips two meters wide with earth dykes of about 30 cm high with the row or the trees in the middle of the border. The water is run in the border, while the space between the borders are not irrigated. Small circular ridges are made around each palm to keep water from coming into direct contact with the trunk.

3.12 The level of the ridge on which the palms stand is about 30 cm higher than the border strip to keep water from touching the trunks.

REFERENCE:

Dowson, V.H.W., 1982, FAO Plant Production and Protection
 Paper 35

GUIDELINES ON THE CONTROL OF DATE PALM WEEVIL (BORER)

The following information might be useful to horticulturists, extensionists and entomologists during demonstrations of borer control:

Symptoms:

1. Difficult to detect infestation in their early stages.
2. Brownish viscous liquid oozes coming out from the point of injury on date palm trunks.
3. Small holes occurring in crowns or soft tissues.

Damage:

Serious damage is caused by grubs and adults in all the provinces.

Life Cycle:

Completed in 2-3 months.

Control:

1. Remove all dead wood and debris from orchard or burn it.
2. Plough and expose the soil to sun.
3. When removing offshoots, treat the cut surface of both mother tree and off-shoot with coal-tar.
4. Fumigate with aluminus phosphide (phostoxin), one table/hole.
5. Cover the hole in the trunk with palm fiber or polyethylene bag, then seal with moist clay.

REFERENCE:

Dowson, V.H.W., 1982, FAO Plant Production and Protection
 Paper 35

GUIDELINES ON THE CONTROL OF
GRAPHIOLA LEAF SPOT ON DATE PALM

The following guidelines might be helpful to horticulturist, extensionists and plant pathologists before demonstrating control of graphiola to to farmers.

Graphiola is one of the Smut Fungi caused by Graphiola Phoenicia (Mong).

Symptoms:

1. The fungi develops sub-epidemally in small spots on both sides of the pinnae and on the rachis.
2. The fruiting structures emerge as small black, covered sori which are absent or infrequent on one year old leaves, conspicuous on two year old leaves and continuing to increase during the third year.
3. Sori are most abundant on the middle section 1-3 mm in diameter.
4. Sori consist of two layers; the outer periderm is hard, dark and persistent, while the inner hayline periderm is thin and degenerates after the spores reach maturity.
5. At maturity the sori open to liberate masses of yellow spores like powder.

Control:

1. Prune infected leaves.
2. Spray with bordeaux mixture.
3. Barhee variety is resistant to graphiola.
4. Use Cuprosan 311, Cupravite and dithane M 45 according to instructions on the label.
5. Use wide spacing (30 ft.) between plants in humid regions without intercropping.

REFERENCES:

- Djerbi, M., 1983, Diseases of the Date Palm, FAO Regional Project for Palm and Dates Research Center in the Near East and North Africa.

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