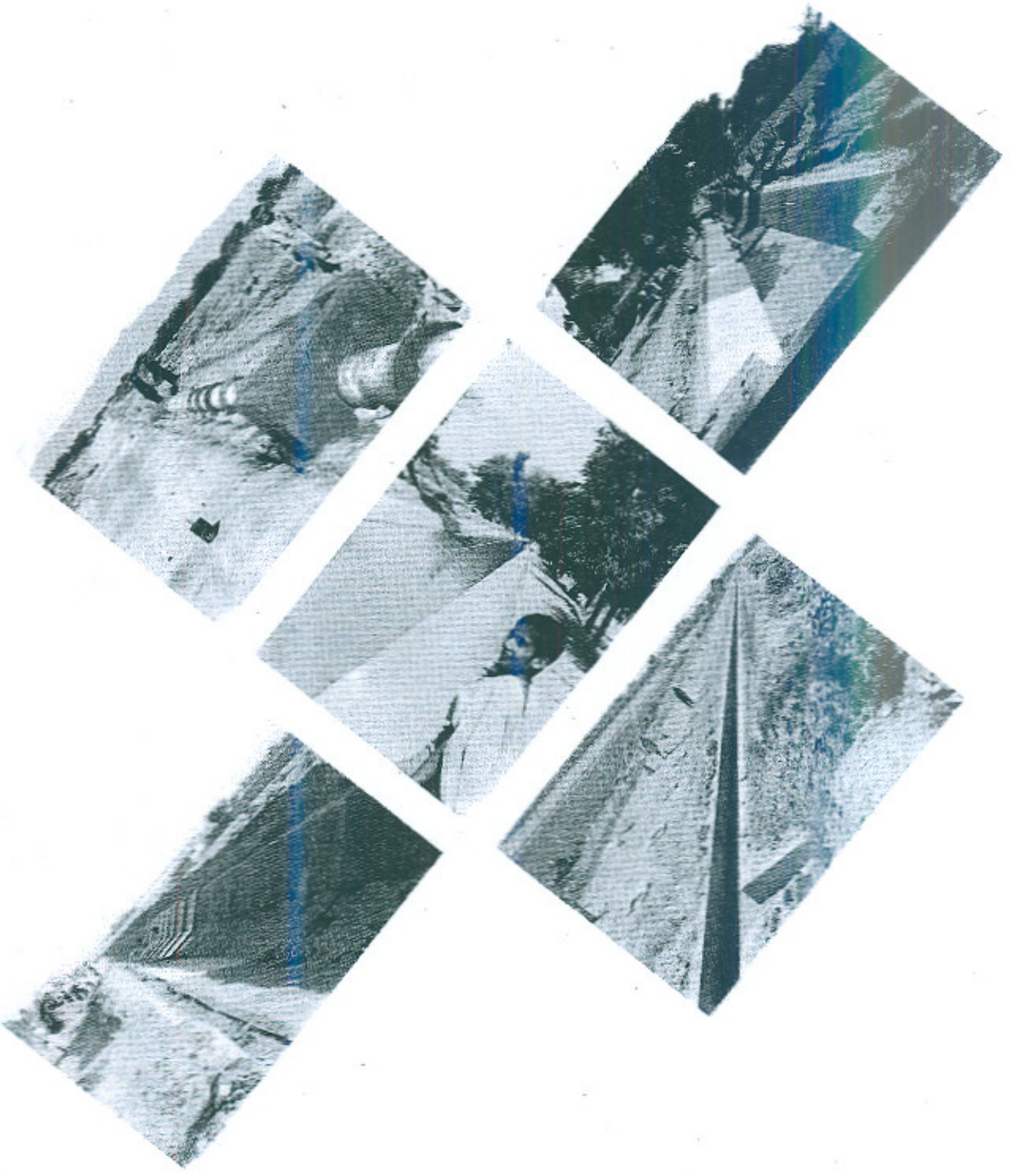
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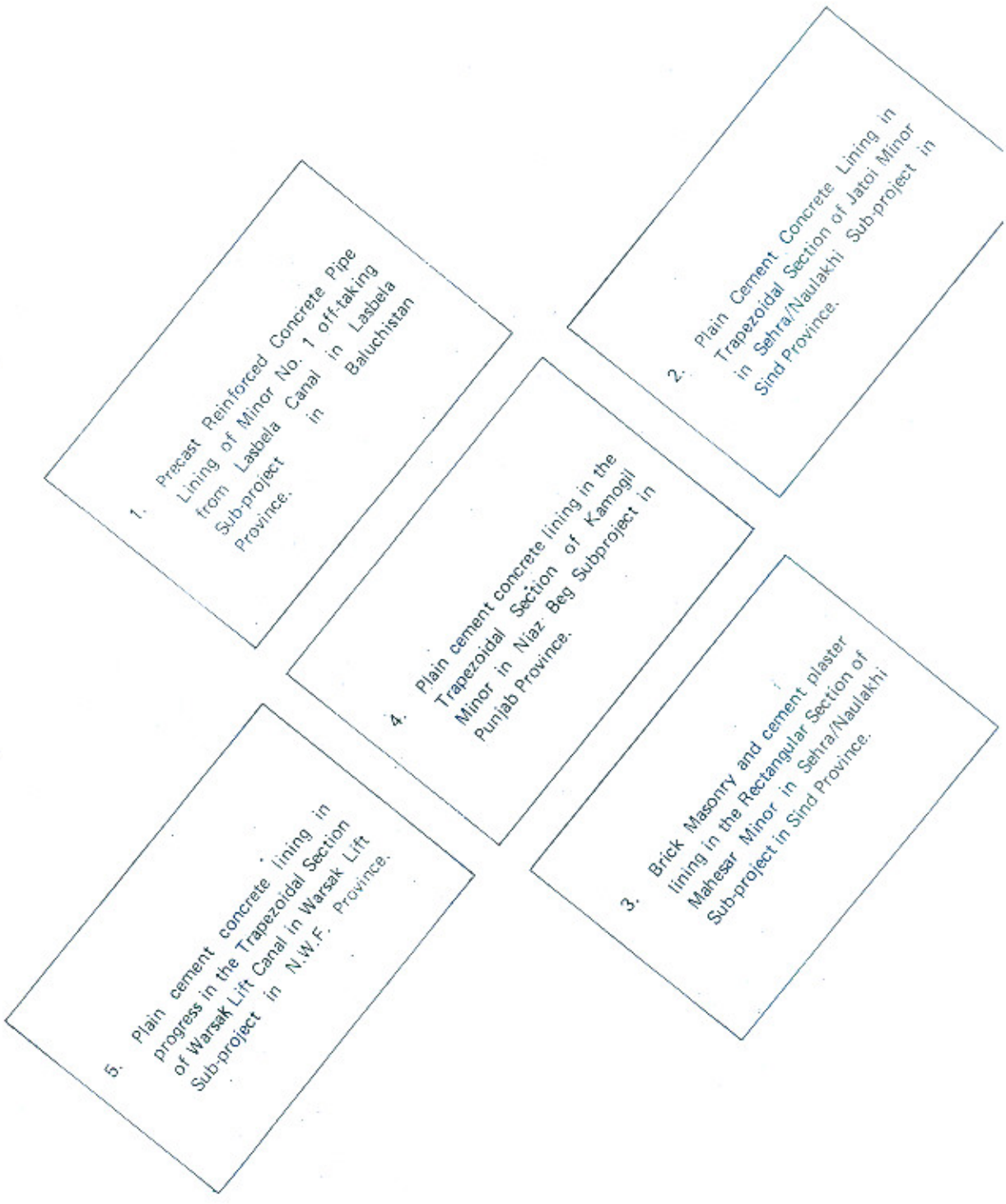
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Cover Story

Different Types of Canal Lining Adopted under Command Water Management Project Pakistan.



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EDITORIAL

Development of Consultancy Services in Pakistan

Consultancy Services in Pakistan are comparatively very young. In the Pre-independence days when the pace of development was confined to only a few development projects planning, design and construction work could conveniently be undertaken and construction supervised by the personnel of the respective departments. The colonialist rulers preferred to produce raw materials for their industries at home, than to fillip the economic development of this country. Engineering Services required to develop, land, water and power resources and communications essential to support their defence plans, were therefore provided through Government Departments such as P.W.D. ignoring the fact that in their own country private engineering practice was not only making considerable headway but also was being patronized. This practice continued even after independence.

With the passage of time, socio-economic and development impacts increased manifold. Handling of engineering projects departmentally, with inherent limitations of stereotype procedures resulted in inordinate delays which tended to retrograde the development pace. At the same time it became virtually impossible for any Government Department to develop and maintain a Specialist Organization big enough to meet the ever growing needs for engineering services. Low pay structures of the Government Service did not provide enough incentive to attract competent people towards design jobs. Consulting firms which could readily provide competent and experienced engineers for the gigantic development projects had therefore, to be associated on project to project basis.

There are no two opinions about the national benefits which a developing or even developed economy can generate through the proper use of its technical and professional personnel. In a developing economy, like that of Pakistan, major portion of capital expenditure is incurred on the constructions of roads, bridges, dams, barrages, canals, public buildings like schools, colleges, hospitals, offices and industrial undertakings. For expeditious execution of such projects commensurate with standards of construction, the role of Consultants becomes most essential. Their experience and ablemindedness can help the Government in deciding about (i) proper location of a particular project in a specific area or environment, (ii) economical use of capital, (iii) expected returns, (iv) maximizing the use of indigenous materials and (v) employment of local manpower during the execution of projects. It is therefore, in

the fitness of things if the Government, on the pattern of United States Bureau of Reclamation (U.S.B.R.), use the existing design offices, manned by experienced engineers for preparations of policy guidelines and design codes for various engineering works according to which they can oversee the planning, design and supervision being done by suitably selected consultants. Such a recourse will also provide an opportunity to the experienced retired engineers to serve the nation instead of wasting the expertise they gained over several decades. This will also relieve the Government exchequer of the permanent burden of manning Design and Planning Cells even during slack periods of development.

Recognizing the limitations of the Government Departments the Federal Government introduced a new concept of autonomous and semi-autonomous corporations to undertake development works in various fields. This instrument was first used in the industrial sector, which was comparatively a new field for our independent country. Later on it was extended to other sectors including that of Water, Power and Agriculture etc. Initially these corporations gave a good account of themselves and justified the confidence reposed in them but gradually Government Rules & Regulations started permeating their procedures with the result that most of these Corporations and Authorities lost much of their dynamism and "Authority

From the very beginning these corporations had to lean heavily on borrowed money and foreign expertise. The most glaring example is that of the Indus Basin Settlement Plan works which called for a multi-billion dollar outlay for a huge programme of Water and Power Development. This unique opportunity would have enlarged our engineering capabilities manifold and transformed us into one of world's leading engineering communities as it did in case of our neighbours and partners in the Treaty, with much smaller outlay. But regretful as it is although we completed gigantic works in a record period of ten years yet failed miserably to build up our own technical capability. We imported foreign expertise wholesale not only in sophisticated areas, where we needed it, but also in conventional fields such as barrages and canals which we were managing successfully for the last hundred years or so. The result was that we almost completely abdicated in favour of foreign expertise and let our own initiative and drive languish and die.

In the past our country has been heavily depending upon foreign consultants in all facets of our developmental activities. Even now there is a lot of dependence on foreign consultants although a sizeable number of consulting firms have been established and are working satisfactorily. Although the loan advancing agencies like World Bank (IDA) and Asian Development Bank etc; generally make it a precondition to induct expatriate consultants of their

choice, before committing any loan but we must insist that even in fields where foreign consultancy is inevitable it should be mandatory for the expatriate consultants to associate suitable local counterparts in lead positions. In this way, we can achieve effective transfer of technology. Another advantage of such associations would be that after departure of foreign consultants the local counterparts would look after the teething troubles of the completed projects and there will be proper accountability in case the envisaged projects fail to fulfil the planned objectives. This is the practice being followed in the neighbouring countries like India and Middle East. In order to save valuable foreign exchange for all engineering disciplines specialities in which local consultants of requisite experience are available, the hiring of foreign consultants should be discouraged as a policy. In this connection recent recommendations of the Pakistan Engineering Council should be implemented through an effective legal instruments.

Foreign consultants generally have little or no knowledge about the local conditions, our socio-economic set up and traditional methods of construction etc. Experience bears out that their ignorance has resulted in disasters like that of Tarbela Dam tragedy of 1974-75 besides problems having been encountered on newly built Rasul and Marala Barrages.

The local consultants, both in Public and Private Sectors, need patronage of the Federal Government, on the pattern of South Korea, in securing bank guarantees and financial assistance from the State Bank of Pakistan for securing and taking up engineering assignments in foreign countries so that they could secure services and earn valuable foreign exchange. Our local firms despite adverse and unfavourable circumstances have been successful in securing projects worth three billion dollars in Iraq, Saudi Arabia, Nigeria, Yemen, Tanzania, Abbu Dhabi, Somalia, Nepal and Muscat etc. With provision of official securities and assistance from the State Bank in transferring the initial funds for commencing works, they could do much better.

For proper transfer of latest technology and to keep them abreast with the latest developments in other parts of the World it is imperative that representatives of private consultants are also associated with Government functionaries in the foreign sponsored training programmes of the Government. This is already being done in the Chamber of Commerce.

An other problem with the consulting firms is the present system of Income Tax assessment which is being done on the pattern of contractors and shopkeepers and there are no separate rules for assessment of their income. It is, therefore, of great importance that fresh rules should be framed for the income tax assessment of consulting firms in consultation with the representatives of public and private consultants

and the Pakistan Engineering Council. Consultancy profession in this country is still in its infancy and flow of jobs is not continuous. As such the consultants cannot maintain a regular nucleous of trained staff. Dependent on the quantum of work that comes their way their income is neither uniform every year nor stable. But the income tax officials expect regular increase which is not logical by any means. Besides, it also needs to be processed that on the example of setting up industries in under-developed areas, consultancy firms should be given tax holiday at the initial stages of their establishment so that they could build up their offices and purchase the desired equipment etc. necessary for the performance of their services. As an incentive consulting firms getting foreign assignments and earning valuable foreign exchange should be exempted from tax on their foreign earnings or atleast a lower tax bracket should be applied to their income.

Yet another problem that continues to haunt the Consultants is that delays in execution of jobs and long periods of slack activities on projects because of budgetary cuts or other causes undermines their efforts at maintaining their level of expertise. If the execution of a project continues at a reasonable pace, it keeps the staff busy and provides desired/ job satisfaction. However, if the works proceed by fits and starts, the staff gets frustrated and its keeness gets eroded. Regularity in-flows of jobs or continuity in execution of projects is tied up with country's financial resources and may not be felt easy to overcome. Yet the ways and means can be developed to maintain an efficient machinery to engineer the development projects. For this we could pool our resources. One of the recommendations made at different times was to permit a more liberal policy of hiring engineers from one organization to another and from public to private sector retaining their lien with the original employer. This is essential even otherwise because no organization in public or private sector can afford to maintain an all-embracing contingent of highly paid technical staff. Secondment of experienced engineers to private consultants would help making use of the available manpower in the fields in which they are specially trained. It could also open promotion vistas in Government Cadres from where seniors could be seconded to private consultants thus avoiding stagnation and frustration amongst the juniors. The earlier the decisions were taken in this direction the better would be the out come.

COMMUNICATION - FUTURE CHALLENGES AND OUR RESPONSIBILITIES.

By

Engr. Mian Ghias-ud-Din

Synopsis

The subject of 'COMMUNICATION' is as old as the Human Race itself. The major efforts made by its Primitive ancestor to communicate with his contemporaries were primarily the gurgling sounds, visual signs and lastly the physical walk on two or four legs. Since those times immemorial with the first phenomenal 'BREAKTHROUGH' of evolution of some kind of 'LANGUAGE', the Era of Modern COMMUNICATION Strategies has dawned encompassing the entire UNIVERSE including our little SOLAR System. Indeed 'AL-QURAN' reveals the last BARRIER to be crossed by the 'MODERN MEN' again in their image of 'AL-QURAN' viz. 'KHALQ-I-JADID' to probe the UNIVERSE in its entirety with the aim of its 'CONQUEST' for the benefit of 'HUMANITY'. The BELIEVER is conveyed the 'CHALLENGE' in Ayat 32, SURAH AL-REHMAN (55) Pa'ra 27, and English translation quoted below:

> "Oh, group of Jinns and Men try to cross limits of SPACE & HEAVENS But you cannot provided you have the POWER to do so."

The spectacular evolution of SCIENCE & TECHNOLOGY, RESEARCH & DEVELOPMENT AND MANAGEMENT SCIENCE TECHNIQUES has given rise to the matchless REVOLUTION in COMMUNICATION technologies and strategies the world over. Space and Electronic age COMMUNICATION is a marvellous ERA and in fact a WONDER OF WONDERS. In modern slang and stance COMMUNICATION in wider context is the vital tool and technique of any MANAGEMENT worth the name viz. Social, Political, Economic and Technological. No SOCIETY OR POLITY can advance, progress or develop without its effective aid and use. If the Pakistani nation, and for that matter on the larger horizon the Muslim UMMAH, has to advance and develop to face its rivals then the Omnipotent CONCEPT of COMMUNICATION has not only to be digested and understood in true perspective but also the contemporary strategies of COMMUNICATION have to be harnessed successfully as a VEHICLE to comprehend ALLAH The ALMIGHTY as stated earlier. The Author has ventured to discuss the methods and means to achieve the priceless goal and objective through this article.

Ex. General Manager, Pakistan Railways.

1. Introduction

Communication is primarily a social need of every man. Basically every human being would wish to communicate with his counterparts and satisfy his curiosity to explore other creations in the universe by using some means of communication. The conquests and the achievements of the man in this field, since its appearance on the planet earth have been phenomenal. The first breakthrough came around with the evolution of some form of the so-called LANGUAGE. Since then the entire modernisation campaign on the part of human race has been master-minded through the astronomic progress and development of communication modes, media, systems and technologies. The great historical evolution in the fields of

- SCIENCE AND TECHNOLOGY
- RESEARCH AND DEVELOPMENT

AND

- MANAGEMENT AND MANAGEMENT SCIENCE TECHNIQUES

during the nineteenth and twentieth centuries especially after the second world war has given rise to the so-called revolution of COMMUNICATIONS encompassing the planet earth and the space around it extending to the entire UNIVERSE as far as millions and billions of light years away. It is this CHALLENGE in the field of communication that Pakistani nation in particular and Muslim UMMA in general is faced with. This unique CHALLENGE has not only to be countenanced confidently but overcome successfully through SELF RELIANCE philosophy and strategy of MODERNISATION.

2. Role of Communication

A dependable and efficient communications system plays an important role in the socio-economic development of a country. The more proficient and developed the communications network the more developed a country would be. Recognising the importance of communications, the developed countries have established sophisticated and economical communication system linked not only to every nook and corner of their home-lands but with the world at large. Resultantly their citizens can contact their contemporaries both at home and abroad just in a matter of a few seconds. The picture is not that rosy in the third world and Muslim UMMAH countries where many of them like Pakistan especially their country-side lack a dependable communication network and systems. Resultantly in some cases it takes days to communicate an important message from one place to the other and so is the case of the transport of the goods and human beings from one destination to another.

3. Communication Aspects

Communication can be sub-divided into three main fundamental aspects viz:-

- TRANSMISSION OF MESSAGE, INFORMATION, VOICE, PICTURE AND FACSIMILE
- TRANSPORT OF HUMAN BEINGS AND ANIMALS, MINERALS, GOODS AND ARTICLES ETC.
- SPACE AND UNIVERSE PROBES-CUM-TRAVELS.

3.1 Under the aspect of Transmission of message, information, voice and picture, the subject is termed as 'TELE-COMMUNICATION'. TELE-COMMUNICATION now occupies such a pivotal position that some economists regard it as a key with which one can open the door of many a field including economic development.

The expert opinion is that an enterprise can save 4% of its income if it spends just 1% or 2% on TELE-COMMUNICATION. This is the reason that the developed countries spend colossal amounts on the development of their TELE-COMMUNICATION infrastructure. According to a rough idea out of 100 billion dollars being spent on TELE-COMMUNICATION every year only 6 billion dollars are spent in the developed countries although they need to invest about 25 billion dollars annually.

Apart from the purely economic advantages TELE-COMMUNICATION makes a tremendous contribution towards promoting peace, harmony and understanding and in goving access to technology and spreading awareness.

Despite the ever-increasing importance of TELE-COMMUNICATION one is pained to note a widening gap between the developed and the third world countries like Pakistan in this vital field as well. Whereas the western world possesses some 90% of the world telephones and it was looking forward to have more elaborate information system, the third world was still struggling with century old telephones open wires and manual switch boards.

The developed countries now seem to be mostly interested in the Integrated Services Digital Network (ISDN) which includes provision of voice, data and picture transmission facility to the subscriber on the existing network. The developing countries, however, continue to grapple with the issue of threadbare telephony for its clients. The cellular mobile telephone service is another area where the West was concentrating more and more while for the developing countries the emphasis remains on selection of technology for meeting the demnd in villages economically and efficiently.

As elsewhere, telephone has become a necessary tool for the business trade, industry and commerce in Pakistan. Though considered a luxury and

status symbol till the sixties, telephone is now becomming an essential appliance of ever-increasing number of house-holds. The government agencies are no longer the major beneficiaries of the TELE-COMMUNICATION services, rather the major and bulk of the consumers happen to be the people drawn from all segments of the society.

3.2 In the aspect of Transport of human beings, animals and goods there have been spectucular advances in its various modes. The major element of advance common to all the modes of transport has been the "SPEED UP", simultaneously catering for the comfort, safety and frequency, etc. In the transport modes of air-ways and road transport there have been phenomenal strides. The charm of owning a private car and bus transport has brought about a massive transformation in the culture of each and every society round the globe. However, motor and road transport have brought in their wake the maladies of serious accidents, congestion, environmental pollution and excessive draw/pressure on the conventional fuel i.e. petrol and diesel making the overall economic development of a society or nation a lopsided affair. The gigantic progress in the air travel has no doubt squeezed the distances round the planet earth but it has not and cannot assume the role of a common man's carrier as the cost in economic and financial terms is beyond the purse of a common man of any society. It is only the RAILWAYS which is lay by day assuming the role of a most efficient and economical common man's carrier especially in big urban centres and that of a high speed, most comfortable and safe carrier between cities and across national borders even. This mode is most suited from the considerations of space utilisation,environmental pollution, safety, comfort and frequency etc. The non-conventional railway system will be vying very soon with air travel round the world at the jet speed of about 800 kmph or so and in the not too distant future when space environment is provided on this earth through vacuum tunnels the non-conventional rail travel will be as fast as the satellite travel.

3.3 The space probes and travels in the universe have ushered into this latest aspect of communication which has opened vistas hitherto unknown even in the science fiction and story books of the late nineteenth and early twentieth century. A trip of MARS and to other planets within our solar universe is now a very close possibility and travel beyond though a remote proposition is not altogether an impossible task. The race for owning a COMMUNICATION satellite in the space by the various nations has become a matter of national prestige and pride.

4. Objectives and Goals

The advances so far made in the various aspects of communication are displayed and claimed as breakthroughs and miracles in the enrichment and progress of all facets of contemporary

life, a few of which are mentioned as under:-

- POLITICAL INCLUDING INSTITUTIONAL AND IDEOLOGICAL REALMS
- ENCOMPASSING AGRICULTURAL AS WELL AS INDUSTRIAL HORIZONS
- SOCIAL AND CULTURAL PLANES COVERING THE CONTEMPORARY LIFE IDEAS OF UNITY OF HUMAN RACE, UNIT OF THOUGHT AND CO-EXISTENCE BETWEEN THE VARIOUS POLITICAL AND RELIGIOUS IDEOLOGIES.
- OFFENCE AND DEFENCE DEALING WITH CONVENTIONAL ARMAMENTS, NON-CONVENTIONAL WAR HEAD INCLUDING LETHAL NUCLEAR DEVICES AND MISSILES, TACTICS AND STRATEGIES OF MODERN WARFARE.
- SCIENTIFIC AND TECHNOLOGICAL FIELDS EMBRACING AND ENVELOPING A PANORAMA OF INNUMERABLE RATHER EVERY FACET AND ASPECT OF HUMAN LIFE ON THIS EARTH.

5. Modes, Media and Techniques of Communications

5.1 The old methodologies of transmission of information, message, voice and picture through book newspaper, letter, post, gramophone, even telegraph and telephone using the media of wire/cable is becoming a story of the past and have been rapidly edged out by the most modern TELE-COMMUNICATION modes and media of

- MICRO-WAVE
- VHF & UHF
- RADIO AND TELEVISION
- VIDEOS OF ALL TYPES AND KINDS
- TELEFACSIMILE PHONEY
- TELE-PRINT
- RADAR AND TELE-METRY
- DATA PROCESSING CUM COMMUNICATION
- COMMUNICATION SATTELITE BEING THE LATEST IN THE SUPER MARKET OF COMMUNICATION FIELD AND TECHNOLOGIES
- MANAGEMENT INFORMATION SERVICES

All these modes and media are operating without a wire or cable i.e. these are wireless.

5.2 In the field of Transport of human beings and goods the various modes are classified as under:-

- HIGHWAYS
- ROAD TRANSPORT
- INLAND WATERWAYS
- SEA AND COASTAL SHIPPING.
- RAILWAYS - CONVENTIONAL AS WELL AS NON-CONVENTIONAL.
- AIRWAYS
- PIPELINES
- ROPEWAYS

5.3 In the aspect of space and universe travel, the modes so far developed are as under:-

- ROCKETARY OF ALL SORTS.
- SATELLITES OF ALL KINDS.
- SPACE STATIONS AND SPACE LANDING CRAFTS.

5. Management through Communication Strategy

The five universal managerial functions viz:

- PLANNING
- ORGANISING
- STAFFING
- DIRECTING AND
- CONTROLLING

present a vivid example of COORDINATION aspect of MANAGEMENT on which depends the success of any MANAGEMENT of a Business worth the name. In fact, the coordination aspect of any management besides the other aspects viz:

- LEADERSHIP
- AUTHORITY AND
- RESPONSIBILITY

is the LINCHPIN on which rests the entire fate of a management be these be

- POLITICAL ORGANISATIONS
- ECONOMIC ENTERPRISES
- SOCIAL AND CULTURAL BODIES
- OFFENCE AND DEFENCE JARGON
- SCIENTIFIC AND TECHNOLOGICAL INSTALLATIONS

The key to achieve perfect COORDINATION by a MANAGEMENT lies in the COMMUNICATION techniques and strategies which it can deploy facilita-

ting the concerned management's success in achieving optimum productivity and profitability ultimately becoming a forward looking viable one. A well-designed COMMUNICATION strategy enables the management to induct various management science techniques to make different cadres and various levels of personnel well-equipped in modern know-how and technologies relevant to the organisation, business and enterprise over which the MANAGEMENT presides. A few of these management science techniques are as under:-

- TRAINING
- AUDIO VISUAL AIDS
- PILOT PROJECTS, PLANTS AND METHODS
- SEMINARS
- SYMPOSIA

AND

- WORKSHOPS

7. Key to Self-Reliance

It hardly requires any emphasis or elaboration that to successfully meet the CHALLANGES posed by the spectacular and all exciting developments in the field of COMMUNICATION techniques and strategies, the PAKISTANI nation in particular and Muslim UMMAH in general have to rise to the occasion by mastering and adapting these new techniques to suit and serve the purposes of development, progress and advancement of Pakistan and UMMAH as well. In order to harness and captivate the modern and sophisticated techniques and technologies of COMMUNICATION as described earlier in brief the most formidable and challenging is the MODERNISATION which has to be not only comprehended in its entirety but also this has to become an all-powerful and omnipotent weapon in the armoury of Pakistan and UMMAH It may be noted that it is the MODERNISATION CAMPAIGN OR WAR which is being continuously waged through the annals of man's history since he appeared as a cave-man on this earth. Whosoever, individual, group of individuals, tribe, nation, business, enterprise or industrial undertaking, MODERNISES first defeats its rival squarely. MODERNISATION may be visualised as a big LOAD of challanges placed on a vehicle. If it has to be uspported well duly balanced and to be moved with the speed of space vehicles then it has to be supported on the two axles of SCIENCE & TECHNOLOGY AND RESEARCH & DEVELOPMENT pushed by the motive force of MANAGEMENT AND MANAGEMENT SCIENCE TECHNIQUES. This modernisation philosophy can only be understood and implemented by the generation of MODERN MEN who have been acclaimed in AL-QURAN as "KHALQ-E-JADEED". This class of MODERN MEN will commission MODERNISATION to revolutionise the COMMUNICATION techniques and strategies to the extent comparable with our

rivals and capable enough to support and sustain the PAKISTANI nation and UMMAH not only on the planet earth but in the entire universe whose CONQUEST the Almighty ALLAH has also ordained for the benefit of humanity.

The biggest question mark is as to whether the PAKISTANI nation and UMMAH are prepared to accept these challenges, the MODERNISATION WAR has thrown on our doorstead? And as to whether our so called EDUCATED ELITE entrenched in SEATS OF LEARNING & POWER be they the UNIVERSITIES, TECHNICAL RESEARCH INSTITUTIONS AND ADMINISTRATIVE CUM MANAGERIAL CADRES of PUBLIC as well as PRIVATE SECTORS of the NATION & ECONOMY are ready to discharge their RESPONSIBILITIES by modernising the COMMUNICATION techniques modes, media and strategies in a manner as our rivals are doing and rather excel them in all fields of COMMUNICATION discussed above.

A REVIEW OF COST OF SCARPS

By

Dr. Nazir Ahmad

WAPDA undertakes installation of Scarps

In 1959 Water and Power Development Authority, (WAPDA) undertook construction of Salinity Control and Reclamation Projects called SCARPS for irrigated areas of Pakistan. SCARP-I prepared by George A. Lahroeque was reviewed by Tipton and Kalmbach, Wapda's consultants for SCARPs of northern areas. They recommended the construction of SCARP-I at a cost of Rs. 168.70 million which included Rs. 98.85 million as cost of construction of tubewells, Rs. 60.45 million towards power facilities and Rs. 9.4 million towards engineering and supervision. Out of 21.7 m. dollars of foreign exchange, WAPDA solicited the aid of the development loan fund of Washington DC for a loan of $ 15.2 million. Harold T. Smith owner of an American firm was engaged to install tubewells of SCARP-I.

Wapda consultants both for northern and southern areas continued to advise for the construction of Scarps in different irrigated areas so that by 1981-82, twenty one Scarps were completed and two more were under construction. It was planned to construct 15780 tubewells and by 1981-82 only 12426 could be completed. The balance 3354 tubewells were yet to be installed. The details of tubewells planned and constructed is given in Table 1.

Table 1. Number of tubewells planned and constructed in the Provinces of Pakistan

Province	Planned			Installed by 1981-82			Balance		
	FGW	SGW	Total	FGW	SGW	Total	FGW	SGW	Total
Punjab	9089	1394	10483	8174	1054	9228	931	324	1255
Sind	4383	443	4826	2376	365	2741	2085	—	2085
NWFP	450	21	471	457	—	457	14	—	14
Total	13922	1858	15780	11007	1419	12426	3030	324	3354

Formerly Director Physics, Irrigation Research Institute, Lahore.

Cost of Construction of SCARP Tubewells

a. After the construction of SCARP-I at a cost of Rs. 169.0 m, other Scarps were continued to be installed. By 30th June 1980, 11292 tubewells had been installed at a cost of Rs. 7354.20 m. By 1981-82, 12426 t/ws had to be installed so that the cost of additional 1134 tubewells at the Rate of Rs. 0.602 million per tubewells is estimated at Rs. 682.7 m. The details of 11292 tubewells installed in each province by June 1980 is given in Table 2.

Table 2 - Cost of SCARP tubewells constructed by June 1980

Location	No. of tubewells			Cost in m. Rs.
	FGW	SGW	Total	
Punjab	8065	978	9043	5091.58
NWFP	508	—	508	377.51
Sind	2376	365	2741	1825.11
Total in Pakistan	10949	1343	11292	7294.20

Cost of balance 1134 tubewells is Rs. 682.7 m. installed by 1981-82.

b. Referring Table 1, 3354 tubewells were yet to be installed. Their construction is being carried out under a phased programme to be completed by 1994-95. Their cost of construction is worked out on the basis of World Bank estimate which in their sub-sector Report of April 1983 gave the cost of a 3 cusecs tubewells in 1980-81 to be Rs. 0.602 m. The cost upto 1983 was estimated to increase at the rate of 7.5 percent per year and there after the escalation was assumed at 6.0 percent per year. The cost of construction of 3354 tubewells on this basis is given in Table-3 hereunder.

c. Wapda had also planned to install 4700 tubewells of high capacity to pump saline gro-

undwater. Presently 2842 tubewells of this type are yet to be installed and their phased construction is to be completed by 1991-92 and their cost based upon World Bank estimate is Rs. 2543.6 million.

d. WAPDA has fixed the useful life of its tubewells equal to 12 years after which these are usually replaced. By 1981-82, out of 12426 tubewells, installed of which those completing 12 years period equal to 1348 had been replaced. The remaining 3889 tubewells are yet to be replaced and their phased construction cost by 1994-95 is worked out in Table 3. This table shows the cost which the nation has already borne on the construction of tubewells of SCARP projects amounting to Rs. 20340.0 million.

Table-3 Cost of Construction of SCARP Tubewells

		Million Rs.
1.	Cost of 11292 tubewells constructed by 30.6.1980	7354.20
2.	Cost of additional 1134 tubewells	682.7
3.	Construction cost of 3345 tubewells by 1994-95	3290.25
4.	Construction of 2842 saline groundwater tubewells	2543.60
5.	Cost of replacement of 3889 tubewells phased upto 1994-95	6469.38
	Total	20340.13

The nation has either spent or committed to spend this much amount. Still 7189 tubewells starting from 1971-72 to 1981-82 will also be completing 12 years life and will need replacement in due course of time.

Operation and Maintenance Cost of SCARP Tubewells

The Operation and Maintenance (O&M) of each SCARP tubewells in 1982-83 was Rs. 57000 per tubewell. The O&M cost of tubewell at the usual rate of escalation is worked out for four different periods. This is determined for tubewells installed in whole of Pakistan and in the Punjab. The amount determined is given inTable-4 below:

Table-4 - O&M Cost of SCARP Tubewells

Year	O&M Cost	No. of T/ws installed upto			O&M in Million Rs.		
	(Rs. 1000)	FGW	SGW	Total	FGW	SGW	Total
1983-84	52.02	10892	1554	12446	567	80	647
1987-88	65.67	10892	1554	12446	715	101	816
1990-91	87.89	10892	1554	12446	957	134	1091
1999-2000	132.15	10892	1554	12446	1439	203	1642
		O&M Cost of Punjab SCARP Tubewells					
1983-84	56.22	8158	1070	9228	459	60	519
1987-88	70.98	8158	1070	9228	579	76	655
1990-91	84.54	8158	1070	9228	690	90	780
1999-2000	145.80	8158	1070	9228	1165	152.8	1318

Punjab has to pay heavy O&M Cost of Tubewells

Table-4 indicates the heavy cost which Punjab has to pay towards O&M of tubewells. By 1990-91 out of total O&M cost of Rs. 1092 m. Punjab shall have to pay Rs. 780.0 m. Punjab is the largest sufferer. All its funds are being spent on operation of tubewells at the cost of maintennce of canals. Table-5 is reproduced out of a publication of 11MI in which Dr. James M. Wolf has studied the funds of Provincial Irrigation Department (PID) of the four provinces. Out of PID funds Punjab has to spend 57% on tubewells and only 16 percent vast irrigation system comprising 24 canal commands irrigating about 21 m.ac. of CCA

Dr. Wolf has estimated that tubewell water is 4 times the cost of canal water in NWFP, 8 times in Sind and 16 times in the Punjab.

Punjab Farmers have saved Pakistan from a very serious situation

Government has already spent nearly Rs. 20340.0 m. on construction of tubewells. The Punjab is obliged to spend about 57% of its budget on maintaining tubewells to pump about 7.0 m.a.ft. by 1977-78. In comparison the farmers of the Punjab by their own resources and by very costly operation having 70% tubewells operated by Diesel are recovering about 28.37 m.a.f (Year 1977-78) of which 19.23 maf is added to the canal commanded area. The na-

tion should be thankful to the Farmers of Punjab. Out of 100 maf of diversion into canal we lose nearly 50% as seepage in the Punjab due to large number of links and other canals, about 34% is lost as seepage in Sind and NWFP. The evaporation from free water surface is in addition to this. We lose about 55% of the diversion and the remaining 45% is left for irrigation of about 35 m.a.c. of CCA. The CAA of NWFP is about 0.87, and of Sind about 13.4 and of the Punjab 20.7 m. acres. If 45 maf are divided according to culturable area the share of each province is exceedingly low but in the actual practice NWFP gets about 4 maf, Sind about 48 maf and Punjab about 56 maf. The increase is due to pumping of about 29 maf of groundwater by farmers and about 7 maf out of Public tubewells located mainly in the Punjab to make available about 36 maf of pumped water at the water course. The Pakistani nation should how to Punjab farmers who have kept the country afloat inspite of heavy cost of pumping groundwater.

Problems of SCARPs are a result of ill-advice

Pakistan had the experience of installing cheap tubewells based upon locally available material. In United Province, Sir Silliams Stamp had installed 1500 tubewells. In the Punjab after the construction of Amritsar and Karol area tubewells, 1526 tubewells under Rasul Project were installed. These were shallow tubewells about 200 feet deep having locally manufactured brass strainers. m.s. pipe and centrifugal pump with-drawing 1.5 cusec of water. The total cost of such a tubewel! was Rs. 16 to 20 thousand. A discharge of 3.0 cusecs could be pumped through two such low cost tubewells without foreign exchange. The Scarp tubewells were designed to pump 3.0 cusecs and more so that turbine pumping sets were imported as these were not manufactured in Pakistan. The advisors gave up the use of brass strainer and in its place imported seamless mild steel pipe to be used for strainers as well as blank pipe. The construction of tubewells was entrusted to Harold T. Smith who brought his boring rigs for drilling. When the strainer of mild steel started showing quick deterioration instead of reverting to brass strainer, fibreglass bonded with epoxy resin was selected and such large stocks were imported which had been in use in all Public tubewells. In SCARP-I above we had to spend Rs. 168.7 m which included $ 21.7 m of foreign exchange.

SCARP Transition is doubtful implementation

The World Bank had advised to dispense with all the Public tubewells and instead encourage the farmers to install their own tubewells, 90% cost of which will be advanced as loan to the farmers. The Government will also provide electrical transmission to the site of tubewell. Nearly 13500 tubewells are to be replaced by farmers low capacity tubewells. Nearly ten farmers

tubewell will be installed for each Scarp tubewell. It is thus being planned to replace Scarp tubewells by about 13500 tubewells of farmers. This experiment is being tried at Khanqah Dogran which has 221 Scarp tubewells which are being replaced during the last eight months at a cost of Rs. 380 million. Even the petty farmers who desire their own tubewells shall have to pay the debt and the Government will need foreign exchange to provide electric power. How far this proposal is expected to materialise is yet an unknown problem?

Pakistan in a very difficult position about its drainage projects

The intention of this note is to acquaint the Pakistani Nation about the most difficult position which has been created by the implementation of SCARPs. The amount we have already spent both on construction and maintenance of SCARP tubewells and the new proposed measures call for urgent consideration of the nation to find a proper solution.

TABLE 5

EXPENDITURE & PERCENTAGE ALLOCATION TO PID'S FOR O&M

Sr. No	Description	PUNJAB US$	PUNJAB Rs.	PUNJAB %	SIND US$	SIND Rs.	SIND %	NWFP US$	NWFP Rs.	NWFP %	BALUCHISTAN US$	BALUCHISTAN Rs.	BALUCHISTAN %
1.	Canals	12.1	162	16	11.4	152.8	37	4.4	59	39	3.4	46	54
2.	Tubewells	43.9	558.3	45	5.6	75	18	1.7	22.8	14	—	—	—
3.	Drainage and Flood	3.6	48.2	3	3.4	45.6	4	1.4	19	15	0.3	4	4
4.	Establishment	30.4	407.4	36	17.3	231.8	36	3.0	40	32	2.4	32	39
5.	Others	0.3	4	0	3.6	48.2	5	—	—	—	0.2	2.70	3
6.	Total with Rs. 13.40 per $	90.3	1210	100	41.3	553.4	100	10.5	141	100	6.3	84.4	100
7.	Total with Rs. 18 per $		1625			743			189		113.4		

For conversion US$ = 1.0 = Rs. 13.40 which value was in 1984 and now it is about Rs. 18. If establishment of tubewell is added the Punjab cost becomes 56%

ROAD SAFETY IN DEVELOPING COUNTRIES

by

M. Sadiq Swati

THE problem of Road Safety in most of the developing countries has already assumed alarming proportion. The number of fatalities in road accidents is now the second highest cause of death in these countries, trailing behind only gastro-entritis.

In recognition of the seriousness of the problem, the U.N. now considers the road accidents in developing countries as one of the most serious health hazard and has mandated the World Health Organisation to carry out research in the problem of road safety in the developing countries and suggest remedial measures.

According to the studies carried out by the Transport and Road Research Laboratory U.K. (Road Accident in Developing Countries G.D. Jacobs and I. Sayer - 1982) the total tangible cost of road accidents in most developing countries was of the order of 1 per cent of their Gross National Product. The amount would increase by at least 30 per cent if cost of pain, grief and suffering is also included. This is a very high cost by any standards and much more so for the most developing countries who can ill-afford to lose such a portion of their financial resources.

The problem of Road Safety in the developing countries has been growing largely due to lack of proper diagnosis of the problem. Hardly any research has been carried out in this vital field in the developing countries in the past. Little progress can be achieved in bringing the problem under control until the causes of the problem have been clearly identified. Since extensive research is a pre-requisite for proper diagnosis, the real causes of the problem could not be detected.

Although research findings from the developing countries can provide some guidance, the road safety problems in the developing countries is markedly different from the developed countries. The proven road safety counter-measures in the developed countries may not be very effective in the developing countries. There is considerable evidence to this effect as far as traffic signals, pedestrian crossings and other road signs and markings are concerned.

In order to get a clearer picture of road safety problems and its possible solutions, a case study of Pakistan is presented here. In Pakistan, the problem of Road Safety was first investigated on scientific lines in 1974 (Acci-

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dent study for Punjab M. Sadiq Swati – 1974). During the last sixteen years, the problem has been looked into from the point of view of road vehicle, driver, enforcement, legislation, driver training, and host of other socio-economic factors.

The results of the research carried out todate are briefly described below:

Accident Definition

A road accident is defined as an error in Road-Vehicle-User System. As long as all these three elements of the system operate smoothly, there would be no accident. Accident would occur only when anyone or more of these elements malfunction or fail to do their assigned tasks. The relative role of each of these in the accident problem in Pakistan is as follows:

The Road

Granted that roads in Pakistan are not excellent. There are no motorways, etc. However, since the roads are built to cater for a given traffic demand, the studies clearly show that, by and large, they are quite adequate for the existing traffic volumes. (Real problem of highway safety in Pakistan M. Sadiq Swati 1980).

As a matter of fact most of the intercity as well as intercity arterial roads, which suffer the highest accident rate, have capacity far in excess of the traffic demand. On most major road networks free-flow conditions prevail and some of them are much wider as compared to the traffic demand. In a study the roads selected were well engineered, with proper road markings and controlled by a very conspicuously placed 'Stop' sign. The 90-97 per cent of the drivers of various types of vehicles, i.e. buses, cars and motor cycles did not stop or even slow down their vehicles (Effect on enforcement on road user behaviour M. Sadiq Swati, 1981).

When asked as to why they did not stop, the majority (85 per cent of the drivers responded that there was no stop sign installed at the intersection. When their attention was drawn to the fact that a stop sign was very conspicuously placed, the normal response was that "somebody must have erected the sign yesterday". This is especially important when viewed in the light of the fact that the sign had been in that location for years and 96 per cent of the drivers were very familiar with the area and had been going through the inter-section on daily basis for years.

This can be explained by the fact that the road markings and signs are primarily needed to guide strangers in the traffic stream to their destination with speed and safety. To those familiar with the route, these signs and markings do not give any additional information that they already do not know. Unlike most developed countries, the traffic stream in Pakistan primarily consists of the individuals who are practically familiar with every inch of

the road being travelled by them and hence do not depend on any road signs to help them reach their destination. Therefore, lack of traffic signs is not a very serious deficiency as far as road safety is concerned.

According to studies, carried out by the author and others Traffic Accident case study Mr. Asad Mahmood Alvi-1980 it has been clearly established that at the most 5 per cent (the comparable figure for the developed countries is 3 per cent) accidents can be attributed to roads in Pakistan which is a very insignificant figure compared to other causes of the accidents. From the preceding, it is clear that the roads in Pakistan are generally adequate for the amount of traffic being carried by them and are unfairly blamed for the accident problem facing the country.

The Vehicle

Since no vehicles are totally manufactured locally, therefore, most of the vehicles and their spare parts are imported at very high cost and hence difficult to maintain in tip top conditions. As a result, the vehicles in Pakistan are not always in very good mechanical condition. But that does not mean that all vehicles are so old and mechanically so defective that they should not be on the road. A survey of the age distribution and mechanical conditions of vehicles in the country gives very favourable results.

The Road User

Since it has been established that the Road and Vehicles, have very small share of the blame of the high accident rate, it automatically points towards the third element namely the road user as the real culprit. This is also borne out by the fact that the majority of the traffic problems and chaos in the developing countries can be directly attributed to the very high degree of traffic indiscipline exhibited by the road users. This clearly points to the fact that the greatest chance of overcoming the prevailing serious problem of highway safety in most developing countries lies in bringing the road-user under control.

Control of Road User

The research has revealed that there are two ways to bring the road user under control. One is education and the other is enforcement. Since nobody could be expected to obey any law/rule, unless he was informed about the existance of such a law/rule, every road user must, therefore, be informed of his rights and obligations on road. Unless this is done he cannot be held responsible for any action of his which is contravention of the law. The education, therefore, is most important. The enforcement comes into motion if any violation is committed.

Education

The extent of knowledge of traffic safety rules on the part of the road users

in Pakistan is very poor. According to a survey carried out in 1978-Psychological Attitudes towards Highway Safety M. Sadiq Swati and Prof. Mumtaz Danial – 1980 only 24 per cent of the drivers knew correct answer to 20 most important and basic rules regarding right-of-way compared to a minimum of 95 per cent desirable. In order to find out the root cause of such universal ignorance of even the basic traffic safety rules, the driver training and driver testing practices prevailing in the country were examined.

Driver Training

Driver training has two parts namely, teaching of driving skills and teaching of rules of the road. The driver training in Pakistan primarily comprises of the former only. The entire emphasis is on how to enable the trainee to control the vehicle while on road. As regards the rules only very elementary rules such as "Drive on the left" and "Overtake on the right" are taught. As a result drivers remain totally ignorant of most basic traffic safety rules (Bus Driver Training pilot study M. Sadiq Swati and A.J. Downing 1981).

Driver Testing

The driver testing was also examined in detail and it was found that the entire emphasis of driver testing was again on driving skill. Virtually no attention was given to knowledge of the traffic safety. This quite clearly explains the reasons for universal ignorance of the rules on the part of the drivers.

Role of Driver Education

A great majority of people in Pakistan attribute the lower accident rate in the developed countries to the traffic safety education in their schools. However, the research has revealed that the belief is without much scientific foundation. It is now established that effect of education has been overstated beyond proportion and in fact the role of education in over-coming traffic safety problem is very limited.

Enforcement

A modern traffic police officer has varied responsibilities. Besides, issuing tickets to the erring drivers, he should be well-versed in the art of traffic control, should himself be an examplary driver, should be adept in the art of providing first-aid to the injured in an accident, should be able to investigate and analyse an accident methodically and systematically, and should be a skilful mechanic to provide necessary aid to the standed drivers.

Educational Level

The educational level, particularly at the lower levels, which are the kingpin of traffic enforcement, is very low. A large proportion of them is either uneducated or have very little education (primary). Majority of them are matriculates. As a result, they are unable to have a good grasp of complex traffic pro-

blems. This is certainly not due to lack of availability of educated individuals in the country, as is proved by the fact that some of the officials at the lowest rung (Foot Constable) are graduates.

Training

No arrangements exist to equip the traffic police to properly discharge their duties by teaching them traffic law, enforcement techniques, accident investigation, proper driving, first-aid and traffic control, etc. As a result, the majority of the traffic staff are unaware of even the basics of traffic enforcement. From amongst the lower ranks, only 2 per cent of the Foot Constables (the lowest rung) and 39 per cent of the Inspectors (the highest rung) knew how to drive a motor cycle. Effectiveness of traffic police training – Syed Mohammad – 1980.

Powers

The powers of traffic police at the lower levels to check violations are severely restricted. They are not empowered to write ticket for any moving violations particularly to private car drivers. Since they have no power, the road users do not pay any attention to them. This was proved by a survey carried out at four inter-sections generally manned by 3-4 members of a traffic staff at all times. The number of violations taking place at these intersections, under similar condition of traffic volume, when these were fully manned and when the traffic staff was taken off, were noted. There was found to be no significant difference in the number of violations in the two cases.

Deployment

There are approximately 3,000 traffic police staff in the country. Out of these, majority are being confined to five major urban centres and only 100 are deployed on patrolling the intercity roads totalling 78,000 K.M. one person for 780 K.M. This is not only lopsided but also extremely inadequate as far rural roads are concerned where majority of the fatal accidents take place. In 1981, 27 per cent of the total fatal accidents occurred on one intercity road. (Road Accident in Pakistan – Mr. Sadiq Swati and A.J. Downing 1981).

As a result, the drivers on the intercity roads are totally free to do what they like. Also the traffic police particularly in the urban areas is deployed for controlling traffic at junctions rather than enforcement of traffic laws.

Enforcement Emphasis

Although overwhelming majority of fatal accidents take place because of speeding and reckless driving, violations of one-way, stop sign, traffic signal, parking and other regulations is extremely wide spread. The total energies of the traffic police are expended in checking frivolous matters such as "insufficient documents, overcharging, overloading, smoking vehicles and improper registration plates". Only 7-9 per

cent tickets are issued for serious moving violations.

Career Planning

There is no systematic career planning for the traffic police personnel. The officials posted to traffic department have no previous traffic experience. The tenure is normally limited to two years at the maximum. Adopted policy has been calculated to prevent traffic specialisation. (Pakistan Road Safety Appraisal Halcrow Fow & Associates-1978). As a result, professionalism required for the job has not developed.

Effect of Enforcement on Road User's Behaviour

There is now growing recognition of the important role played by enforcement in overcoming road safety problem, in the developing countries. Considerable evidence now is available to establish a very high correlation between highway safety and effective law enforcement. International symposium on drunk driving - insurance institute of highway safety - 1982. A study was carried out in the twin cities of Rawalpindi/Islamabad to gauge the response of road users to various enforcement emphasis. A Comprehensive Enforcement Plan was devised and the entire traffic police force was divided into: (a) Speed Checking (b) Beat Patrolling; (c) Point Duty. Each individual was permanently assigned a specific area/ point and trained thoroughly for the particular job and asked to strictly enforce the law. The performance of each official was closely monitored to ensure strict compliance. The result of the survey indicating the conditions prevailing before and one month after the scheme was in force are described in the following paragraphs.

Speed Violations

Prior to the study, the extent of speed violations in and around the twin cities of Rawalpindi and Islamabad was very widespread. The speed check carried out under the study resulted in significant reduction in operating speeds and the percentage of the drivers who violated the speed limits dropped by 95 per cent.

Turning Violations:

Before the study, hardly anybody paid any heed to road marking and other signs erected to regulate the traffic. All kinds of violations were committed while making a turn. The most common violation was turning from the wrong lane i.e. right turn from the left lane and vice versa particularly on a dual carriage-way in complete disregard of the law and also the lane markings. After the study, a significant decrease in turning violations was noticed.

One Way Violations:

Before the study, violation of one-way regulation was a common feature

in and around the study area. After the study a significant reduction was observed.

Stop Sign Violations:

Two locations were selected which were controlled by a very conspicuously placed stop sign giving right-of-way to a major road carrying substantial amount of traffic, A number of serious accidents had also occurred on these locations. The locations were closely monitored and the road users failing to observe the stop sign were checked/prosecuted.

Before the study, hardly anybody bothered to stop at these intersections while at the end of the study a significant improvement took place in observance of stop sign at both locations. The figures indicated in the case are primarily those who slowed down, looked to the right and left and gave way to the traffic on the other road. Nobody stopped first and then looked.

Conclusion:

The preceding fact quite clearly indicates that the key to the road traffic safety problems inthe developing countries lies in enforcement. An effective and intelligent enforcement of selective rules is the most economical method of overcoming the problem of traffic indiscipline and chaos which is the hallmark of the devoloping countries.

(Courstey Dawn March 1, 1988)

COMPETITIVE BIDDING (OF SPECIAL INTEREST TO AGENCIES, CONSTRUCTION-FIRMS)

by
*M. Idrees Anjum**

Summary

While dealing with construction-industry during span of experience, it has been found with great concern that process of tendering/submitting bids is based on hit and trial and till date no scientific approach has been evolved and adopted. The random method of bidding does not bring favourable results but contrarily reduces the chances of winning. The whole procedure developed on scientific lines can not be described here, however, a few helpful guidelines are given below, which will be of optimum benefit to construction firms.

Introduction

Competitive bidding based on tender-documents prepared by the client's professional advisor is still the most common method of distributing the construction industry's contracts among the contractors willing to undertake the work. Variations such as negotiated contracts and package deals form only a proportion of the contracts offered to construction industry.

The random nature of bidding process also ensures that contracting companies will be unable to plan their company's activities with much certainity; that many contracts will be tendered for with unrealistically low prices and that that pre-occupancy of most contractors with claims will also continue.

From the contractor's view point competitive bidding has the appearance of roulette; sometimes he wins when he thinks his price is high, sometimes he loses when his price is dangerously low and he has a wry smile for the apparent "winner" Often when contractor obtains a contract he resorts to claims to ensure that his achieved mark-up is positive because original tender was based on a low cost estimate. It is not surprising that the subject of competitive bidding has attracted investigations and research by both the contracting agencies themselves and a variety of academicians. Disappointingly, the results of these investigations and efforts to remove some of the uncertinity from bidding are not conclusive. However, a study of work will give a better understanding where the uncertainity arises and guidance on how to live with this inherent uncertainity.

Background

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The subject of bidding strategy has interested various researchers in America & Europe since the mid-1950. The aim of most of these workers has been the development of a probablistic model which will project the chances of winning in the construction industry.

The probablistic models have attempted to give guidance to bidders by Producing statements of type, if you bid a mark up of 12 Percent, you have a 30 P.C. Chances of winning. Following on from these calculations of probability, previous workers have attempted to derive a mark-up which purports to represent the optimum mark-up. This is the mark-up which in the long run would produce maximum profit.

Review

The basic assumption of all the calculation is that a relationship exists between the tender sum and the probability of chance of winning the contract. The aim of the probablistic models is to express this numerically.

In entering a bidding competition, it is assumed that the contractor first estimates his costs and then adds a mark-up to cover profit. If the contractor is really desperate to win, he could submit a bid at something less than the cost. If this bid was low enough then it would have a 100 P.C. chance of winning. There also exist at the other extreme a bid with no chance of winning (say cost plus 50 P.C. mark–up), Between these two extremes there exists a continuous of bids with associated probabilities which measure the chances of winning.

The method of deriving the relationship between bids and the chances of winning depends upon the collection and manipulation of historical data as follows:

a. We collect data on bids submitted by a particular competitor on past contracts in which we have competed with him.

b. We divide the competitor's bid by our estimated cost in each case.

c. We group this data and plot a histogram (or frequency distribution) as shown. This histogram now represents a picture of this competitor's historical performance against us.

$$\text{Ratio Of:} \quad \frac{\text{Lowest competitors bid}}{\text{Our estimates}}$$

Note: (Number of Accuracies)

Fig-1 = Distribution of 31 lowest competitor's bids compared to our estimates equivalent of lowest competitor's mark-up on our cost estimates.

Probability of winning a contract

at a given mark-up competing against a number of known competitors.

= Probability of beating "A" competitor
= Probability of competing "B" competitor
= x probability of beating "C" competitor etc

To predict the probability of winning a contract against a known number of un-known competitors. Friedman suggested the following.

Probability of winning against "n" unknown competitors for a given mark up.

= (Probability of beating one typical competitor) For the case of unknown competitors, the Gates model becomes

$$Pn = \frac{1}{n/(1-pty)\ pty + 1}$$

Pn: Probability of beating n, unknown competitors

Pty: Probability of beating a typical competitor.

Discussion

Using different ranges of values for following factors, the results obtained gave some insight to the likely effects on achieved profit-margins and a contractor's ability to secure the contracts.

i) The estimating accuracy of the contractor whose record is being considered (referred to contractor "E")

ii) The general estimating accuracy of his competitors.

iii) The average applied profit margin of contractor"E" (The profit margin he includes in his tender)

iv) The average applied profit margins of his competitors.

v) The number of competitors he meets when tendering.

Results typical of those obtained for the full range of situations simulated are prescribed below and show something of the effect of improving estimating accuracy.

Situation-1

The situation is the assumed existing set of conditions against which any change will be compared. The level of estimating accuracy and of average mark-up are purely assumptions.

Assumptions

Contractor "E" and four others have estimating accuracies of likely cost + — 10 P.C. On average all contractors include a profit margin of 10 P.C. in the tenders.

Results:

All contractors win one contract in every five they tender for. The average achieved profit margin is 3 P.C. The average difference between applied and achieved profit margins is the average difference between likely cost and the estimated cost of winning tenders.

This means that contractor E's average profit/turn-over is 3.00 P.C and this success ratio (i.e. Number of contractor won/number of tender's submitted) is 1:5. The success ratio is contractor's ability to obtain contracts. .

Situation-2

In this situation contractor "E" has improved his estimating accuracy and maintains the same average applied profit margin as in situation-1. His competitors maintains their existing accuracies and profit margins in this situation, the questions being asked are:

a. What would be the effect on contractor's ability to obtain contract? (i.e the effect on his success ration)

b. What will be the effect on his profit margin?

Assumption

Contractor "E" has an estimating accuracy of likely cost ± 5 P.C. The four other contractors have estimating accuracy of ± 10 P.C. On average all contractors include a profit margin of 10 P.C. in their tenders.

Results

Contractor "E" is less successful in securing contracts and now only wins between one in 10 and one in 11 of the contracts he tenders for. The average achieved profit margin on the contract he wins is approximately 8 P.C. By doubling his accuracy contractor "E" has vastly improved the profit margin he achieves, but because his ability to secure contracts is lessened, his turn-over will be lessened if he continues to submit about same number of tenders.

The answer to these questions are (a) his ability to secure contracts has been reduced from 1:5 to 1:11) The average margin has increased from 3% to 8% which is marginal increase in company's profits. Notwithstanding the increase in profits the decline is ability to secure the contracts which in turn affects contractor E turn-over is unsatisfactory. However, two solutions are offered.

a. Either to compensate by increasing the number of tenders submitted if sufficient amount of work is available.

b. To reduce applied mark-up.

Situation-3

In this situation contractor "E" :

a. Reduces applied margin of profit in order that his ability to secure contracts is the same as in situation-1 (i.e. a success ratio of 1:5)

b. The question is what effect will this have on company's profit.

Assumptions

Contractor "E" has estimating accuracy of likely cost ± 5 P.C. and on average includes a profit margin of 7.5 P.C. in his tenders. The four other contractors have estimating accuracies of ± 10 P.C. and on average include a profit margin of 10 P.C. in their tenders.

Results

Contractor "E" wins on contract in every five he tenders for (same as in situation-1). The average achieved profit margin of the contracts he wins is in excess of 6 P.C. (Compared with 3 P.C. in situation-1).

The conclusion so far and the answers to the questions are:

i) If a contractor unilaterally improves his estimating accuracy and maintains the same average mark-up, his ability to secure contracts is substantially reduced (2) If the contractor reduce his average applied profit margin in order to improve his ability to secure contracts his average achieved profit margin will still be substantially higher than before, the third question, whether any benefits would remain if contractor "E" competitors also made similar improvements will be studied in situation 4 & 5.

Situation-4

In this situation, the other four contractors have also improved their estimating accuracies and have also reduced their applied margin profits.

Assumption

All five contractors have estimating accuracies of likely cost ± 5 P.C. and on average include profit margins of 7.5 P.C. in their tenders.

Results

Contractor "E" and other contractors win one contract in every five they tender for. The average achieved profit margin is just over 4.00 P.C.

For contractor "E" this is still an improvement when compared

with the original situation-1) i.e. 3 P.C. but is a deterioration from the situation where he alone has improved his estimating accuracy (of situation 3, i.e. 6 P.C.)

Situation-5

In this situation all contractor's estimating accuracies remain at the new improved level and their applied profit margins return to the level that existed only.

Assumptions

All five contractors have estimating accuracies of likely cost ± 5 P.C. and on average include a profit margin of 10 P.C. likely cost ± 5 P.C. and on average include a profit margin of 10 P.C. in their tenders.

Results

For contractor "E" and other contractors win one contract in every five tendered for. The average achieved profit margin is just in excess of 6½ P.C.

For contractor "E" this compares favourably with the original situation-1 (i.e. 3 P.C.) and with the situation where he alone improves his estimating accuracy (Situation 3, i.e. 6.00 P.C.) (in situation 3, it will be recalled contractor "E" has reduced his applied profit margin from 10 P.C. to 7½ P.C.) The answer to question is that profit improvements do remain same even when competitors make similar improvement to estimating accuracies.

Situation-6

In this situation four contractors including "E" have improved their estimating accuracies, the fifth has not.

Assumptions

Four contractors (including "E") have improved thier estimating accuracies of ± 5 P.C. The fifth contractor has an estimating accuracy of ± 10 P.C. All five have an average applied profit margin of 10 P.C.

Results

The ability of contractor "E" to obtain contracts is slightly reduced from 1:5 to 1:6. The average achieved profit margin with the original achieved margin of ± 3 P.C. but less favourably with situation 5, where all contractors have improved their accuracy. Nevertheless, substantial profit improvements remain.

Conclusions

The general conclusions drawn from this study are:

1. The achieved profit margin

will be increased if the accuracy of estimating is improved.

2. If estimating accuracy is improved and the contractor wishes to maintain the same turnover he will need to:

   a. Reduce his applied profit margin

   b. Increase the number of tenders he submits

   c. Make some reduction in his applied profit margin and also increase the number of tenders he submits.

3. The achieved profit margin will still be greater than the original profit margins when all contractors improve their estimating accuracy. This assumes that contractors fix their mark-up with references to the current profitability of the company. However, the competitive nature of industry would probably cause contractors to cut their margin once enhanced and profitability has been achieved. It is difficult to assess this effect but at least one residual benefit would remain, namely the reduction in number of loss making contracts.

4. There are serious consequences for any contractor who allows the accuracy of his estimating to deteriorate.

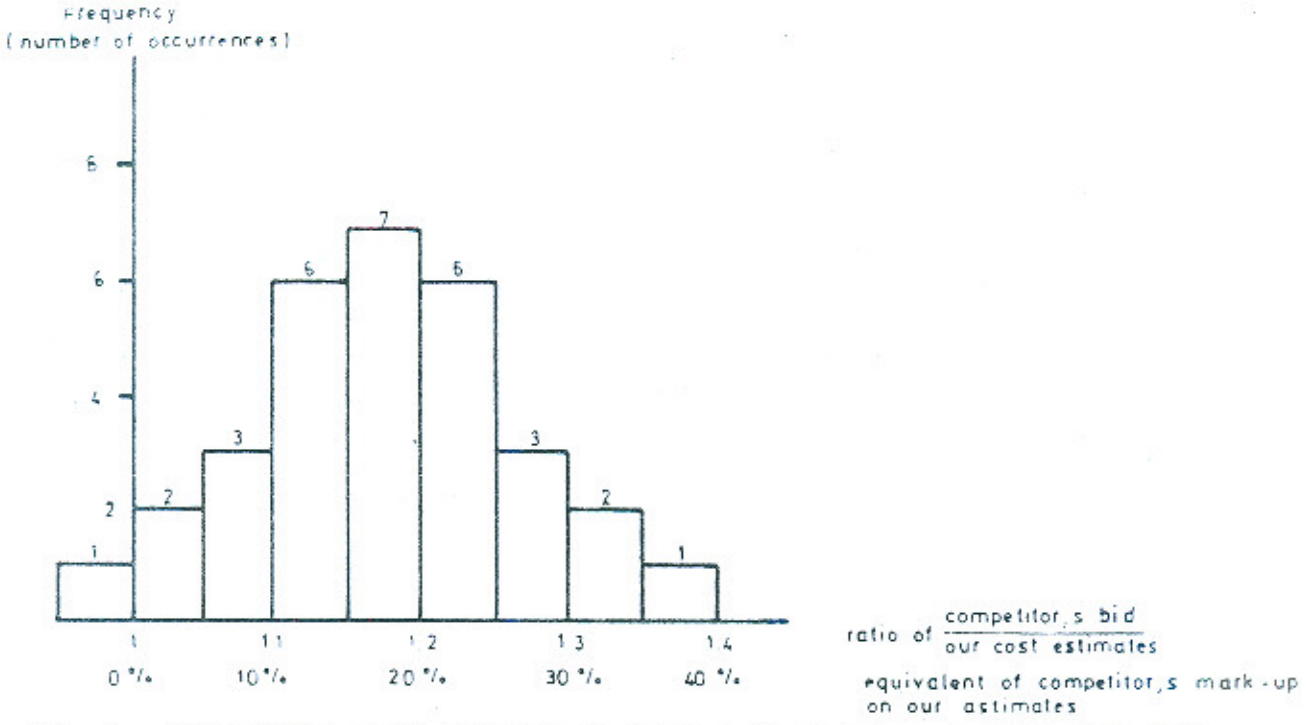


Fig. 1 Distridution of 31 competitors, bids compared to our cost estimates.

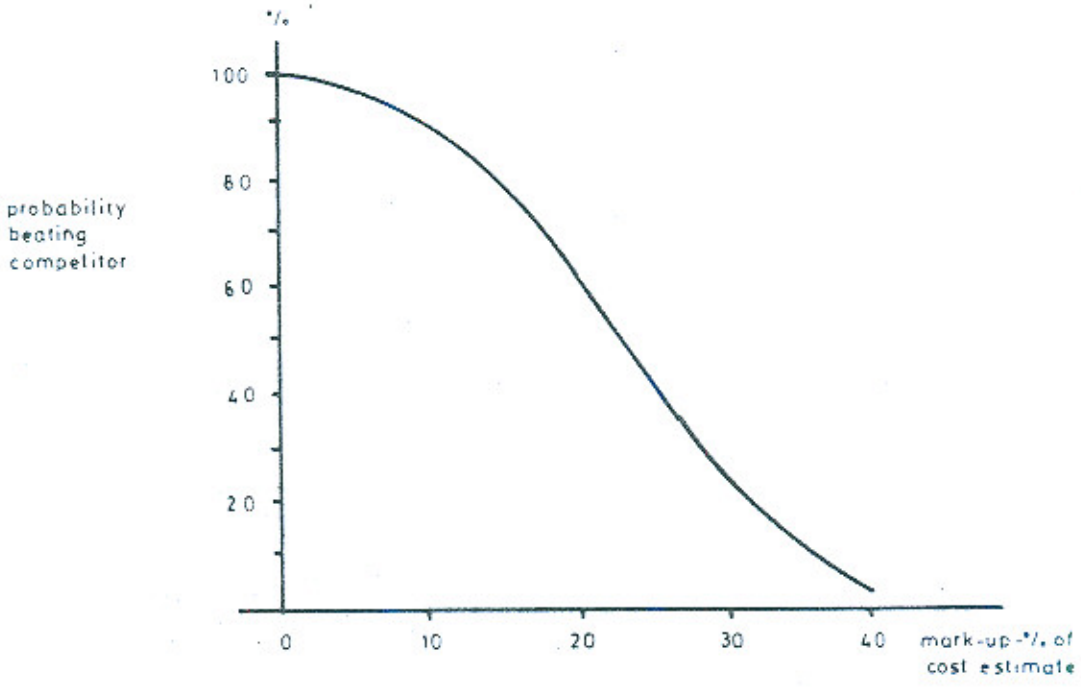


Fig 2 Probability of beating competitor,s mark up

ANALOGIES AND ANOMALIES IN WATER MANAGEMENT IN THE IRRIGATED AGRICULTURE

By

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"A good Engineer is one who is also good accountant" was the advice generally given by the seniors to the new entrants in service a few decades ago. But during the present time to be a successful engineer, associated with Water Management, he should, besides engineering, be conversant, if not, reasonably versed, with Geology, Hydro-geology, Agriculture, Soil Science, Economics etc. I do not claim to fulfil these requirements but in my humble capacity as an engineer associated in the South Zone for the last few years with problems connnected with Water-logging and Salinity, I have ventured to put forth the following ideas. As is evident from the above, I have selected a topic entitled "Analogies and Anomalies in Water Management" for this article. This is broadly in the context of problems connected with loss of water to the ground with resultant Waterlogging and Salinity, apparently a very unconventional subject but based on the results/ inferences drawn from my association, stated above.

Pakistan covers a total area of 197.00 million acres out of which 75 million acres or about 38% can be used for cultivation but only 48 million acres or 24% is at present under cultivation. Of the cultivated area two-third is irrigated and one-third depends wholly on rain.

With over 80% of the population engaged in agriculture and with the total population increasing at the rate of 3.5 percent per annum, the over riding national need is that of substantially increased agricultural production.

Pakistan is proud of having the largest contiguous Irrigation system, in the world, and of possessing more knowledge and experience on vertical drainage through the use of tubewells than any where else in the world. Inspite of all these lofty claims, true though any where else in the world. Inspite of all these loftly claims, true though these are and the efforts that have been made in the past to achieve increased agricultural production, it is paradoxical to state that the crop yields on the average in Pakistan are the lowest in the world. One of the main causes for the low level of agriculture is the problem of Waterlogging and Salinity in the irrigated areas caused by lack of drainage, shortage of irrigation water and inefficient irrigation and agricultural practices.

When irrigated agriculture started in Pakistan, its development mainly depended upon Engineering solution. The agricultural development achieved so far is largely due to extended irrigation facilities to new areas. Within this general strategy the canal system designed at that time worked satisfactorily under conditions of low population and large holdings. When the population/land ratio increased, an anomaly was created. Farmers had to extend their areas under cultivation but with a reduced supply of water. This anomalous situation resulted in some of the present day problems.

This concept of agricultural development through Engineering solution is undergoing a radical change. It is being recognised that a scientific approach be given in this direction to the need to supply adequate quantity of water in terms of crop-consumptive use and leaching requirements and other relevant factors to obtain substantial increase in agricultural production.

Land potential and its productivity, water resource and its development, land and water use and their problems, are important factors which need very careful consideration and evaluation for maximization of agriculture production which is the end result of all efforts of irrigation, agriculture and waterlogging and salinity control. Construction of dams, reservoirs and large canals alone does not necessarily result in higher crop yields. On the contrary in many countries, including Pakistan, it has led to an absolute or relative reduction of output due to deterioration of soils by Waterlogging and Salinity. Experience has shown that investment in major constructions making more water available, yield a measurable effect only when the farmer knows how to use the new possibilities and is fully aware of the risks of inefficient irrigation and insufficient drainage.

As already clarified in the beginning above, my topic is Water Management in relation to loss of water with resultant Waterlogging and Salinity but this is a part of larger package deal comprising elements like drainage, irrigation practices, cultural practices and fertilization as well as credit and other services. I have, therefore, digressed a little from my subject to bring home the fact that unless all the elements of the package are simulataneously implemented, increased production, which is the only yard-stick of success, can not be achieved.

Waterlogging and Salinity are twin menaces for the country and considered to be the cancer of the land. The anomaly in this situation is that this disease has not defied the modern technology and scientific knowledge, but the real problem is the land and water management. To elaborate this, it is necessary to lay emphasis on and highlight the wreckless wastage and thoughtless use of water in the irrgated agriculture in the country, as a result

of which we are faced with the present day crisis. If Waterlogging and Salinity is a disease, wastage of water is a calamity in this country. I am intentionally using the word "Wastage" as against the commonly used terminology "Loss" in this context to denote an action which occurs on many counts, namely improper distribution, malpractices of unsocial and influential land lords, defective cultural practices, faulty means of conveyance of water etc. etc.

There is nothing novel that I am discussing here but I intend to present in a manner which would highlight the problems and give food for thought with a deep sense of feeling and responsibility to those who actualy matter.

Improper Distribution of Water

a) Here I would like to illustrate the prevalent state of affairs with regard to wastage of water on the rice growing areas in this region. During the first two or three weeks in which non-perennial canals are opened a small quantity of water in each canal is required for irrigating nursery beds only but this is not actually being done on account of difficulties of command and inevitably a large volume of water is wasted until transplanting is well on the way.

Secondly scarcity of water at the tail ends develops during transplanting season, owing to over drawals by upper influential zamindars to accomplish the coverage of areas with the rice crop in a short span of 45 days (June to mid-July).

Suggested Remedial Measures

So far the first part i.e., irrigating the nursery beds just with the required quantity is concerned, it is purely a technical problem which should have been solved by now during this advanced technological age. Since this has not yet been done I, with my limited knowlege, venture to put forth the following ideas for consideration. The problem can be tackled by one of the two following ways.

1) Large nurseries can be established in the head reaches where just the required quantity of water can be supplied. No water should be released in the down reaches. Seedlings can be transported to areas where required. This arrangement can be done through Government or some workable mechanism to be evolved through the cooperation of progressive zamindars.

2) Required quantity of Water for irrigating the nurseries spread over the area should be released but in the down reaches which lack command. Suitable and cheap heading up arrangements could be made to make the nursery areas commanded. It is, therefore, evident that no wastage of water is involved in this.

Mal-practices of unsocial and influential Land lords

Regarding the second situation of over-drawals by influential Zamindars and other unsocial elements in the head

reaches during transplanting season it is purely an administrative problem to be dealt with by the law enforcing agencies. Over drawals at the cost of others is an illegal action and is, therefore, to be tackled accordingly. Excessive use of water besides adversely affecting the healthy of crops has also damaging effects on land. It not only causes waterlogging and salinity but also is a sheer wastage of national wealth in the shape of very valuable water. This is a sad commentary on our working both in the public and private sectors. Over use of water in this connection has analogy with over-eating for a human being which not only entails extra expenditure for sustaining normal life but also is the root cause of several ailments including sometimes serious injury to health. The cultivators at the tail suffer twice i.e., before transplanting they receive too much of water and after transplanting they get too little of it.

In view of what has been suggested above the cultivators at the tail will not suffer twice i.e., before and after transplanting. They will just get the requisite quantity of water. This will thus not only avoid wastage of water but also minimise the chances of waterlogging and salinity.

b) Matching irrigation Water supply to actual crop water need

It is now being realised that according to the rotation system adopted in the Irrigation Department, the farmer is obliged to receive the allotted quantity of water (once in about 10 days) though crops may require smaller irrigation but more frequently. Revolutionary measures should therefore be resorted to improve water scheduling by the Department to have more flexible rotation system with more frequent turns when crop needs dictate.

Defective Cultural practices

a) There is what is called a panchoo system of irrigation traditionally practised in all the rice growing areas in this Region. This system entails extra dose of water and is allowed to continuously flow in the fields which ultimately creats wide spread pools of water in the low lying areas. It is believed that cognizance of this has been taken in several forums at various levels and discussed among experts consisting of protagonists of the system and those who oppose this and consider that this involves certain avoidable wastage of water. I will be over-stepping my jurisdiction if I give my firm views on this complicated issue but I can not avoid offering a suggestion here that a special study on the Panchoo system of irrigation, comprising experts should be made, specially on account of the fact that the author had an opportunity to visit Dokri Rice Research Institute located in the Northern part of Sind where experiments were being conducted without applying the Panchoo system. It was amazing to note that the yield of certain species of

rice is two to three times the yield that is being attained by the farmers in their land by having the Panchoo system. It is evident that with no Panchoo system there will be a saving in use of water and whole basis of design of surface drains will need a drastic change, resulting in low cost drainage system. It can not be denied that there are strong social and traditional barriers for changing the concept of Panchoo Irrigation. But the assessment of losses suffered or benefits foregone, by following the traditional and apparently inefficient practice, can only be made by practising alternatives.

b) Another factor that is associated with the loss of water in this country is the irrigation application losses due to undulated topography of the fields and the traditional irrigation practices. It appears that there has been awakening in this direction among some of the progressive cultivators for levelling the unlevelled land in engineering design.

Faulty means of Conveyance of Water

Now the most important aspect where loss of water takes place is the means through which it is conveyed to the fields. These are the carrier channels including from main canals to water courses. As a result of research conducted at experimental projects and centres of excellence, it has been established that colossal quantum of useable water is just lost into the ground through water courses alone. An average of about 50% of the water which leaves the mogha and the tubewell in the Punjab and Sind is lost and does not reach the fields. Quantity of water lost in Pakistan after diversion from the rivers, through water course delivery and at the farm, as quoted by various agencies are not consistent. The figure of 50 MAF quoted by Master Planning and Review Division, WAPDA (assumed to be more authentic) is adopted for the purpose of the article: Total loss due to percolation given by various agencies is given as under:

1. On page 252 under Chapter 7, Advantages of Lining, in the Book entitled "Irrigation Canals." by Mr. Iqtidar H. Siddiqui, a figure of 10 MAF is given.

2. Dr. Nazir Ahmad in his article "Making better use of Pakistan's water resources" has quoted a figure of 17 MAF.

3. Mr. Mumtaz Ahmad Awan, Agronomist, Training Research Institute Water Management Lahore, in his statement in Pakistan Times dated 23-5-1986 has said that:

   a) Losses in the canals are 32 MAF.
   b) Losses from water courses are 37 MAF.
   c) Irrigation application losses are 14 MAF

   Total: 83 MAF.

4. One page 30 of the publication

"Revised Action Programme for Irrigated Agriculture" prepared by Master Planning and Review Division, WAPDA, a figure of 50 MAF is quoted (35 MAF in water courses and 15 MAF at the Farm).

Now if we draw an analogy between the water lost and the water stored in reservoirs created by dams, water of as many as almost eight Mangla Dams is lost since the storage capacity of Mangla Dam is almost 5.88 MAF. If you ponder over this analogy, the situation seems to be fantastic and unbelievable. Thus saving of water has analogy with the construction of dams in the sense of conservation of water. Now for a storage project like dam, imagine the long and tedious process the country has to undertake from the date it is conceived till its water is put to beneficial use after completion of the dam. It will require appointment of Consultants, preparation of feasibility report, designing and final preparation of Project Planning Report etc. etc. involving lot of time and money. During actual execution of the project, continuance of foreign/local consultants (not necessarily foreign but this is the present practice in the country if it is a big dam), import of machinery and foreign exchange are required, thus depending mostly on foreign assistance. But no such rigours as mentioned above are needed for works which are required to minimise the loss of water. Among various devices to control/minimise loss of water though seepage, consider, for the purpose of illustration, canal lining. Costly though it is, yet neither import of costly machinery nor any foreign specialists nor foreign exchange are required. In this field, Pakistan has the requisite expertise to cope with any type of such work. Thus it can be stated that "launching of schemes like lining of earthen channels to control loss of water through seepage" has analogy with the construction of storage works like Dams" in the limited sense of production of water and its ultimate beneficial use for the purpose of irrigation.

There has been greater realization and awakening at government level in this direction and it is heartening to note that a beginning (belated thought it is) in the recent past has been made to take steps against the loss of water through percolation. This question is being dealth with under what is now called Command Water Management Project. This project consists of two components namely Irrigation component and On-Farm Water Management (OFWM) component. About seven sub-projects spread over an area of 6,10,000 acres (G.A) and 510 ac (C.A) are being executed in all the four provinces of Pakistan.

Irrigation component provides lining of Distributaries and Minors in addition to rehabilitation of channels and remodelling of outlets. OFWM component includes lining of water courses. The main objective is not only to save loss of water as much as possible and increase the intensity by using the saved water but also as a corollary substantially minimise waterlogging and salinity.

DR. A. Q. KHAN HONOURED

By
*Engr. Haroon Rashid Toosy.**

Dr. A. Q. Khan Project Director Dr. A. Q. Khan Research Laboratories Kahuta was awarded PEC diamond Jubilee Medal Award of 1987 in a special meeting of Executive Council of Pakistan Engineering Congress held in Railway Auditorium on 4th Feb: 1988. Dr. Khan had been nominated for the award earlier but he could not receive it in person due to indisposition. The members of the Executive Council were keen to see that Dr. Khan received the medal in person, so that could have an opportunity to meet a great son of soil whose dedication to his work is source of honour and pride for the Engineers of Pakistan.

The meeting started with recitation from Holy Quran by Engr. Barkat Ali Luna and was followed by address of welcome by Dr. Mohammad Ikramullah President of the Pakkstan Engineering Congress. The address of welcome is reproduced below:-

> "Honourable Chief Guest Dr. Abdul Qadeer Khan, Members of the Pakistan Engineering Congress Executive Council and dear fellow Engineers.
>
> This is indeed an occasion of immense pleasure that we have with us today a world renowned scientist and the pride of Pakistan's engineering profession. I mean, our respected Chief Guest Dr. Abdul Qadeer Khan who has kindly travelled all the way from Kahuta, specially to grace this function of the Pakistan Engineering Congress.
>
> As you might be aware, one of the aims of the Pakistan Engineering Congress is to promote science, profession and practice of engineering. In this regard some medals have been instituted by the Congress, technical organizations and individuals. These medals are awarded annually to the selected authors of technical and research papers. During December last year the Congress held its Diamond Jubilee Session and it was decided to confer special medals on this auspicious occasion on some most distinguished and celebrated sons of our soil who have excelled themselves in their fields of specialization. It has been a privilege for the Congress to nominate Dr. Abdul Qadeer Khan for the award of one of the Diamond Jubilee Medals. Unfortunately, due to certain unavoidable circumstances it was not possible for Dr. Khan to attend the Diamond Jubilee Session and to receive the award on that occasion. The Pakistan Engineering

* Director Technical (Power) Punjab, Irrigation & Power Deptt. & Publicity Secretary, Pakistan Engineering Congress.