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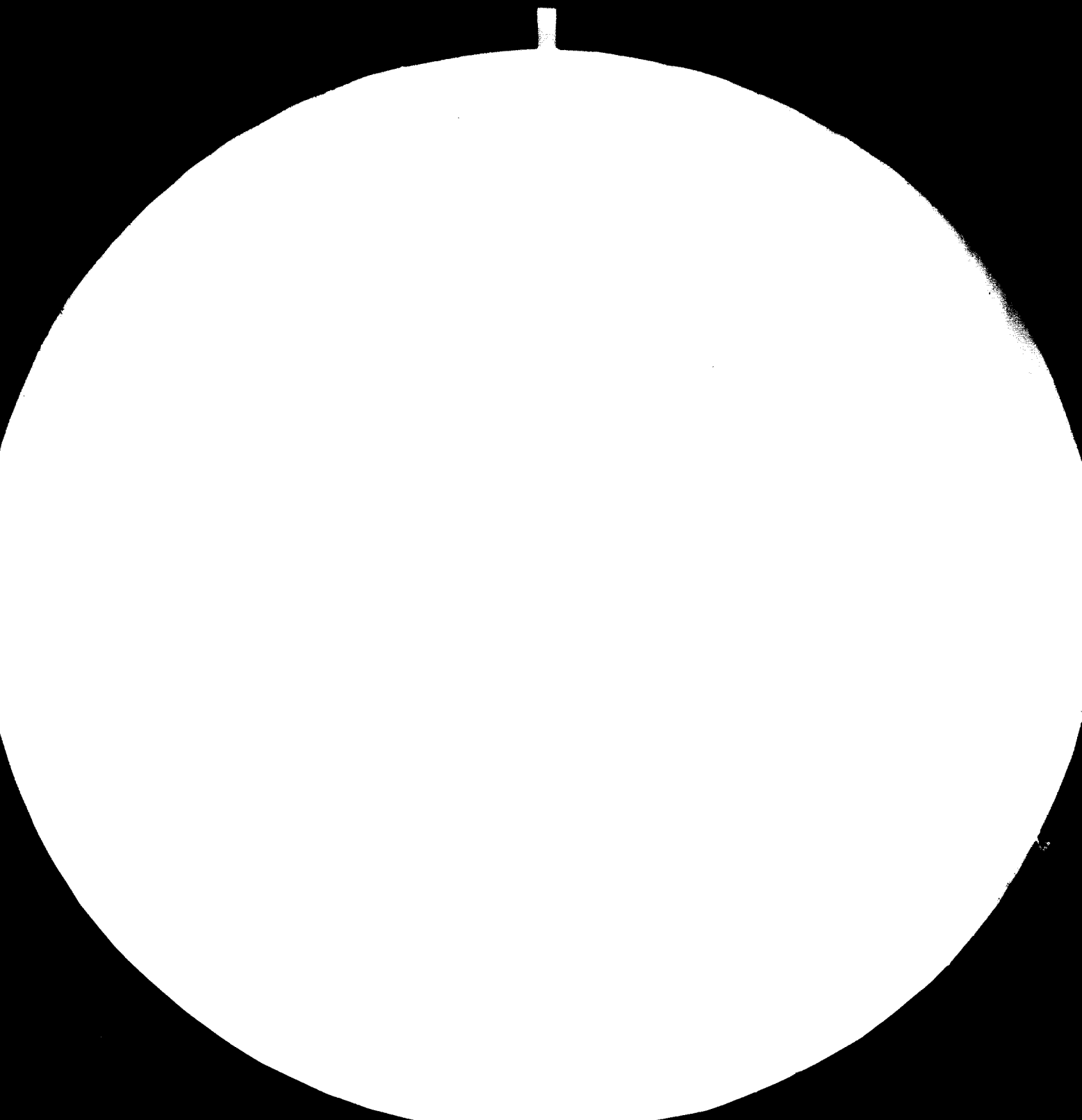
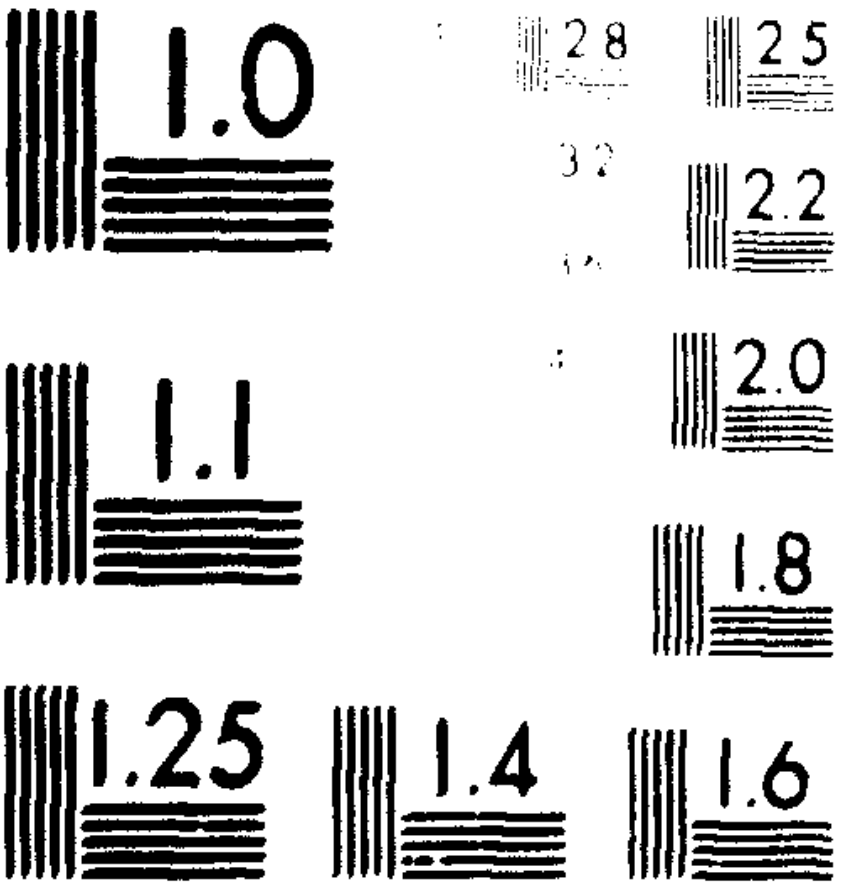




UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

October-November 1982

English

Egypt.

PLASTICS DEVELOPMENT CENTER

12565

DP/EGY/77/004/11-02/G/32.1.H

Report prepered

by

Jean-Claude Garnaud, ingénieur horticole,

plasticulturist consultant

(this report has not been cleared with UNIDO which does not therefore necessarily share the views presented)

Contents :

This mission being a continuation of the mission made in spring, the report consequently follows the same lines

1 feddan : 4 200 m2

The expert gratefully acknowledges the help and assistance received from the PDC directors and staff during his mission.

1. DIARY

14.10.82 - travel Paris-Vienna
- lecture (illustrated with slides) on Plastics in Agriculture at LKT-TGM : 13th UNIDO In-Plant Group Training Programme for Plastics Technology - 18 participants

15.10.82 - briefing at UNIDO Headquarters, Vienna
- travel Vienna-Cairo

16.10.82 - briefing at UNDP Office, Cairo

17.10.82 - visit to the Engineering and Industrial Development Center, Pyramid Institute : evaluation of prototype structures for poultry houses
- travel Cairo-Baharia Oasis

18.10.82 - Baharia Oasis : visits and discussions
- lecture on protected cultivation with plastics at the Club of the El Gedida Mines, Egyptian Iron and Steel Co.

19.10.82 - Baharia Oasis : visits and conclusions
- travel Baharia-Alexandria

20.10.82 - discussions at PDC ; briefing with Dr Osman Abu Zeid, general Director, and Mrs. Nadia Nosseir, Head of the Technical Department.

21.10.82 - meeting at PDC with PDC directors, PDC agriculturists and Dr Farouk El Afdy, special agricultural advisor to PDC : prepares programmes and implementation plans for the PDC Field Experiment Station Gianaclis.

22.10.82 - off

23.10.82 - International Exhibition for Agriculture and Industries, Irrigation and Land Reclamation, Cairo

24.10.82 - office work at PDC : preparation of the Baharia mission report to be forwarded to the Minister of Industry.

25 and 26.10.82 - Gianaclis
- land survey of the site devoted to the PDC Field Experiment Station ;
- discussions with managers of the Center for Farm Machinery ;
- interview of a small holder (M. Zihine) ;
- survey of the Gianaclis Co. vineyards, orchards and nurseries ;

- visit to Mr Attia Tawfeek Moustafa, Chairman, Egyptian Vineyards Co.

27.10.82 - lecture delivered to PDC plastics technologists and agriculturists

28.10.82 - Kafr El Sheikh, Faculty of Agriculture (Dr Farouk El Aïdy) : survey of trials, discussions and preliminary sketch of an extension leaflet

- Visit to the Shiati Co's farm, Tanta : evaluation of locally made multi-span greenhouse structures and of a mulched strawberry crop.

29.10.82 - off

30.10.82 - discussion at PDC : agriculturists

31.10.82 - office work at PDC : tentative programme for the PDC Field Experiment Station

01.11.82 - discussions at PDC : Dr Osman Abu Zeid, Dr Farouk El Aïdy and PDC agriculturists

02.11.82 - final briefing at PDC with Dr Osman Abu Zeid and Mrs Nadia Nosseir

- travel Alexandria-Cairo

(03.11.82/12.11.82 : private journey to Upper-Egypt)

13.11.82 - travel Cairo-Paris

2. PDC FIELD EXPERIMENT STATION FOR PLASTICULTURE

21. Provisional programme : see Annex I

22. Plan : see Annex II, rough plan resulting from discussions with Dr Faruk El Aidy and PDC staff

23. Ground preparation

The grading has already been excellently implemented by the Institute for Farm Machinery. The terrain presents a gentle slope of about 3 p.cent from the north to the south.

To improve the soil, it has been agreed to sow :

- a mixture of barley and Indian clover in the western half, i.e. on a strip about 100 m wide along the canal ; this part will be used in the coming months, part for buidings and part for the first trials (the crop will be ploughed in just before occupation).
- alfalfa in the other two thirds, which will probably not be used before three years.

Staking out will be done as soon as detailed plans are adopted, indicating roads and paths, the water distribution network, the area to be reserved for buildings and services, etc.

24. Limits - A wire fence may be sufficient on the east side but to the south and the west, in addition to the wire, hedges of mixed ornamental bushes or trees will embellish the station.

25. Roads and paths

A road 8 m wide is being constructed along the western canal. Inside the station, service roads will have to be built : main roads 3 m wide and submains 2.20 m.

Spacing these roads 40 m apart in the direction W/E and 105 m apart in the perpendicular direction will give elementary plots each with an area of 1 feddan (4 200 m2) : see Annex II.

26. Water supply is obtainable :

- either from the canal to the west, which is provided by pump n°14 and owned by Gianaclis Co ;
- or from the canal to the north, which needs to be cleaned and the rights of which are shared by Ginaclis Co and the Institute.

The slope dictates to install the pumping unit for the station along the north side feeded by the second canal. It is consequently recommended that PDC directors establish an agreement with the two other partners in order to be granted a right.

The water distribution net (channels and pipes) will be constructed at the same time as the roads.

27. Electricity

It is also urgent that PDC directors take all necessary steps to install a transformer feeded by the 10 000 volt line. A diesel generator will be necessary as soon as automated systems are operated, because of frequent failures in electricity supply.

28. Buildings

For convenience and because of the pumping unit to be installed on the north side, the "service area" will be located in the N-W corner, together with the entrance to the station. The service area will include :

- housing for the guard : 20 m2 (+ garden)
- office : 20 m2
- store : 30 m2
- toilet : 5 m2
- shed : 50 m2
- pumping unit
- transformer
- parking area for 10-15 cars
- courtyard ...

3. PDC EXPERIMENTAL NETWORK

see Annex III : Mission to El Gedida Mines

4. SPECIFICATIONS FOR AGRICULTURAL PLASTICS

The very low quality of locally supplied plastics may discourage growers to use plastics, and endanger the efforts made to introduce new techniques. It is however conforting to hear that contracts have been passed between PDC and several plastics processors to improve their production. In addition, joint ventures between Egyptian companies and foreign processors with advanced technologies should be encouraged.

5. SUPPLIES

51. Light Field Equipment

Because of their late transmission to PDC, recommendations proposed in a previous report could not be discussed and applied till now.

52. General supplies

Following the circular-letter distributed by CIPA Secretariat to National Associations, lists of French and German suppliers have been received at PDC.
In addition, the French Committee for Plastics in Agriculture has donated some equipment and documents : see Annex IV.

6. PDC DOCUMENTATION

Though again the recommendations contained in a previous report could not be put into practice at the time of this second visit, it appears that the consultant should devote 3-4 days of a next mission to demonstrate, and explain to :

- the librarian, how to identify and file documents to be kept (in order to select easily the available information upon future requests) ;
- the agriculturists, how to use the PDC library and how to keep pace with the advances of materials and techniques.

7. PDC INFORMATION

72. Leaflets : a preliminary sketch of an extension leaflet was drawn up with Dr Farouk El Aidy: protected cultivation of cucumbers with plastics.

73. Conferences

Instead of symposia, generally with international participation, the consultant advised PDC to organize :

- specialized seminars (3 days), to improve the knowledge of personnels in various fields of plastics technology and applications of plastics in agriculture and water management ;
- and mostly permanent working groups, meeting 1-3 times a year on a specific subject : irrigation, drainage, protected cultivation, etc.

74. Public relations

Visiting the Cairo International Exhibition for Agriculture and Foodstuff Industries, Irrigation and Land Reclamation initiated the idea to provide for a PDC stand to be presented at future exhibitions and similar events.

75. International relations

PDC will join CIPA as active member representing Egypt. The 20 copies of "Plasticulture", the journal of CIPA, will be distributed to PDC staff and also to members of the board. Through CIPA, more and better links will be formed around PDC.

8. TRAINING

PDC should take advantage of the presence of consultants or experts to organize lectures intended to the staff.

NB : the conference room requires a paper-board, a screen and a convenient darkening system.

Trainees from PDC were participating to the 13th UNIDO In-Plant Group Training Programme of Plastics Technology when the consultant delivered a lecture in Vienna (LKT) : see Annex V

9. CONCLUSIONS

In the immediate future, the PDC agriculturists will have to concentrate on the Field Experiment Station :

- concluding aggreements for water and electricity supplies (most urgent) ;
- studying and drawing detailed plans to complete and sharpen the enclosed general plan ;
- making drafts and estimates ;
- negociating with contractors (MM. Osama Abd El Samad and El Hamy Gad being especially in charge of supervising the works in process of construction).

It should be added that PDC disposes permanently of a land survey specialist and of a civil engineer to help the agriculturists.

If need be, an irrigation specialist may be requested.

It is not recommended to order equipment such as greenhouses, tunnels, drip irrigation systems ... and accessories before the completion of the basic civil works : roads, buildings, fences, underground lines (water, electricity ...). At this time, the co-operation of a bioclimatologist will certainly be useful to advise and assist in the setting up of trials in protected cultivation, in the selection and installation of measuring instruments, in the measuring operations and in the interpretation of the collected data.

PDC FIELD EXPERIMENTAL STATION FOR PLASTI-CULTURE PROVISIONAL PROGRAMME

1. IDENTIFICATION SURVEY

According to the decisions taken at a meeting held at PDC on 21.10.82, under the direction of Dr. Osman Abuzeid and with the participation of Dr. Farouk El Aidy, Special Agricultural Advisor to PDC, a general survey was completed in order to establish :-

(1) the environmental conditions of the station;

(2) the needs of the W. Nubaria agriculture

1.1 ENVIRONMENTAL CONDITIONS

In addition to climatic data already collected by G. Pruzan, it seems sufficient to note that :-

- soil is almost pure sand, with a depth of 3,00m.
- the water table is about 3.50 m deep.

Consequently , the site of the station is very typical of the land being reclaimed in this semi-arid zone (rainfall of about 100mm/year); the results obtained at the station will need no interpretation or adaptation before extension to the farms.

1.2 NEEDS OF THE WEST NUBARIA AGRICULTURE

1.2.1 Governmental Companies

Visits to the farms and personal contacts with the managers, during this mission and during a previous one, gave highly useful information to draw up the following guidelines (see 40, 50, 60). With the exception of W. Nubaria Co. for meat, every company has been approached.

- The Gianaclis Co.
- The W. Nubaria Agricultural Co.
- The Nobaseed Co.

1.2.2 Small holders

There are no small private farms in the W. Nubaria area, but many workers dispose of a "family plot" (between 1/3 and 1/6 feddan generally) where vegetables or more generally fodder for the cattle are grown. Beside the interruptions in the water supply (due to failures at pumping stations, or to the cleaning of canals in December-January), the main problem is a purely domestic one : the draining off of sewage waters (see 73).

2. WIND PROTECTION

Though prevailing winds coming from the north do not normally exceed 3 m/s, wind protection against the 'Khamaseen' coming from the S-SW and attaining high velocities (12m/s) specially in March, should be reinforced. It is proposed to demonstrate the use of plastics wind-breaks as :-

2.1 One fixed high wind-break (2m) in the north-west corner, where there is a discontinuity in the Casuarina hedges;

2.2 Movable low wind-breaks (1m high) to protect vegetables row crops;

2.3 Individual plastics net sleeves to protect young trees for 3 - 4 years after planting out.

3. WATER MANAGEMENT

See Mr. Parthasarathy's report.
Every possible application of plastics should be demonstrated in trials comparing various technologies (traditional and new) and different materials and products.

3.1 Water Collection and Storage

The interruptions occurring in the water supply are one of the main sources of worries for farmers. The development of economical and easy to build water reservoirs would certainly help to solve at least partially the problem.

3.2 Water Transportation and Distribution

The main delivery duct to install along the North side of the station, running parallel to the canal (pump II) because of the slope going to the south, will have to compare in successive segments :

- traditional channel
- PE film lined channel
- PVC pipe

Losses through seepage and evaporation will have to be calculated.

3.3 Irrigation

As many systems as possible (locally made and imported) should be tested and always compared with traditional watering methods, especially for what concerns the dispersion of weeds :-

- drip irrigation systems
- micro sprinklers
- sub-irrigation (non-woven mats) for pots, etc.

Special attention will be given to filtration equipment, pressure valves, fittings and other accessories. As already stressed by Mr. M. Parthasarathy, simpler technologies should be adopted to begin with, for instance overhead tank fed drip systems instead of highly automated systems requiring sophisticated pressure control accessories.

4. GRAPES

The rather low yields (average = 3t/feddan) may be at glance explained by :

- poor propagation practices (rooting rate 0-50 p.cent according to varieties).
- contamination by soil-borne nematodes ;
- irregular irrigation, with long intervals of dry soil phases between short near saturation phases.

4.1 Mulching of Nursery Beds

(with and without drip irrigation)

By maintaining the soil structure and moisture, and by controlling weeds (if black), a plastics mulch laid over the beds before inserting the cuttings should greatly improve the rooting rate.

4.2 Grafting

Since it is economically impossible to destroy nematodes to a sufficient depth before planting new vineyards and that recontamination will occur within a few years it is suggested to graft vine varieties on more vigourous Vitis rootstocks, more or less tolerant to nematodes. This research of course does not concern plasticulture and is not relevant to PDC, though plastics may be used to seal the grafts and again to mulch the rooting beds.

4.3 Drip Irrigation

Very large drip irrigation developments made in Australia after 1969 have shown that, besides the economy in water used (30 - 35 p.cent less in sandy soils mulch similar to W. Nubaria soils), vines produce more grapes, bigger bunches, berries of a more regular and greater size, and better coloured, with a higher level of sugar. Experience in South Africa has proved that the yields of export quality grapes are increased by more than 60%. There is no reason why such results could not be obtained in W. Nubaria.

4.4 Raisin Drying

Covering structures using PE or PVC film could be tried to accelerate the drying process, as for tobacco in Greece or Bulgaria.

5. FRUIT TREES

The main problems plastics may help to solve are the survival of young transplanted trees and the quality of fruits (sugar content).

5.1 Mulching of Young Plantations
(with and without drip irrigation).

5.2 Drip Irrigation of Orchards : guavas, mangos etc.

Experience acquired in similar situations, i.e. in semi-arid zones (Australia, S. Africa, California...) has shown that drip irrigated trees give fruits containing 3p.cent more sugar than furrow or sprinkler irrigated trees.

5.3 Olives

In addition to mulching and drip irrigation, which in preliminary trials at Marsa Matrouh have given very good results, plastics nets could be used for harvesting.

5.4 Strawberries

When improved after a few years, the sandy soil in Gianaclis should prove very favourable to strawberry cultivation on raised beds, drip irrigated and mulched. Trials however are necessary to establish the optimal size of the beds and first of all the type of PE film to be used for mulching : black, transparent (if soil sterilization is feasable) or white.

5.5 Bananas

Drip irrigation and mulching (transparent PE film) of new planted suckers. Compare fertilizing methods: farm manure and soluble nutrients distributed at low rates but semi permanently through drip irrigation systems.

6. VEGETABLES

Plastics, together with the use of selected varieties, of adapted fertilizers and of a sound pesticide programme, must contribute to achieve two main objectives :

- Increase the yields in quantity (for instance, the yield for tomatoes could be easily enough quadruple of the average actual 6-8 t / feddan) and in quality.
- Fill the gaps (shortages) in the production calendar :
  - tomatoes : mostly mid February - mid April (2 months) and also September - October.
  - Cucumber : mostly December - April (5 months) and also June.

For every experiment technical results will have to be completed with economical data to assess the real profitability of the proposed technique.

6.1 Tomato

6.10 Systems for transplants production

Trials will have to compare for each type of cropping (summer, "Nile" and winter) various systems or techniques for transplants or seedlings production :

- traditional : open air + (sometimes) wind breaks made of Arundo donax.
- unsupported covers: perforated PE film and non-woven materials.
- low tunnels covered with :
  - plastics film for summer tomatoes
  - plastics shading nets for winter tomatoes

  N.B. the effect of shading nets on the contamination by the whitefly Bemisia tabaci should be tested at the same time (in as far as the whitefly is present at W. Nubaria).
- plastics greenhouses
  - Standard tunnel type (natural ventilation) for summer tomatoes sown in January- February.
  - Fully conditioned type (equipped with an efficient cooling system) for winter tomatoes, thus allowing to sow in July-August for transplanting in September if need be under shade areas, and to harvest as early as February-March.

6.11 Mulching of Field Grown Tomatoes (with and without drip irrigation).

Trials will have to compare black, transparent and white reflective PE films in order to recommend the type best fitted for :

- the summer crop (transplanted March-April), when weeds are the main problem;

- the "Nile" crop (transplanted July-August), when special attention should be given to the effect of the plastics mulches on the occurrence of fungal diseases.
- the winter crop (transplanted October-November), when the repelling effect towards the whitefly of reflective mulch films (aluminised,or PE loaded with titanium white) should be closely observed.

6.2 Cucumber

6.2.1 Mulching

Trials at Kafr El Sheikh Faculty of Agriculture have shown that transparent PE films mulch allow to sow as early as the beginning of January and even the end of December, and to harvest in April in spite of a slow rate of growth.

6.2.2 Low tunnels

Trials have to establish if this simple protection will allow to sow in December and to start harvesting in March. Moreover, they will have to specify :

- the ventilation regime;
- the effect of plastics mulches (which reduce evaporation from the soil) in controlling excessive humidity under low tunnels and consequently in controlling the extension of fungal diseases such as Peronospora cubensis and Pseudomonas lacrymans

6.2.3 Greenhouses Cultivation

Standard tunnel-greenhouses (walk-in tunnels) are to be tested since they will probably bring a number of advantages :

- a more convenient management routine than low tunnels, which require much labour for ventilation and make disease control difficult because of the tightness and restricted volume;
- an earlier crop (January?) by advancing the sowing date to mid November;
- A much increased yield per m^2, the plants being trained on (PP) twins vertically.

6.3 Water melon

Results of trials using :

- transparent PE film for mulching,
- low tunnels, and possibly frameless covers, for 4-6 weeks after sowing,

- transparent mulch and low tunnel
  (with and without drip irrigation)
  should be compared on an economical basis with market prices paid for early water melons supplied from Upper Egypt in February.

6.4 Early Potatoes

6.4.1 Frameless covers

(perforated PE film and non-woven materials) to increase early yields.

6.4.2 Solar Sterilization of Soil

The treatment will be applied in Summer, for one month between mid June and mid August, in order to eliminate fungal diseases (Verticillium , Rhizoctonia, Sclerotium, Pythium...)and to control nematodes (at least Pratylenchus sp.).
Soil samples will be sent before and after the treatment to laboratories specializing in nematology and phytopathology, for analysing. Moreover, evaluation of the production (weight, quality...) will be made to compare solar sterilized plots and non sterilized plots.
N.B. The technique of soil solar sterilization could also be tested for other crops sensitive to soil borne pathogens such as tomatoes and onions.

7. RURAL DEVELOPMENT
(of small holders: 122)

7.1 Water Storage

Through demonstration and leaflets, the experience acquired in (31) could be shared with small holders.

7.2 Family Gardens

The same applies to experience gained in (6).

7.3 Sewage Water

PDC staff with the assistance of a specialized engineer, will have to study and develop a system to purify seepage water from the PDC station buildings. Plastics films could be used to line

the decantation tanks and PVC corrugated drain pipes to carry away the purified water for the sub-irrigation of amenity plantations. Extension activities (such as demonstrations and leaflets) will have afterwards to popularize the technique.

8. NATURAL EXPOSURE TESTS

Plastics films, sheets, nets, pipes, etc. will be exposed to natural ageing conditions at the PDC station :-

- either fixed on special frames (Annex V)
- or used in trials, and then exposed not only to solar radiation,but also to the effect of water vapour and/ or of water flow, of agricultural chemicals (fertilizers, pesticides), of mechanical and thermal constraints, etc.

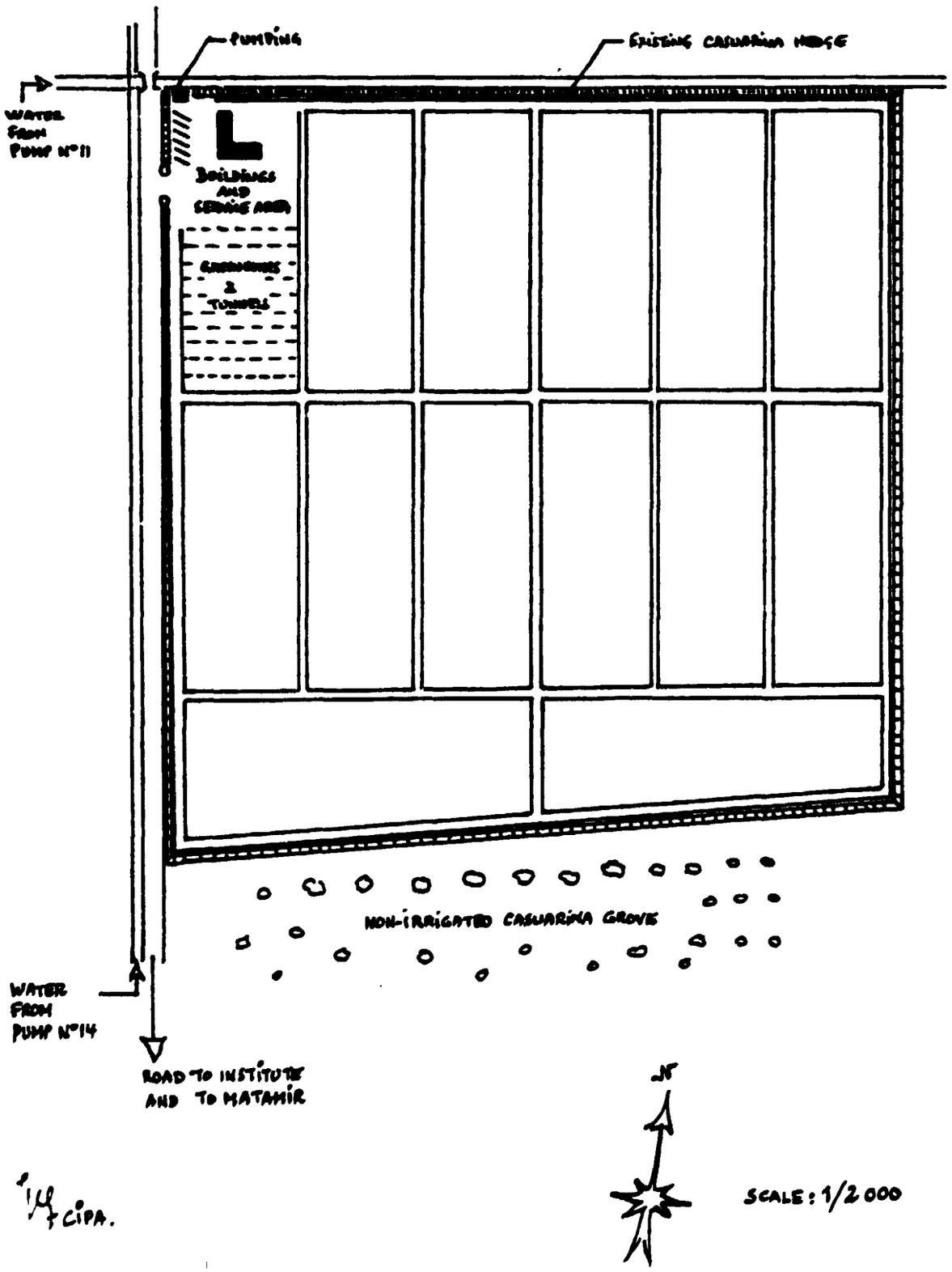
Samples duly identified will have to be regularly taken and carried to the PDC technology laboratories for testing according to standardized (ISO) methods.

9. ENGINEERING

Studies will have to be made, generally in collaboration with relevant Institutes and Research Centres (i.e. the Engineering and Industrial Development Centre, Pyramids Institute), to adapt designs to local conditic develop construction systems both efficient a cmical: hoops for low tunnels, structures for tunnel greenhouses, multi-span greenhouses and poultry houses, cooling systems, overhead tank fed systems for drip irrigation, laying machines for mulching, etc.

It is to be noted that locally made greenhouses structures still poorly designed and made of non galvanized iron parts, are rather expensive (3 EP/m^2).

PDC FIELD EXPERIMENT STATION FOR PLASTICULTURE ANNEX II



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ANNEX III

MISSION TO EL GEDIDA MINES

The Egyptian Iron and Steel Company, (Baharia Oasis).

From 17 to 19 October, 1982.

Mr. Abdel Khalek Soliman) PDC
Mr. Bahgat Moussa)
Mr. Parthasarathy) UNIDO Consultants
Mr. J.Cl. Garnaud)

1. INTRODUCTION

At the suggestion of the Minister of Industry, a contact has been established between PDC and the Egyptian Iron and Steel Company. The PDC is requested to assist the El Gedida Mines Branch in improving water management and cultivation techniques for food crops as well as for forest and amenity plantings.

The El Gedida Mines are located near the Baharia Oasis, about 750 km. from Alexandria.

The mission took advantage of the presence of Mr. Parthasarathy, UNIDO Consultant (India), water management specialist, and of Mr. J. Cl. Garnaud (France), UNIDO Consultant for Plasticulture. The mission arrived on Sunday 17, 1982 late at night and departed on Tuesday 19, in the afternoon.

2. VISITS

2.1 El Gedida Settlement

The development of this new community started in 1973. The objective was to create a pleasant and green environment in order to encourage technicans and workers to settle near mines with their families. The population actually has risen to 3,000 (of which 900 miners).

1 well, 350 m. deep, pumping from 40 m (because of insufficient pressure).

The objective has been largely achieved thanks to the help of the Swedish Medical Aid and above all thanks to the determination and efforts of the Company managers and staff.

75,000 trees have been already planted, mostly Casuarina and Eucalyptus (first phase). The final programme includes 1 million trees.

Moreover, each family has its own plot where various vegetable and fruit trees are cultivated, all contributing to improve the environment. It is to be noted that sugar-cane cultivation, till now unknown in the Baharia area, has been successfully introduced by workers from Upper Egypt.

Other items developed at the Gedida includes also :-

- A nursery for the propagation of tree transplants and ornamentals.
- A magnificent rose garden with a restricted but very interesting botanical garden.
- A rabbit farm of 24 mothers

2.2 El Sadat Farm

80 feddans reclaimed near the mine excavation, start 1976.
1 well, 800 m deep with a pumping station, 80-100 l.h.
Essentially devoted to fruit production: oranges (3 feddans), grapes (6 fed.), Guyava (2 fed.), Pears (3 fed.), abricots (3 fed.) with vegetables and alfalfa.

Main Problems

- Wind damages
- Root asphyxiation, especially on apricots, possibly due to silting and clogging caused by flood irrigation and aggravated by iron excess (consumption of 02); suffering plants are more prone to diseases and wilt.

2.3 El Harra Pilot Farm

200 feddans located south, between two hill ranges and to be reclaimed as a first phase. The FAO supported project intends to facilitate the settlement of older workers after retirement and to improve the food supply in the area.

2.4 Baharia Oasis

4 villages, 4 artesian wells (one with an output of 1 million m^3/year providing for 700 feddans). According to each village water rules, each plot receives water every 20 days for 2 days; this prevents the cultivation of vegetables under the palm and olive trees as it is done in the oasis of south Tunisia or Algeria.

3. OBSERVATIONS

Within the last 8 years, tremendous advances have totally transformed the landscape in the Gedida Mining area and desert has come to life. There are still difficulties to overcome in order to extend the green belts and to improve the food supply in quality, if not in quantity.

3.1 Wind is probably the most important limiting factor. Prevailing winds come from the North, but the most redoubtable winds (Khamaseen) coming from the South, SW and West may exceed 80km/h. in velocity and are loaded with sand. Such winds have very depressing effects on plants, both by provoking mechanical damages and by intensifying the evapotiausperation (and consequantly water losses).

3.2 Weeds compete severely with cultivated plants in every location.

3.3 The water supply seems for the time being plentiful but large quantities are spoiled especially by seepage in channels used for water transpcrtation from the wells to the fields.

3.4 The cropping calendar does not exactly fit the population requirements. For instance, at this time of the year, there was an over production of aubergines while tomatoes and onions were in short supply.

4. RECOMMENDATIONS

Plastics would certainly contribute to solve these problems.

4.1 Protection against the wind

It was suggested to make trials using

- Artificial wind breaks (Plastics nets or curtains made of Arundo Donax canes , or boos), about 1-1,50m high, to reinforce the protection inside the primary wind-break net made of natural hedges (generally Casuarina).
  Contrary to natural wind-breaks or hedges, artificial wind breaks are movable, th us allowing machine preparation of the soil and exerce no competition at root level for water and nutrients.
- Plastics net sleeves to protect individually young trees after planting out, both from wind and sand.
  N.B. Samples of a plastics net sleeve already extensively used in Saudi Arabia will be sent from France (Nortene) to Mr. Sayed Abdel RaziK.
- Plastics net Sand-barriers to stop the advance of dunes.

4.2 Water transport

Open channels spread seeds and rhizones of weeds. Transporting and distributing water through pipes and micro irrigation systems deliver a water free of weeds and, especially after filtration, free of pathogenic organisms.

4.3 Water management at El Gedida

Actually, all the sewage water released by the village and the mining works drains freely at the end of the collectors.

(which would surely bring salinity problems. [illegible] trees are to be planted as planned, means should be taken to recycle this sewage water. Plastics could be used for the lining of economical decantation/purification tanks.

It is advised to install two distinct distributing nets: one carrying well water for domestic and industrial uses and for the irrigation of food crops, the other restricted exclusively to recycled water from sewage for the irrigation of forest and amenity plantings. It would be unwise to use recycled water, still containing impurities, salts and possibly heavy metals, to irrigate crops intended for human or animal consumption.

In both cases, for the irrigation of forest and amenity plantings (recycled water) and of food crops (well water), drip irrigation would procure considerable savings of water, in the order of 30-50 p.. cent.

By using this technology and also recycled water, the area irrigated with the same amount of water could easily be doubled.

4.4 Water management at Baharia Oasis

The use of pipes for water transportation (or at least the lining of the channels) and the use of micro-irrigation systems could allow to give water to each plot at least every 3.4 days instead of 20 days. The farmers could then afford to establish a strata of low-growing crops (vegetables...) under the shade of the palm trees.

4.5 Protected Cultivation

In conventional desertic zones, far from the moderating influence of the sea, the range of daily temperatures is much wider, with sharp drops or rises. This is still more evident at El Gedida, which lays on the plateau 70-100 m higher than the Baharia Oasis. As a first step, it is proposed to improve the production of tomato seedlings by protecting them with :

- Low tunnels (covered with transparent PE film) in the Winter, for the Summer season.
- Shade areas (covered with plastics not laid upon the hoop previously used for low tunnels) in August, September, for the Winter season.

If the trials demonstrate that the techniques need too much labour for a proper ventilation (because of the differences in temperatures between day and night, the tunnels will have to be disclosed every morning and closed in the late afternoon), or procure an enviroment still too cold in the Winter and too hot in Summer, a fully conditioned greenhouse might be necessary at least to start the

Trials made at Nobaseed Co. and at Kafr El Sheikh Faculty of Agriculture will indicate the varieties best fitted for Winter and Summer cultivation.

4.6 Nursery

As demonstrated at W. Nubaria, Casuarina germination rate is easily raised from 50 - 60 p.cent when seeding is done under a simple tunnel-greenhouse.

4.7 Mulching

As a first step, and because of the cold nights, it is suggested use transparent PE film to mulch young plantings of banana suckers,, in order to encourage rooting (together with drip irrigation and selected disease free clones).

4.8 Poultry

A plastic structure of the type being developed by the Faculty of Agriculture Alexandria and the PDC could be added to the existing "rabbit farm".

4.9 Fish Farming

The PDC could advise on lining techniques for the economical construction of reservoirs, the techniques being much the same as those used for canals or water tanks.

5. CONCLUSIONS

The visits, the discussions and especially the short lectures illustrated with slides that Mr. Parthasarathy (on the use of plastics in water management: Canal and reservoir lining, drip irrigation) and Mr. Garnaud delivered on the evening of October 18, 1982, reinforced the interest of the Egyptian Iron and Steel Co. for the use of plastics in water management and horticulture. The two UNIDO Consultants insisted that pilot trials be made before generalizing any system; this applies particularly to the El Harra Project. The implementation of the recycling plant for sewage water will probably request a special consultant.

The mission would like to express its appreciation of the kind hospitality offered by the Egyptian Iron and Steel Company, and of the help and assistance of its managers and staff, especially Mr. M.A. Abdel Kerim, Vice President, Sayed Abdel Razik, Director and the faithful Mr. Abdallah El Hamza.

SUPPLIES DONATED TO PDC

BY THE FRENCH COMMITTEE FOR PLASTICS IN AGRICULTURE

1. Materials and equipment

1 kg shading paint for greenhouses (Ombraflex, Jefco)

1 kg vinyl acrylic protective paint for agricultural plastics (Agriplast, Jefco)

1 special roller to apply the protective paint on the covering film, above the frame elements (Jefco)

1 heat perforator (Ets Fillières) equipped with

1 case Ø 50 mm

1 case Ø 80 mm

1 case Ø 150 mm

2 seedling trays made of expanded polystyrene (SOCAR)

1 PE net sleeve or individual wind-break for trees (Nortène)

1 adhesive tape for transparent PE films (Rubacol, made by Novacel)

1 adhesive tape for black PE films used in canal lining (Adhesive Tapes Ltd).

2. Litterature

1 Plasticulture, a choice of reprints of Plasticulture, journal of CIPA (Indian Petrochemicals Corporation ed.).

1 Guide de l'utilisateur des plastiques en agriculture

1 Les plastiques en agriculture, Colloque national d'Hyères, 1976

1 Catalogue officiel Europlastique 82

1 Dépliant du Centre d'étude des matières plastiques, Paris, 1982

1 Les matières plastiques : propriétés, applications, fabrication, transformation, ICICA, Paris, 1982
16 slides and a lecturer booklet giving a broad picture of plastics and of their applications in modern economic activities.

ANNEX V

L K T - T G M

13th UNIDO In-Plant Group Training Programme in the Field of Plastics Technology, Austria 1982

LIST OF THE PARTICIPANTS

Group	Name		Country
A	MD.HABIBUR	Rahman	Bangladesh
	CHONDHURY	Abu Muhammed Sham-Suddin	Bagladesh
	KHAMEES	Khaled	Egypt
	SHAALAN	Muhammed	Egypt
	PIN HARRY	Lee Kee Poo Jacob	Mauritius
B	YIFRU	Fikre	Ethiopia
	KAFOTEKA	Bryson	Malawi
	GUPTA	Arun Kumar	India
	SAXENA	Sanjay Kumar	India
	BALDACCHINO	George	Malta
C	REGO	Jaime Pinto	Mozambique
	MUNDIA	Alouysius Y.	Zambia
	DESULME	Jean-Marie	Jamaica
	AGUILAR	Carlos E.	Argentina
	MLEMBE	Rajabu K.	Tanzania
D	KHANAL	Arun Kumar	Nepal
	JAYAMAHA	J.H.T.	Sri Lanka
	HAJI ABATI	Shikey	Somalia
	Diague	Papa	Senegal

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