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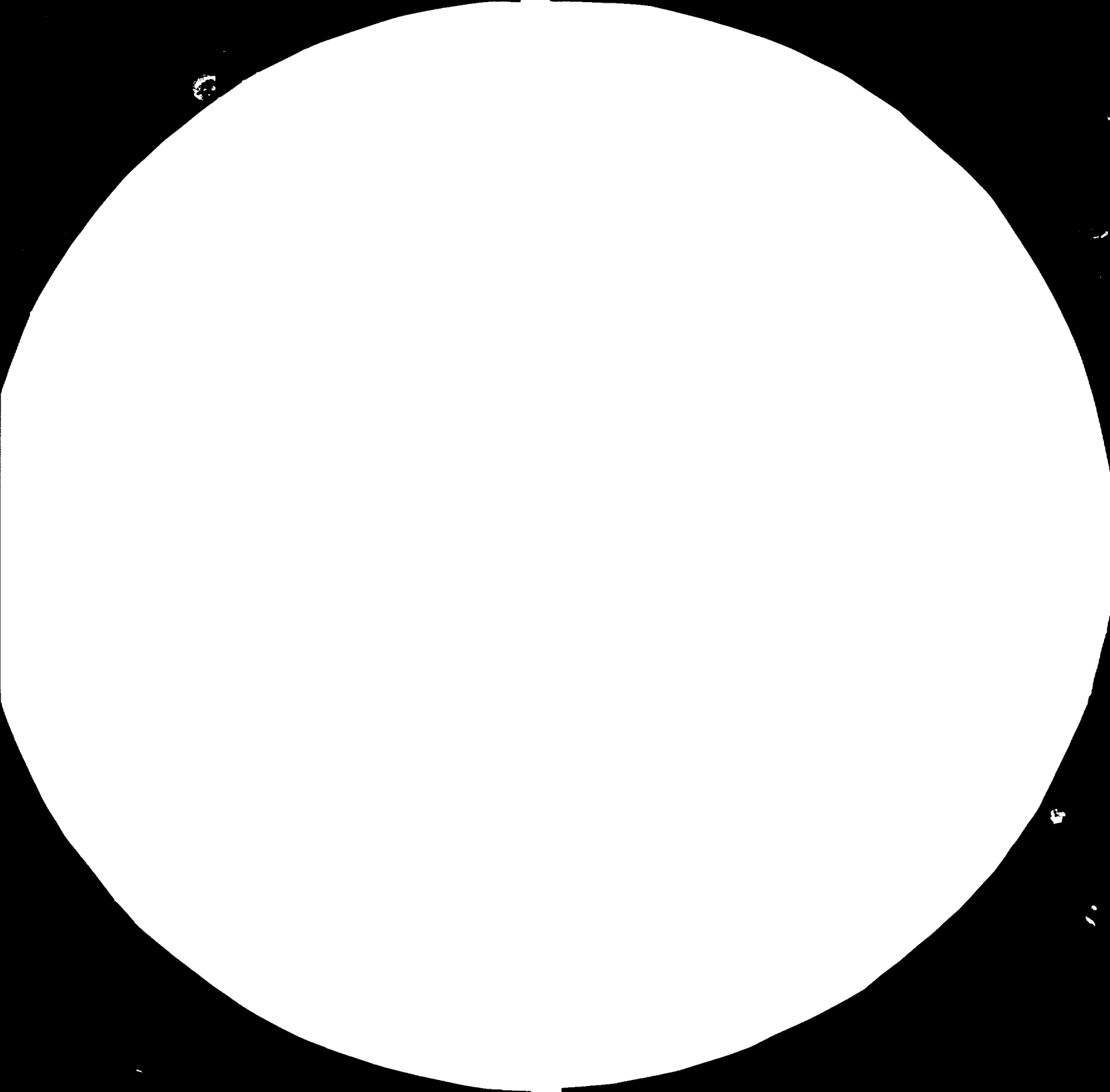

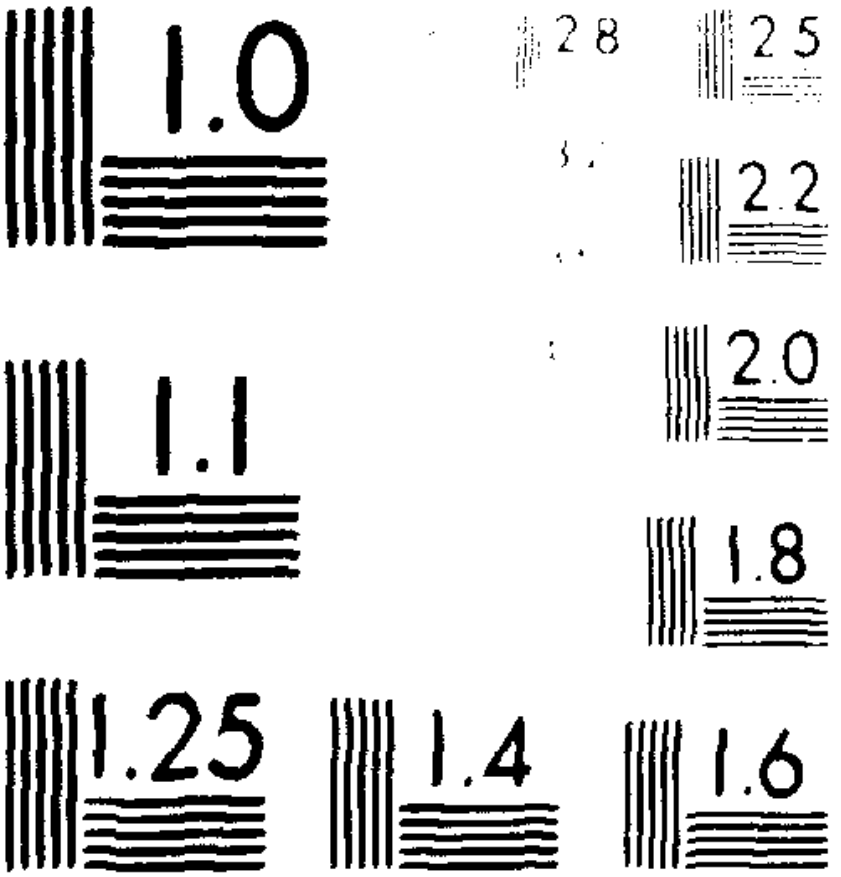
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Egypt. FINAL REPORT. Use of plastics in irrigation.

UNIDO

DP/EGY/77/004/11-02R

RETURN MISSION 2 - 21 DAYS FROM 30TH SEPT. '82
TO 20TH OCTOBER '82

PREPARED BY:

M. PARTHASARATHY, B.E., F.I.E. (Ind); F.P.R.I. (Lond);
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PLASTICULTURIST attached to

P.D.C., ALEXANDRIA

(EGYPT)

MISSION PROGRAMME:

1982		
30th Sept.	Thursday	Left Madras by Indian Airlines via Bangalore for Bombay.
1st Oct.	Friday	Left Bombay for Cairo via Dubai - Reached Cairo & settled in Nile Hilton.
2nd Oct.	Saturday	Briefing visit to UNDP; took Super jet Bus at 16-30 for Alex & settled down at Cecil Hotel.
3rd Oct.	Sunday	Delivered all samples from India for Drip. Discussed with Dr. Abu Zeid & Mme. Nossier detailed programme.
4th Oct.	Monday	Discussions at P.D.C. Alexandria.
5th Oct.	Tuesday	Mersa Matrouh with Dr. Abu Zeid & Mme. Nossier; Drip Irrigation installation on Olives; Tank lining visits and discussions with Governor Mr. Allam was not available - Returned to Alex. by night.
6th Oct.	Wednesday	Holiday
7th Oct.	Thursday	Visit by Egypt Water Use & Management Project to P.D.C. - Discussions & fixed plans to visit Khafr El Sheikh on 12th Oct. Also started preparations for "PLASTICULTURE" on top of P.D.C. garage.
8th Oct.	Friday	Holiday.
9th Oct.	Saturday	P.D.C. fixed programme to visit Helwan on 10th; Prepared a detailed note on Tank lining job at Mersa Matrouh, taken up during my earlier mission.
10th Oct.	Sunday	Left Alex at 5-30 A.M. fo Cairo and Helwan with Mme. Nossier. Visited effluent canal site & discussed problems of Beharia Oasis with Mr. Karim, Vice President of Egyptian Iron & Steel Co. - Returned to Alex late night.
11th Oct.	Monday	Further discussions on PDC Garage Roof Garden; Gave full details on Canal Lining Seminar in New Delhi on Sept., 10th. Copies of papers presented and the note prepared by Indian National Committee on Plastics in Agriculture.
12th Oct.	Tuesday	Visited Khafr El Sheikh with Dr. Abu Zeid & Mme. Nossier. Usuful discussions with Egypt Water Use & Management Project personnel on collaboration with PDC & visits to problem sites for possible help from PDC. Returned to Alex late night.
13th Oct.	Wednesday	Preparing visit reports for follow-up by PDC - Discussions with PDC staff.

14th Oct.	Thursday	Preparing visit reports for follow-up by PDC - Discussions with PDC staff.
15th Oct.	Friday	Holiday.
16th Oct.	Saturday	Visit Egyptian Plastics Co. - Dr. Garrana with Dr. Abu Zeid & Mme. Nossier. PDC roof garden work was continued & full instructions given to complete the work.
17th Oct.	Sunday	Left for Cairo & met Dr. Wahby, Director for Egyptian Water Use & Management Project - called on UNDP & left for Beharia Oasis along with Mr. Garnaud & PDC staff and reached late night.
18th Oct.	Monday	Visited sites, Sadat Farm, Oasis in the evening. Arranged a slide show for the Vice President and staff of the Iron & Steel Co., with useful discussions.
19th Oct.	Tuesday	After a few more visits, left for Cairo & got dropped at Criza Holiday Inn. Reached Airport for departure to India late night.
20th Oct.	Wednesday	Reached Bombay and connected Indian Airlines flight to Madras same evening.

F I N A L R E P O R T.

INTRODUCTION:

The third mission had been discussed during my second in July and Dr. Abu Zeid at P.D.C. had felt that a larger representative section of crops and soil and weather conditions should be covered by Drip Irrigation installations and also some more canal & tank lining efforts would get speedier acceptance of the technology. On the earlier two missions, contact with officials in the Irrigation Ministry as well as liaison with Irrigation research workers could not be established. Work by P.D.C. in isolation would be least effective and so this mission was organised to make up for the shortfall in the earlier missions.

THE MISSION:

Apart from the very valuable visits arranged by Dr. Abu Zeid as per visit reports 1 - 5 enclosed, the effective steps for P.D.C. to take, to quicken the pace of acceptance of these new technologies in Plasticulture, could be planned during this mission. The steps discussed with Dr. Abu Zeid and Mme. Nadia Nossier are:

1. The mere lining of a small field channel in West Nubaria hardly does any justice to the combination Polythene lining concept which is so very imperative for Egyptian Irrigation conditions.A more impressive large channel lining has to be done urgently in complete co-operation with the Irrigation Ministry and the Research Wing of that Ministry. The earliest opportunity should be taken to arrange the lining of a big canal with complete arrangements for discharge measurements etc., to prove the efficiency of the technology.

2. The Indian National Committee for Plastics in Agriculture organised a National Seminar in New Delhi on the 10th September 1982. This was addressed by the Indian Minister for Irrigation and the Minister for Energy. The Ministries had ensured the participation of four or five Irrigation Engineers from from each State with all the Chief Engineers in charge of Irrigation pooled together from the States. There were some 300 Irrigation Engineers gathered in Delhi for this seminar. The Minister asked all the State Irrigation Engineers to thrash out all the technical problems during the whole day proceedings and the Union Secretary for Irrigation sat through to see that no State Irrigation Engineer went back to his State with any doubts about the benefits of this technology. With all the World Bank aided projects in India being asked by their experts to adopt this technology, each State has now gone, after the seminar, for massive purchases of film (Black LDPE film 240 microns). Tamil Nadu State alone has tendered for about 750 tons of film for canal lining.

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I delivered to P.D.C. the papers presented at this Indian Seminar as also a booklet on the state of the art in India released by the Indian National Committee on the occasion. I have suggested to P.D.C. to organise, as early as possible, a similar get-together of all Engineers in Egypt connected with Irrigation with active support and participation of the concerned Ministers. Only such a step (which can be an excellent opportunity to clear any doubts amongst Irrigation Engineers) would quicken the adoption of this technology and benefit the economy.

3. In regard to Drip Irrigation, its effectiveness under all the diverse soil, water and climatic conditions in Egypt were discussed with Dr. Abu Zeid and Mme. Nossier. It can prove most beneficial in all situations. Heavy and impervious soils as well as totally sandy soils, saline water and very particularly when water availability constraints limit the area and crop type etc., etc. While very meagre and superficial attempts only have been made so far, P.D.C. should undertake extensive coverage under a variety of conditions. System design and erection are a relatively simple problem when dealing with areas upto a feddan or two. For larger areas, the system design could be complicated and would require training and further specialisation for designing. It would be some risk to attempt large areas without adequately calculating the components like pipe network diameters and positioning in the field, corrections for change in contours etc. Any private Industry taking interest in a "slow growth" application like Drip installation and taking the pains to train technicians for system design or installation is not very likely for quite some time to come. It would therefore be very necessary for P.D.C. staff to be well trained, at least to the extent of establishing a large number of small installations very correctly to prove the usefullness of the technology. This problem of getting private industry to develop and tool up for producing acceptable quality Drip components indigenously is even more difficult. The off-take could be least tempting for quite some time to come. P.D.C. pilot plant could attempt some of these components and get the confidence to recommend them to the industry by stages. Quality of each component should be fully ensured. Automated Drip Irrigation systems working on high pressures could become quite expensive and would be difficult to adopt for Egypt, particularly in terms of eventual indigenisation, design complication and development of parts, fittings and pipes to suit higher working pressures. It would be important for P.D.C. to depute one of their staff to India to get trained on system design techniques for a minimum period of 3 months. I have suggested to P.D.C. to acquire from Union Carbide, Australia, a copy of "POLYPLOT" for designing pipe diameters in a Drip Irrigation network.

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4. With the extreme necessity to conserve water from seepage losses and extending irrigation in desert areas, increased use of P.V.C. rigid pipes should be attempted. Every few kilometres along a canal in the deserts, water needs to be pumped to a higher level to reach out to larger command areas. Canals as a system of conveying irrigation water under such conditions and in highly porous soils, needs to be rapidly changed to pipes. Also distribution pipe network can improve water use efficiency. In the highly saline soil conditions, prevalent almost all over the country, metal, asbestos, cement and other pipes for irrigation or drinking water supply or sewage should all be changed to the more lasting, economical and efficient (friction loss of head in P.V.C. pipes is minimum) P.V.C. pipe system. In India, the rate of growth of P.V.C. pipe consumption, is a clear indication of the advantage over other pipe systems. It has reached from 6 to 800 tons/annum 5 years ago to 30,000 tons last year and the estimated pipe requirement in the next couple of years would exceed 100,000 tons. While a similar situation is developing in many other countries in the world, the economic conditions in Egypt is very similar to India and so what happens in India would be quite relevant to Egypt, to serve as an indicator for future development.

With this background, I have suggested to the P.D.C. Director to arrange for a proper tie-up between a reputed local industry and a reputed, International P.V.C. pipe system manufacturer so that very soon Egypt could make available to the economy, a reliable P.V.C. pipe system in various sizes with full fittings, all made to standard specifications. Some newspaper cuttings I obtained during my short stay, strongly justify such a step. This was readily appreciated by Dr. Abu Zeid and a meeting was arranged between (1) Dr. Garrana, Chairman, Egyptian Plastics Company (2) Director, P.D.C., (3) Mme. Nadia Nossier and (4) the writer (M.Parthasarathy). This discussion was very constructive and as a result, I sent a telex to WAVIN BV of Holland who has done an excellent job in India to introduce, promote and lay down proper standards for the country over the last 15 years, by participating in a very successful joint venture. Dr. Garrana would be establishing this contact and I feel this is a step in the right direction.

5. PLASTICULTURE DISPLAY ON P.D.C. GARAGE ROOF:

From the time of my first mission in Dec. '81 - Jan. '82, I have been recommending that on the roof of the garage in P.D.C., a small demonstration should be organised as low tunnel roof garden. At that time, civil construction was still going on and so nothing concrete could be taken up. During my return mission in July, I gave details of this proposal and it was approved by Dr. Abu Zeid since it would be a very good show-piece for P.D.C. to illustrate to visitors

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the PLASTICULTURE concepts of LOW TUNNELS, MULCHING, DRIP IRRIGATION etc., all at the same time. During this mission I had the brickwork done for creating a trough which was lined with 200 micron black film. After filling soil into the trough, the same sheet was used to cover the top to form the mulch. After seephose was spread in a shallow level groove, the water-charged seephose was to be covered with sieved sand. On either side of the seephose, holes have to be punched in the mulch of 75 10 100 mm dia., in two rows to take the transplant. On the 1.5 metre bed, two rows of seephose would be established to serve 4 rows of vegetable transplant. Soft steel wire of 12 or 14 SWG was bent along template to serve as structure for the low tunnel and over these located approximately 1 metre apart, UV stabilised film would be stretched and anchored at both ends. Ropes tied to the loops in the wire structure would anchor the film spread to form the tunnel. Since the available UV stabilised film was only adequate to cover both sides from bottom, leaving a gap at the top, the tunnel would be of the type adopted extensively in California where the open gap at the top serves to ventilate the tunnel. I have suggested that the mulching layer of black film over the soil should be coated with lime wash in the initial stages to cut down excessive absorption of afternoon tropical heat from the sun. After the plant grows and castes its shadow on the film, this may not be necessary any longer. Also if the UV stabilised film forming the low tunnel is not masking the hot sun enough, the same lime wash can be applied, on it as well periodically. Dr. Farouk El Aidy could be consulted on plant to be grown, water and fertilizer inputs required etc. The soil to be filled in could be a mixture of some good local soil, sand and granulated polystrene foam scrap.

This work could not be completed during my stay for several reasons. Fortunately, Mr. Garnaud was available for P.D.C. as I was completing my mission. The P.D.C. staff have been given complete data on how to complete the job. With Mr. Garnaud's help, I hope P.D.C. can complete this very useful demonstration installation.

CONCLUSIONS:-

The relevance of Drip Irrigation Technology is as strong in the water satiated Nile Valley/Delta area as it is in the water starved Deserts, not to speak of its compelling need in the oasis and the Mediterranean coastal belt. The technical arguments that would favour the adoption of this highly result-oriented technology may be different for these different regions, yet, immense improvements in agricultural yields both in quality and quantity, are never in doubt in all situations.

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Massive propogation of the technology can control the ever increasing problems of water table build-up and salinity damage to crops while ensuring a bountiful crop. Any delay can only enhance these problems and deny the benefits of this technology to the farmers. The change-over to piped system of irrigation water conveyance and Polythene Combination Lining of canals are also imperative technologies for the conditions that prevail in the country. Even here any delay in extensive adoption of these technologies can only postpone the solution to the already proliferating problem of Food Security to the country.

HOME NEWS

French aid to farm projects

An agricultural cooperation agreement between Egypt and France was signed yesterday at the headquarters of the Ministry of Agriculture. The draft was signed by the Minister of Agriculture, Dr. Youssef Wali and his French counterpart, Mrs Edith Cresson.

The French Government will finance the feasibility study of a project to cultivate oil-producing plants. The project is to develop fish production in El-Bardawil Lake as well as agriculture in El-Nubaria, said an official source at the Ministry of Agriculture.

The protocol also provides for opening a branch of the French Agricultural Credit Bank in Cairo and for extending LE 1.5 million for the purchase of pasteurising equipment and agricultural machines, the source added.

Following the signing of the protocol the French Minister held a press conference. She said that President Hosni Mubarak was interested in moving towards self-sufficiency in food and he was also looking for solutions to Egypt's food problem.

The French Minister also announced that France would carry out a joint project with Egypt to improve the Egyptian breed of goat so as to increase milk and meat production.

The Minister praised the Egyptian farmers who had managed to cultivate a number of non-traditional crops such as soya beans and sweet-root using modern systems of irrigation and cultivation.

At the end of her speech, the Minister said that Dr Wali and the Egyptian agricultural delegation were invited to visit France to see French agricultural technology.

The French Minister left Cairo yesterday for Paris, winding up a four-day official visit to Egypt during which she was received by President Hosni Mubarak, the Minister of Agriculture and top officials at the Ministry of Agriculture. — MEN

The Egyptian Gazette Oct. 14th '82

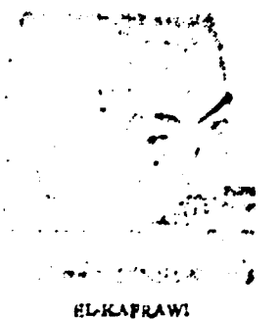
90 pc to get drinking water

Cairo and Alexandria's drinking water allocation will increase by three million cubic metres daily during the next five years after the two governorates implement their renovation and replacement projects said the Minister of Housing and Reconstruction, Mr. Hassanein el-Kafrawi.

The Minister pointed out that by the end of the five year development plan 1982-1987, drinking water would be available to 90 percent of Egyptians and remaining areas would be supplied before the year 2000.

Mr El-Kafrawi also said that in cities, the rate of water consumption would increase during this period from 60 litres daily to 120 litres daily per person and is expected to reach 200 litres daily per person by the year 2000 he added.

As regards the rural areas, said the Minister, that in 5 years time the rate of water consumption would reach 80 litres daily and 90 litres daily per person by the year 2000.



EL-KAFRAWI

A number of projects are now underway to increase the quantity of drinking water at various governorates, said Mr. El-Kafrawi. He added that a number of mobile water desalination units had been imported to provide people in rural areas with drinking water specially in the governorates of the Red Sea and Marsa Matrub.

On the subject of completed projects the Minister said that the expansion project of El-Maadi water station had increased the station's capacity by 40,000 cubic metres daily and that the expansion project of Rod El-Farag station has increased capacity by 100,000 cubic metres daily.

The Minister also said that the Ministry of Housing and Reconstruction had received $ 47 million from the United States to finance the expansion project of Rod el-Farag station, LE 20 million from the Federal Republic of Germany to finance the renovation of Embaba water station and $ 50 million from the World Bank to finance water projects in Behera Governorate. — MEN

The Egyptian Gazette 14th Oct. '82

Cairo's sewers

THE bursting of sewer pipes is now an all too common occurrence in any part of Cairo. This is hardly surprising in the light of the fact that the main sewerage system serving Cairo today was built in 1914 with a predicted life span of 40 years. It survived a further eleven years up to 1965 when there was a total breakdown and all Cairo was flooded with sewer water. A state of emergency was declared and a plan was drawn up. It was called «The Hundred Day Plan» and all resources were mobilised into action till once again Cairo's streets were clear of sewage water, except for the puddles which stank till they evaporated. Yet even this was only a temporary measure meant as a stopgap for three years. In fact it has lasted till today, and here we are fourteen years later waiting for another major catastrophe to wake us up.

Round about 1965 a major plan was drawn up to solve the sewage problem permanently by bringing the drainage system up to date. At the time this would have cost LE 50 million; today its cost would be LE 1,500 million.

To quote only one alarming figure, the present capacity of our drainage system, with all its additional «improvements», is only 1.8 million cubic metres whereas Cairo uses 2.5 million cubic metres of water daily and our sewer system has the extra burden of 200,000 cubic metres laid on it each day. And all the while Cairo's tower blocks are spreading and growing higher

The allocation of local funds for 1982/83 has allowed only LE 40 million towards renovating Cairo's sewers. This would mean that the major improvement plan would take 30 years to complete and that is assuming that world prices remain constant.

So far we have been lucky in that no major epidemics have broken out, but will our good luck last forever ?

in animal breeding.

STRAWBERRY OUTPUT

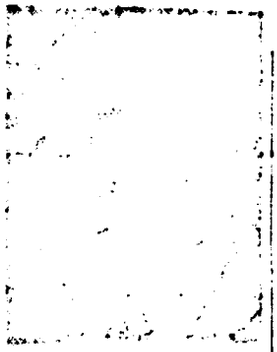
THE revenues from strawberry exports equal the money spent on wheat imports according to the Minister of Agriculture and Food Sufficiency Dr Yussef Wali. More than 1,000 feddans are to be cultivated with strawberry besides the existing 25,000 in order to increase the output of the harvest and boost exports.

The Egyptian Gazette 6th Oct '82

The Egyptian Gazette
3rd Oct. 82

The Egyptian Gazette
WATER 13th Oct. 82

WORK has started in Mahalla el Kobra on the installation of the new water pipe network to overcome the shortage of drinkable water in the city. The new network will be linked to the newly opened water station. The project is expected to cost LE five million said an official source at Gharbia Governorate yesterday.



YUSEF WALI

Growing farm co-operation with France

Means of boosting agricultural cooperation between Egypt and France were discussed at a meeting yesterday between the Minister of Agriculture and Food sufficiency, Dr Yusef Wali, and the visiting French Minister of Agriculture, Mrs Odette Greason.

Mrs Gresson arrived in Cairo yesterday, leading delegation on a four-day visit to Egypt. In an airport statement, the French Minister said she would discuss with Dr Wali French aid in carrying out agro-industrial projects and setting up factories for the manufacture of tractors.

France will extend a LE 60 million grant to Egypt to finance agricultural and food imports as well as setting up plants for edible oils fish and livestock farms she said.

The meeting also discussed the possibility of setting up joint ventures for the cultivation of sunflowers to produce oils and fodders. It also dealt with establishing dairy factories and laboratories for the manufacturing of veterinary vaccines as well as developing fishing in communities.

French private participation in joint ventures with Egyptian companies to cultivate some areas in West Nubaria with non-traditional crops was also discussed. — MEN

such as storageand cooling facili- MEN GSS

World cotton body to meet here

MINISTER of Economy and Foreign Trade Dr Mostapha el Said has said that the holding of the 41st week-long session of the International Advisory Committee on Cotton on Monday in Cairo was of particular significance to Egypt as one of the largest cotton producing countries in the world.

Egypt alone he said was responsible for half the cotton production of Africa and approximately 3.5 per cent of world production. Furthermore 25 per cent of the world's superior long staple cotton was grown in Egypt he noted.

Despite a 15 per cent reduction in world cotton prices the Egyptian Government Dr el Said stated will keep local purchase prices unchanged and seek to increase output to meet growing foreign demand. The country's five year plan he said had made larger investment appropriations for the spinning and weaving sector.

Dr el Said pointed out that the Committee was an International Organisation established in 1938 with the object of creating ties of cooperation among countries concerned with the cultivation and consumption of cotton. MEN

the end of 1983. — GSS

Pulse production to increase

SIXTY thousand tons of beans and 180000 tons of lentils are to be imported the Minister of Supply Mr Ahmed Nuh said. He affirmed that local production would increase next year and that 10000 tons of sesame would be exported.

The Minister added that 1.2 million tons of flour would also be imported. He also said that the production of macaroni would be increased a lot. El Sua factory will increase its production to 150 tons daily and Amun factory will increase its production from 25 tons to 55 tons daily. Mr Nuh pointed out that the new macaroni facory in Ismailia would start work this year and ould produce 30 tons daily. — GSS

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The Egyptian Gazette 15th Oct. 82

Sinai reconstruction planned

THE Higher Committee for the Reconstruction of Sinai headed by the Prime Minister Dr Fuad Mohieddin yesterday discussed the plans for the reconstruction of Sinai which aims at linking Sinai to the Nile Valley.

Minister of Cabinet Affairs and Administrative Development Justice Adel Abdel Baki said that the committee had agreed to form a national Authority for the reconstruction of Sinai. This would execute the reconstruction strategy in stages and coordinate between the Local Councils of North and South Sinai.

The Committee has also discussed the studies prepared by Ministers of irrigation and Reconstruction about following up water projects in Arish and Rafah. The study looks at ways of using the wells for agricultural purposes. — GSS

The Egyptian Gazette 15th Oct. 82

LE10.3m Helwan sewer project under way

THE Minister of Housing and Reconstruction, Mr Hassan el-Kattawi yesterday announced that the execution of Helwan Sewerage project has already begun and that the project is expected to be completed within the coming five years.

The scheme which will cost LE 10.6 million includes the establishment of a main sewerage network as well as a collateral one in the areas of El-Maasara and Helwan. The project also includes the establishment of three sewerage stations between El-Maasara and El-Tebbin a distance of 25 kilometres to purify the effluent the Minister pointed out.

In addition a purification station will be also set up in Helwan with a capacity of 350(M) cubic metres daily to be increased later to 550(M) cubic metres daily he said.

The purified sewage will be used for the irrigation of a large area of land to be reclaimed at Helwan and the excess water will be transported via an underground canal to be established between Helwan and El-Mohamdiya drainage canal on the west bank of the Nile.

The Minister also said that a number of European sources have agreed to participate in financing the project. The Italian Government will extend LE 40(M) and the Dutch Government will extend LE 24(M) and the European Fund will extend LE 24.5(M). — MEN

VISIT REPORT I 5th Oct., '82.

Mersa Matrouh Water Storage Tanks Underground.

Persons met: (1) Dr. O. Abu Zeid, Director, P.D.C.
(2) Mme. Nadia Nossier.
(3) Mr. M. Parthasarathy.
(4) P.D.C. Staff Mr. Khallek etc., and
(5) His Excellency the Governor of Mersa Matrouh.

INTRODUCTION:-

The Governerate is largely arid zones with very poor water resources. The soil is mostly sandy and porous. Agriculture under such adverse conditions is a challenge and the conventional, age old practices have kept the total area under cultivation severely restricted and evenin the restricted areas, yields are generally very poor and the farmers are severely exposed to crop vagaries based on water availability. The sand dunes along the sea coast, hold back salinity ingress from the sea to a great extent, although, if you go deep enough into the soil, salinity will show up. The annual rainfall averages 12.5 mms., in the area. This valuable precipitation which is the only fresh water source is restricted to only a few weeks in the year. The terrain and soil conditions are such that unless good water harvesting technologies are adopted, much of this valuable fresh water drains into the sea. Urgent and massive steps both on the water harvesting side and the optimised, efficient and economic use of this water in agriculture are called for.

Present Practices:-

Many farmers in certain select areas (where the rainwater has percolated and forms a distinct fresh water top layer over the saline water table) dig up open wells upto 5 metres deep and carefully pump up the fresh water layer only. The rate of pumping and the period to which irrigation is possible is thus severely restricted. In all such locations, change over to drip irrigation practice could increase the area of cultivation 3 to 4 fold and an assured excellent yield in all this extended area is possible. The rainfall is so intense and concentrated that surface run off takes away very large quantities into the sea. From time immemorial, practices like construction of dykes with stone and cement and establishing underground water storage tanks which could fill up whenever flow is impounded by these shallow dykes have been extensively adopted in this area. The period for which this water would stay in these tanks after allowing for the inevitable seepage loss, would largely depend on the efficiency of construction of these tanks. It is needless to say that the longer it holds water without seepage loss, the more it serves agricultural irrigation requirements. There are two types of construction adopted to establish these underground tanks and these are chosen in any location only on the basis of the type of the soil. In hard sandstone or similarly consilidated soil conditions, the old Roman technology of scooping out a small vertical hole and extending the bottom of this hole into a large horizontal tank of several square meters area and deep enough to form an adequate storage volume is done by hand labour, specially trained for this. The scooped out surface, whenever necessary, is additionally coated

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with cement or similar surface impervious treatment. Such tanks have existed for thousands of years and they are quite inexpensive. Where soil is loose, the tanks are constructed with brick in cement after excavation and the top is closed with R.C.C. roof slab, leaving openings for both charging with water and for pumping out.

Plastics Technology for this application:-

Low Density Polyethylene film is a perfect water barrier and has been extensively used in Black wide width sheets as underlay in lining of water tanks and in the lining of canals for preventing seepage loss. If the sheet is spread without damaging it while laying and the brick in cement tank is constructed over the film spread in the pit, the tank becomes totally effective and seepage is fully controlled. Since the membrane is relied upon to prevent seepage, the construction of the tank walls, the cement and ratio used, the plaster can all be of a very inexpensive and inferior type and large economics are possible in this regard. The excavation of the pit has to be geometrically correct and the surfaces smoothened out to prevent possibilities of film damage by sharp corners or projections. In fact a sieved sand cushion is desirable as a sandwiching layer on both sides of the film before brick work is commenced. This technology, however, is not applicable to the Roman type of tanks.

It is important to end this note by expressing my appreciation of the excellent way the staff of PDC headed by Mr. Soliman Khalek could quickly grasp the technique and actually implement a major portion of the job after I left the scene at the expiration of my short mission.

VISIT REPORT 2.

10th October 1982.

EGYPTIAN IRON & STEEL CO., HELWAN.

Persons met: (1) Mr. M.A. Abdel Kerim, M.Sc., Vice President.
(2) Mr. Aly A. Fahmy El Ganainy, Engineer, Chief of Iron Making.

INTRODUCTION:-

The Steel Company has been seeking the help of PDC, for solving two major problems:-

(a) The effluent channel which drains into the Nile gets severely choked with extensive growth of weeds and heavy silting of suspended solids in the effluent, resulting in heavy breaches, overflow into neighbouring land, roads etc., whenever there is a rainfall and the channel is unable to take this additional discharge.

(b) In their iron Ore open cast mining area in the Baharia Oasis, 320 km., from Cairo in the desert, water management problems and optimised use of water is considered essential and agricultural practices using furrow irrigation has to be urgently replaced by the highly efficient drip irrigation technology.

Effluent Channel:-

An open channel (Trapezoidal section) established to drain the raw effluent from a number of industries in the area runs approx. 4 km., with a total drop in level (to be verified) of 15 m., before it enters the right bank of the Nile in Helwan. The sloping sides are mostly lined with stones and cement pointing and the bed is unlined, approx. 20 m., wide. Complete cross sectional drawings are awaited. The discharge builds up with each industry draining its effluent along the line. The non-monsoon discharge itself could vary and this needs to be studied in detail. The type of industries which contribute to this effluent problem along the line are a steel forge, coal washery, chemicals etc., apart from the Iron and Steel industry which contributes very heavily to the solids and sludge in the flow.

The Problem:-

The fine solids which are largely discharged by the Iron and Steel Industry heavily silts up the bed of the channel, obstructing free flow and weeds (Arabic name "BOOS" - Latin name not known) grow uncontrollably and heavily, all along the length. As a result of this very heavy weed growth, the discharge capacity of the channel is severely reduced, making it imposible to cope up with rain water supplementation. The result is heavy overflow across the side bunds, water-logging in low lying areas and all the difficulties resulting from this situation like making the roads unusable in certain stretches etc. Since the sides have been lined with stone, mechanical equipment to deal with either the weeds or the silt cannot be adapted and human labour only has to be engaged making the effort, slow, tedious and expensive. Besides, efforts so far, to physically remove the silt and weeds have proved to be very temporary in effect. A more lasting solution is called for.

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Possible Solutions:-

1. The Iron and Steel Industry is the main contributor to the problem of solids in the effluent channel. Instead of spreading the problem to the entire length of the channel, it would be worthwhile to consider the establishment of a slit collection settling tank within the industry and allow only the clarified over flow from this into the effluent channel. The problem of desilting and weed control in the entire length of the effluent channel would then get relieved considerably.

2. Under normal total discharge conditions in the channel, the entire bed width of approx. 20 metres is wetted, resulting in severe drop in velocity of flow which is far below the "Silting Velocity" for the particle size of solids in the effluent. This results in severe and continuous deposition of solids on the bed and the flow tends to establish its own regime, amidst this massive build up of silt. With the entire flow passing through a very restricted area of the available large cross section, the rest of the silted area offers a very congenial situation for extensive and intensive germination and growth of weeds. In addition to the silt selting tank proposal in (1) above, the possible additional step to reduce the problem in the channel would be to reprofile the channel cross section. The velocity of flow is discharge divided by the area of cross section of flow. To increase the velocity to anywhere nearer "Scouring Velocity" would need a reduction in the area of cross section of flow. The present profile of the channel is a clean trapezium. Instead, if the profiling is done in two or three trapezodical steps he flow restricted to these smaller sections for lc arges, the velocity could be improved to levels wh ing does not happen anymore. This reprofiling would need careful hydraulic studies and calculations to make this effective under the various conditions that prevail in the present channel like bed slope, the need to increase the cross section with every additional effluent inlet along the line etc., etc. The services of the Research Centre of the Ministry of Irrigation would have to be pooled to make this scientific assessment and try out a revised profile of the channel. The bed also would then need lining.

3. The water table is by no means low, particularly in rainy season. Reverse pressure problems may arise only when channel is depleted at high water table periods. Any lining of the channel would need to keep this in mind at the design stage. The type of weed that is predominantly prolific is called "BOOS" in Arabic which is also common in marshes around Alexandria. Its root spread depth and whether the roots will penetrate low density PE black sheet will have to be studied. Based on these two studies, it is possible that a LDPE membrane underlay in the channel may help control weeds better by:-

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a) reducing root anchorage depth and so make it easier to dislodge it when it grows and

b) Maybe if the root penetration is severely restricted (such as when the membrane underlay is used) its growth gets stunted and so control measures may become easiler. It was told that a foliage spray of herbicide had very little long term effect, perhaps because of the strong and indestructible root system established by the weed, which revives after a lapse of time.

Suggestions:-

1. PDC should pool the resources of the Water Research Centre of the Ministry of Irrigation to make a joint study of the problem and its possible solutions.

2. A study of the behaviour of the particular species of weed with a LDPE film underlay and the over burden treatment to be adopted on the Helwan channel to be made by PDC, perhaps with the help of Dr. Farouk El Aidy from Kafr el Sheikh University.

3. Based on the consensus of a discussion PDC and the above two, a suitable technology should be evolved to try out (on an experimental basis) over a 100 or 200 metres length of the Helwan channel for assessment of performance over a year.

Conclusion:-

The problem of the effluent channel in Helwan is very severe and needs to be solved some day, somehow. Perhaps more than one trial may be found necessary. It is good for PDC and its image improvement to tackle such problems, but keep the client cautioned that these are only attempts based on some scientific approach and quick success cannot be assured in any sense.

The Drip Irrigation for Baharia Oasis is to be studied during the proposed visit on 18th October 1982.

VISIT REPORT 3.

12th Oct., 1982.

Kafr El Sheikh - Egypt Water Use and Management Project.

Persons met : From EWUP - Kafr El Sheikh

1) Mr. Ken Litwiller, Agro. Engineer
2) Mr. Abdel Fattah Metaweh
3) Mr. Ragy Darwish, Agro Economist *
4) Mme. Hoda Hussein, Agronomist * etc., etc.

From PDC, Alex.

1) Dr. O.A. Zeid, Director
2) Mme. Nadia Nosseir, Dep. Director
3) Mr. M. Parthasarathy, UNIDO Expert.

* These two visited PDC on 7th Oct., and the reverse visit was arranged during this visit.

Introduction:-

Large areas in the Delta region are facing acute problems of an uncontrollably high build-up of the water table and thiscombined with the cumulative build-up in salinity is rendering vast areas unsuitable for raising satisfactory crops. The black cotton soil is unable to drain any water downwards and besides at a depth of about 2 metres, there is an impervious barrier which forces all excess irrigation to stay behind and raise the water table from 1 metre to very often zero. Farmers who lift up unrestricted quantities of water, free of charge, using "Sakis" have tended to excess irrigate. Salinity build-up that has resulted extensively is also periodically leached by flooding and lateral displacement as no vertical leaching is possible. Land drainage is hardly effective in these heavy soil. Effective control of water table is the prime problem in the area.

Problems and Efforts made to solve them:

The 2000 feddans which is covered by the USAID project has an average holding of 1.5 feddan per farmer. The plentiful and free of cost availability of irrigation water has resulted in wasteful and excessive irrigation over centuries with water table raising and land drainage is least effective.

The EWUP has studied the many aspects of the problem in the area and done extensive work on levelling of land to improve the rapidity of irrigation (thereby reducing seepage contribution to the raise of the water table); rationalized and reduced "marwas" on the field by redesigning furrow lengths and configuration etc.

Possible Contributions from PDC to the Problems:-

Cracks in black cotton soils which develop each time the soil is wetted and allowed to dry results in heavy flow of irrigation water to rapidly raise the water table. Excessive and heavy flow in "marwas" is inevitable to enable water to reach out to furrow at the far end.

PDC can pointedly devote its attention to three alternatives which should be given field trials to assess its effectiveness in Kafr El Sheikh.

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1) LDPE Black Film Underlay for "Marwas":-

The ENUP reported some success with lining of "Marwa" with a thin black film they procured from Medical Packaging Co., last year. Apparently, the film was not to proper specification and it failed & developed extensive tare WITHIN a few months. Besides, the film had been laid on the surface, without any over-burden treatment. If one full length (100 metres) "Marwa" is excavated in steps and a 200 or 250 micron film of approx. 2 metres width is spread the whole length and covered back with soil to restore the "Marwa" to its original size, bed level and side bund profile, the seepage could be reduced to "nothing" and water would reach out to the farther end very rapidly.

The buried and completely covered film will stay and function effectively for many seasons as the "Marwas" are not disturbed when crops are changed.

2) The entire "Marwa" could be replaced by a layflat LDPE 350 to 400 micron tube of adequate width. This can be provided with outlet cups at desired places along the length. A similar concept has been tried by EWUP, but connected to the discharge of a pump and not the "Saki". The head available from the standard "saki" may not be sufficient. An improved "saki" is working in the area and such a "saki" may give adequate head for the system to work. The fittings like "T" or bend can be fabricated from Galvanized Iron sheets and used. The cups can serve also as plugs if the uncut cup is inserted where flow has to be stopped. The sample cups and leaflet coming from India give all the details of this technology. Depending on the discharge required in the furrow the cup bottom can be opened out to the appropriate step provided. These layflat tubes from 0.2 MFI, LDPE with 2.5% carbon black dispersion can be locally produced inexpensively and so are the injection mouldedcups. It may work out to be a fascinating solution to the water table control problems of the area. The method of opening out holes using a circular cutting tool after charging the line with water and inserting the cups are all described in the leaflet. If no regranulated scrap is added either to the layflat tube or the HDPE cup, produced from injection moulding grade of HDPE with 2.5% carbon black, they can last quite long, particularly when EWUP mentioned that there was little or no rodent problems in the area. Off season, these could be conveniently rolled up and stored.

The complete avoidance of the preparation of "Marwas", the very little space occupied by the layflat tube in the field and inexpensive (if produced locally with reasonable profits only) component involved, make this technology very attractive for conducting field assessments. The layflat width required, the static head to be created to make the system function satisfactorily, the numbers of furrows that can be fed simultaneously for a given "Saki" discharge etc., etc., have all to be worked out, optimised and standardised.

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There can be no better organization than EWUP to coordinate with PDC to do these trials.

3) Logically, the most effective way to control high water table problems is to adopt drip irrigation technology. However, in all the Kafr El Sheikh area, the cropping cycle involves paddy (Rice), wheat, maize, cotton and sometimes Alfalfa, sugar beet etc. Even row crop system of drip irrigation for such crops could be too expensive. EWUP have offered to try out for vegetable crops in their experimental station to feed PDC with data on drip irrigation effectiveness vis-a-vis high water table control problem. This would be very useful study if orchard crops irrigation is to be tackled in high water table areas.

Conclusion:-

It was a masterly step by Dr. Abu Zeid to establish contact, at the highest level, with a organisation like EWUP. The team in Kafr El Sheikh is a band of highly qualified and enthusiastic scientific workers of a variety of disciplines. PDC lacks expertise in a number of fields of specialisation like hydraulic measurements, calculations of irrigation and water use efficiency on the fields etc., etc. The collaborative efforts between PDC and EWUP can rapidly contribute to the adoption and propogation of "PLASTICULTURE" technologies in Egypt. Measurement of seepage in West Nubaria canal lining work, Mersa Matrouh tank lining work etc., can all be undertaken with their help.

On the 12th October when I was in Cairo, I met Dr. Hassan Wahby The Director of Egypt Water Use and Management Agency alongwith Mr. Khalek & Mr. Bhagat of P.D.C. I mentioned to him the gist of our visit and discussions at Khafr El Sheikh and the broad proposals P.D.C. had for a collaborative effort. I mentioned to him that Dr. Abu Zeid would take the earliest opportunity to discuss details and an agreement for mutual co-operation. I mentioned to Dr. Wahby that his team in Khafr El Sheikh, in my opinion, was a most delightful, competent & enthusiastic band to work with and many benefits would accrue to the Egyptian farmer as a result of this joint effort. Dr. Abu Zeid must be congratulated at striking such a "Gold Mine" to further the cause of P.D.C.

VISIT REPORT 4.

16th Oct., 1982.

EGYPTIAN PLASTICS, ALEXANDRIA:

Persons met:
1. Dr. Farouk Garrana, Chairman, Egyptian Plastics.
2. Dr. O. Abu Zeid, Director, P.D.C.
3. Mme. Nadia Nossier, P.D.C.
4. Mr. M. Parthasarathy, UNIDO Expert.

This visit was kindly arranged by Dr. O. ABU Zeid as I had been stressing the importance of developing piping systems, complete with fittings, indigenously to make any long term progress with irrigation systems in Egypt.

Introduction:-

The need for developing pipes, fittings and accessories to very strict quality standards within Egypt has been raised by Dr. Abu Zeid on many occasions in the past. The failure of the irrigation system, as is everywhere else, is consequential to the failure of the weakest link in the chain. The experience at the Drip Irrigation installation at Mersa Matrouh revealed that locally procured pipes or other components should be adequately tested before releasing them on the field. Connections with a reputable local firm for gradually developing the various items required is essential and Dr. Abu Zeid's idea of going to the best known to start with (Egyptian Plastics) is very good.

The Problem:

For all water management attempts, a sound Plastic pipe system forms the kingpin. Also due to the highly saline soil conditions almost everywhere in Egypt, Plastic pipes must be adopted for Cold Water services in addition to irrigation. They are more lasting against corrosion in addition to being more economical compared to Galvanized Iron, Cast Iron or Cementpipes. Also due to substantial reduction in friction loss of pressure and consequential improvement in discharges, plastic pipes have been found most efficient and so desirable to switchover in developing countries. In Drip Irrigation systems, the pipe network costs would nearly constitute 80% of the total cost. Development of a reliable source of supply for both PVC and Polythene pipes with all fittings is therefore most urgent.

Proposals:-

I mentioned to Dr. Garrana about the urgent need to develop good pipes and fittings and he most readily agreed that it was an urgent step which he had also felt necessary for the country and Dr. Abu Zeid had arranged for this meeting to explore the possibilities for solving this problem for Egypt. I recounted the Indian experience and informed him the multi-pronged benefit we had derived in India by starting a joint venture organisation with a gigantic internationally reputed Company like WAVIN of Holland. They had shown exceptional sympathy and patience to the problems of a developing country like India from 1964 when

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VISIT REPORT 5.

18th & 19th Oct., 1982.

BAHARIA OASIS/EL GEDIDA IRON ORE PROJECT AREA.

Persons met: (1) Mr. N.A. Abdel Kerim, M.Sc., Vice President.
(2) Mr. Sayed Abd El Razik Director of Mine
(3) Mr. Abdella.

During the discussions with Mr. M.A. Abdel Kerim, M.Sc., Vice President, Egyptian Iron & Steel Co. (Vide visit report No. 2) on 10th October, the problems of Water Management in their Sadat Farm (80 feddans) and the rest of El Gedida Iron Ore Project area was covered. Consequent to this discussion and the earlier meetings Dr. Abu Zeid had with the Iron & Steel Co., this visit was arranged to the Baharia Oasis on 18th & 19th. I was accompanied on these visits by Mr. Abdel Soliman Khalek and Mr. Lhagat.

Introduction:-

The El Gedida Iron Ore area, the staff quarters, the Sadat Farm for cultivation and the entire campus is a standing example of the results that can be obtained, growing plants under the most adverse conditions of soil, irrigation water, land terrain, weather conditions - a total absence of any rain in the whole year. Avenue trees, the vegetable farm and the land around each dwelling house, have been developed into an unbelievable greenary in the midst of complete desert conditions all around. With such determined management, the injection of useful new technologies is bound to become most productive and successful.

Problems:-

Water saving and control of salinity build-up are both severe problems in this area. The oasis has a variety of conditions in different places starting from an artesian well (discharging day andnight over the last decade and over through an 8" dia. (200 mm) pipe into a channel irrigating more thar 1700 feddans to areas where it has to be pumped out from a water table extendingto about 100 metres below the surface (as in the El Gedida mining area). The water is estimated to be from an almost inexhaustible fossil source. (The artesian discharge has maintained for over a decade, unabated, without any noticeable depletion in the water table which has been located more than 5 to 600 metres below the surface.) The oasis is a depression of about 100 metres below the surrounding endless Desert table, in which the El Gedida area is located (about 13 KM away into the desert North East of the Oasis). There are serious apprehensions that the fossil water source has no recharge facility and so, may one day come to a grinding and almost fatal halt, upsetting life in the entire oasis area. Also, excessive irrigation in many areas, makes it possible to irrigate plants only once in 10 to 14 days and cumulative build-up of salinity under such conditions is already apparent in some places and is bound to extend in coming years. Under

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these circumstances, better and more efficient methods of irrigation such as DRIP becomes very urgent and important. The biggest problem to propogate this technology which is capital oriented in the initial stage, cannot be propogated to farmers who are used to copious irrigation practice since the value of water is not recognised when it is made available free of cost. They cannot appreciate, particularly when they have to pay for Drip system, the long term imperativeness of the revised irrigation practice without visually appreciating the other many sided benefits by switching over to Drip system. It is, however, most fortunate for P.D.C. that the Iron & Steel Company has dynamic executives who are rightly looking at the long range impact on the economy of the Oasis as a whole by immediately switching over to most economical uses of water by converting their own farm and greeny patches as proving ground for others to follow the example.

P.D.C. should install Drip system of proper design, initially for all the three types of cropping (1) Orchards (2) Close plantings like water melon etc., using microtube/regulating plug system and (3) Row Crops such as Tomato, Vegetables, Corn etc., using seephose.

Iron & Steel Company have very qualified Agr. Technologists to properly run, maintain and minitor results which will be a rich field data for P.D.C. to acquire.