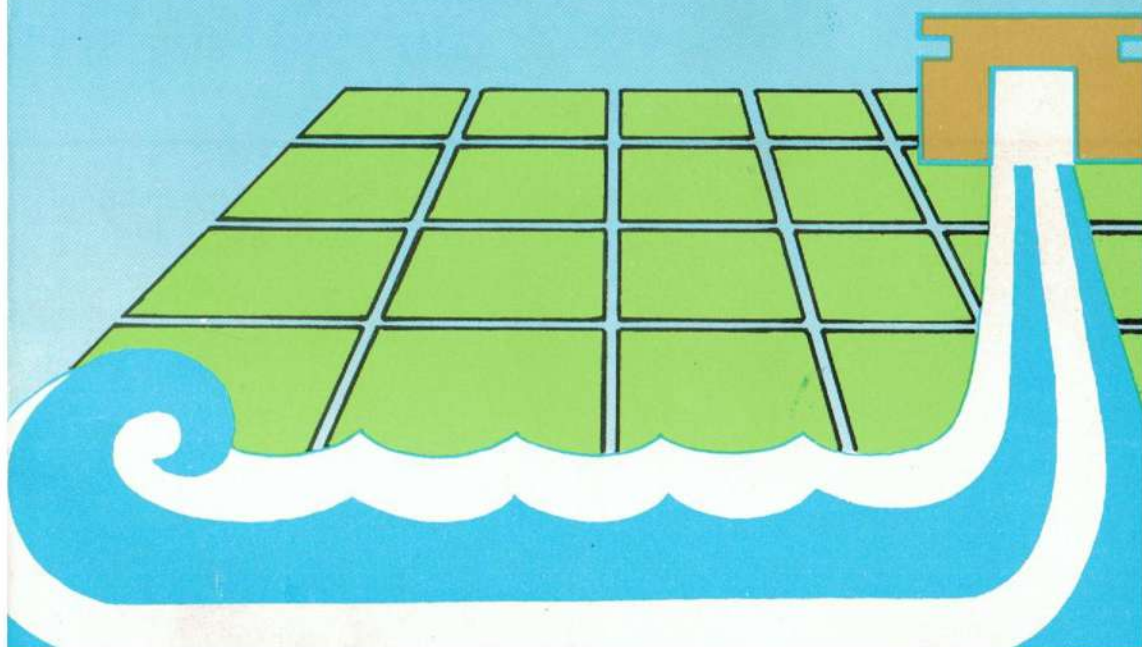


A COMPREHENSIVE
HISTORY OF **IRRIGATION**
IN THE PHILIPPINES



**A COMPREHENSIVE HISTORY
OF
IRRIGATION IN THE PHILIPPINES**



NATIONAL IRRIGATION ADMINISTRATION
National Government Center, Epifanio delos
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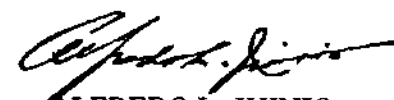
FOREWORD

The following treatise is a comprehensive narration of irrigation development in the Philippines that takes us two thousand years back when, without the aid of modern knowledge, tools and technology, the original inhabitants carved rice terraces out of forbidding mountainsides that came to be regarded as the eighth wonder of the world. It discusses further development towards modern irrigation technology during three centuries of Spanish and half a century of American domination. It finally covers the more sustained, heroic development efforts after the Philippines regained its independence in 1946 that ushered in an era some authorities term as the "Golden Age of Irrigation in the Philippines".

Irrigation systems in the country in earlier days developed very slowly and most were government-built small to medium-sized "run-of-the-river" government-operated national systems or farmer-operated communal systems that covered a few thousand hectares at the beginning of this century up to about 200,000 hectares in the 1950s. After independence in 1946, the rate of irrigation growth picked up gradually but was still not enough to support the growing population's rising food requirement until the National Irrigation Administration (NIA) was created by law on June 22, 1963. The new irrigation agency, a government corporation, started operations in March 1964. Its corporate status enabled it to carry out its functions effectively, thus accelerating irrigation development through better conceived, better designed and better built and managed irrigation systems. By 1989, some 1,538,144 hectares out of about 3.16 million hectares of potential irrigable area in the Philippines had been placed under irrigation.

Significant, too, was the successful implementation of two large reservoir-type projects, the Upper Pampanga River Project (UPRP) in Nueva Ecija and the Magat River Multipurpose Project (MRMP) in Isabela, which primarily provide year-round irrigation. Earlier, NIA had participated in the Angat River Multipurpose Project (ARMP) in Bulacan, which was built principally for power generation. Pump irrigation was undertaken wherever economically feasible and drainage concerns were also given due consideration.

To be sure, both the need and the pressure to build more irrigation systems and to increase agricultural productivity through better operations and maintenance of existing ones will be there for the authorities to meet as long as our population grows at its present rate. It is comforting to note however, that the institutions, the basic infrastructure and the political will for further irrigation development are already in place. The country awaits with great expectations.



ALFREDO L. JUINIO
Administrator (1966-1980)

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National Government Center, E. delos Santos Avenue,
Quezon City, Metro Manila

Published by
The National Irrigation Administration

PREFACE

In the years before the publication of this book, students, government and private workers and professionals in agriculture, civil engineering, economics and other disciplines had been increasingly conducting researches on the various aspects of irrigation in the Philippines. Many of them were particularly interested in obtaining materials on the history of irrigation in this country. Materials available at the time, however, dealt on specific aspects of irrigation too technical in language and presentation or too limited in scope to satisfy the purposes of most researchers.

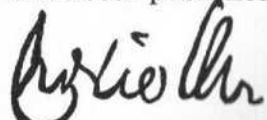
To answer general research needs and as part of its regular information dissemination activities, the Public Affairs and Information Staff (PAIS) proposed in late 1978 to then Administrator Alfredo L. Juinio the publication of a book on the history of irrigation in the Philippines. Administrator Juinio approved the proposal, and work on the manuscript started in January 1979. Due to certain constraints, however, the project was deferred later that year. In late 1986, PAIS revived the idea, citing the strong justification for the project. I readily approved the proposal and committed my full support to the undertaking.

The objectives of the book are:

1. To make available to students, researchers and other parties a comprehensive and authoritative reference material on the subject.
2. To document the history of irrigation in the Philippines for inclusion in the National Archives.
3. To emphasize the decisive effect of irrigation on the productivity of palay and other agricultural crops.
4. To cite the role of the National Irrigation Administration (NIA) as the government arm in irrigation development.
5. To stress the need for sustained irrigation development to provide continuing support to the national food production program.

This book consists of eight chapters. It also has four annexes that discuss in detail the following major subjects included in the contents: (a) the making of irrigation projects; (b) forest degradation and water pollution, (c) farmers' participation in irrigation development and; (d) foreign assistance and cooperation.

I am particularly proud that this book, which required high research capabilities and writing standard is the product of the collective effort of the rank and file of the agency — top management, mid-level managers and the lower echelons, including the indispensable typists. And I am sure this is the first of its kind in the Philippines in terms of scope, contents and presentation, and I hope that it will serve the purposes for which it has been published.



FEDERICO N. ALDAY, JR.

ACKNOWLEDGMENTS

Several individuals in and outside the National Irrigation Administration contributed in varying degrees, directly or indirectly towards the realization of the book, a milestone in the annals of the agency. A lot of work, time and other resources went into the making of this book which involved a wide variety of activities: research, analysis of data, organizing of materials, writing of manuscript, validation of data and information, revisions, shooting and processing of photographs, preparation of artworks, tables and other illustrations, editing, typing of drafts and final copy, layouting, proofreading, coordination and printing supervision.

Because of the big number of individuals involved in the project, it is not possible to enumerate all their names and acknowledge their respective contributions. However, the following individuals were directly involved either in the major stages or entire duration of the project as members of the Working Committee, and later of the Production Staff:

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Proofreader
Proofreader
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Utilityman
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Indexing

Bonifacio M. Mangalindan and Frank R. Hernandez provided general guidance to the project as Chairman and Vice-Chairman, respectively, of the working committee with Engr. Ma. Trinidad E. dela Rosa taking over final coordination with the printer, while top and middle management acted as consultants. On the other hand, Mrs. Clehenia C. San Juan, former supervisor of the Journalism Department of the Division of City Schools, Manila served as Editorial Consultant of the book.

HOW THE BOOK WAS WRITTEN

This book took more than ten years to produce. It started in late 1978 when management approved a proposal of the Public Affairs and Information Staff (PAIS) to undertake a project to publish a definitive history of irrigation development in the country.

For the purpose, the Public Affairs Officer of Region 6, Carmelo L. Mabunay, was designated to help PAIS in undertaking the job. However, serious problems cropped up during the initial research stage so that the project had to be shelved indefinitely.

Shortly after the February 1986 Revolution, the new NIA management gave PAIS the go-signal to resume work on the long-dormant project. This time, a Book Project Staff was created with representatives from the four major sectors of the agency.

During the periodic draft reviews, the Project Staff left no stone unturned in order to come up with an accurate and comprehensive volume. They argued, sometimes heatedly, over choice of words, phrases, sentence structures, shades of meaning and other seemingly trivial but nevertheless relevant details. Also, the Project Staff sent out questionnaires to some technical specialists whose pertinent comments and suggestions were evaluated and incorporated in the final text. The result is a balanced and readable book which the general public will find both informative and interesting.

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INTRODUCTION

This book, the very first on irrigation development in the Philippines, discusses not only irrigation as practised through the centuries but also the creation and growth of the National Irrigation Administration (NIA). It is intended for easy, yet authoritative reference in all research works concerning irrigated agriculture in the country and can be used for any level of high school or college activities where the emphasis is irrigation engineering.

To provide the proper background, the book traces the origin of irrigation in ancient times. Then it enumerates and discusses irrigation events, programs and accomplishments in irrigation development in the country starting from the building of the rice terraces about 2,000 years ago through the different historical periods up to contemporary times. It concludes with a summary on the importance of water and the need for immediate and decisive actions to rehabilitate our watersheds and prevent the siltation of rivers and pollution of our water resources.

That irrigation plays a very vital role in the development of our agricultural economy is a fact established beyond any doubt in this book. And yet it is interesting to note that no sustained program for its development existed until NIA started operations in 1964. It was about the middle of the year when the new irrigation agency proceeded earnestly to fulfill its mandate to bring about an "Irrigation Age" in the Philippines that rapid progress in irrigation development really began. And with it, NIA grew also rapidly as the implementation of priority projects proceeded with increasing urgency to meet the rising food requirements of the country's growing population.

Irrigation development in the Philippines has been influenced by three distinct factors and these are: the country has been and still is chiefly agricultural, rapid increase of a mostly rice-eating population and a pronounced rainy season usually punctuated by typhoons followed by a relatively dry summer period. The government has placed emphasis on irrigated rice culture although significant gains have been achieved lately in the production of exportable crops like bananas and sugar. The preponderance also of relatively small-size farms and the government policy of breaking up big plantations have heavily influenced the design and operation of irrigation systems. Introduction of improved and early maturing varieties have made rice farming more profitable and irrigation investments more viable and attractive in the last two decades.

A recent development that has set a new direction for irrigation development in the country is NIA's implementation of the Diversified Crops Irrigation Engineering Project (DCIEP), a five-year technical assistance package grant from the government of Japan. Its primary purpose is "the study of the most appropriate methods of irrigating diversified crops and establishment of standards for the planning and design of facilities for non-rice crops". Complemented by a Diversified Crops Irrigation Engineering Center with facilities for trainings, soil and water laboratory and other support services, it is expected to boost the agency's capability to deliver the basic input for agricultural productivity and countryside development. All these will help greatly in promoting the

attainment of our national goal of self-sufficiency in agricultural crops for a more self-reliant economy.

There is no doubt that the Philippines has great potentials in agricultural production. With adequate infrastructures, technology and support services, it could well become a major exporter of a wide range of agricultural products. But this obviously requires continued irrigation expansion to cover the remaining unirrigated areas of the country.



JOSE B. DEL ROSARIO, JR.
Administrator

CHAPTER I

IRRIGATION IN HISTORY AND THE RICE TERRACES

Origin of irrigation; irrigation defined; some primitive devices and structures; the Irrigation Water Court of Valencia, Spain; the building of the rice terraces and irrigation practices in Northern Luzon; and traces of the terrace culture in other parts of the archipelago.

ARCHAEOLOGICAL records reveal that people started early in ancient times to engage in farming as a way of life. Through farming, they gradually developed a social life based on family and kinship. Later on, they established societies and developed cultures which became the roots of civilization. At first, these early farmers depended solely on rainfall or floodwaters in the culture of their crops. After a long but indeterminate period of time, however, they found a means of supplementing rainfall or floodwaters in growing their crops and in making arid lands cultivable. This means is known as "irrigation", defined by Webster's dictionary as "the artificial watering of land (as by canals, ditches, pipes or flooding) to supply moisture for plant growth". As societies grew, the demand for food also grew, and irrigation became increasingly important in the production of agricultural food crops.

In ancient times, people probably conceived the idea of irrigating their lands from the natural phenomenon of the seasonal flooding of lands where rainfall was scarce. When the flood subsided, they observed that lands along riverbanks were heavily soaked with water, and they planted seeds in the mud. After doing this from generation to generation, they must have reasoned out that it was not necessary for them to wait for the seasonal floods to soak their farms. Long after the flood had subsided, they drew water stored or retained in natural depressions along riverbanks to water their crops. The invention of the first water container led to other inventions to draw water from a stationary source or a watercourse and to store, divert and convey it to the fields. These were done by closing or damming exits of runoff water and watercourses, excavating portions of riverbanks, constructing diversion structures, canals and ditches and digging depressions and wells in places far from water sources.

Irrigation in History

It is most likely that irrigation was first practised in the great river delta of the Nile in Egypt. The names of irrigation devices still widely used today in that country and in many other parts of the world seem to confirm the Egyptian origin of irrigation. Along with goods and ideas, the knowledge of irrigation and irrigation practices spread to other places through the ancient trade routes between Egypt and Asia. It was, therefore, no coincidence that ancient civilizations such as those in Babylon (later Mesopotamia, now Iraq), Persia (modern Iran), India and Cathay (China) flourished where irrigation was extensively practised.

Biblical Times. The Scriptures confirm the ancient origin of irrigation. In *Genesis 2:10*, there is reference to a river that "went out of Eden to water the garden. . . .". In *II Kings 3:16*, the allusion is clearer: "And he said, 'Thus saith the Lord, Make this valley full of ditches.' For, saith the Lord, 'Ye shall not see wind, neither shall ye see rain; yet the valley shall be filled with water.' . . .".

Menes, the first king of a unified Egypt (circa 3,000 B.C.), is believed to have built banks along the Nile to control flooding, originating the basin system of irrigation. Because the annual floods played a central role in their lives, ancient Egyptians devised gauges that registered the height of water level at any given time. These measuring devices, called *nilometers* (literally, "measurement of the Nile"), are graduated scales cut out on a natural rock or on a stone wall of a pit connected by a tunnel to the Nile. Some of these measuring devices still exist.

An inscription on the tomb of Assyrian Queen Semiramis (circa 2,000 B.C.) reads: "I constrained the mighty river to flow according to my will and led its water to fertilize land that has been barren and without inhabitants". Irrigation canals believed to have been built during her reign are still delivering Nile water to the parched lands of Egypt.

River regulation and water storage for irrigation and domestic use were also practised by the ancient Babylonians who controlled the water level of the Euphrates by digging huge depressions in the Arabian deserts. These artificial lakes covered 650 square miles and were 25 feet deep when full of water. A massive construction was undertaken by Nimrod who had the river feeding the Tigris Valley dammed with earth and rocks to raise the

water level by some 40 feet. One of the canals of this irrigation structure was 40 feet wide, 16 feet deep and 350 feet long.

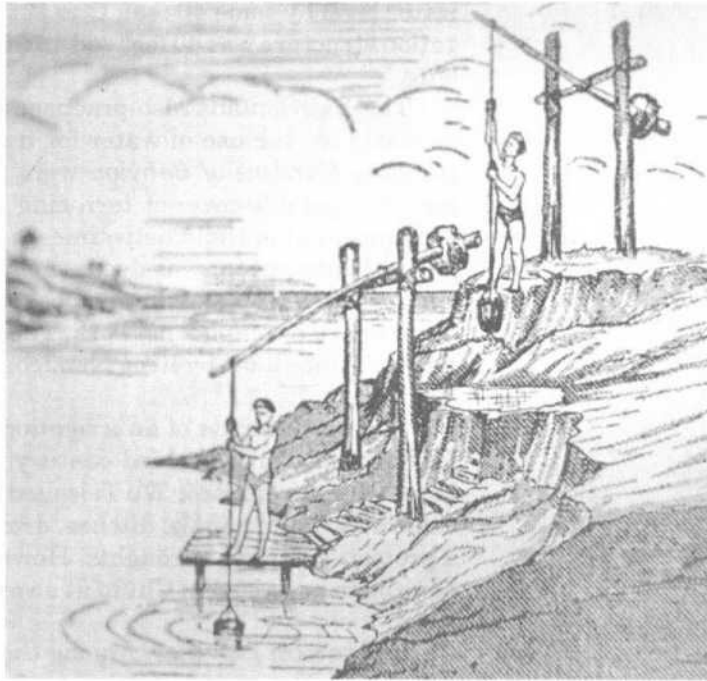
The Babylonians also practised terraced agriculture to maximize the use of water for irrigation. The famous *Hanging Gardens of Babylon* were actually a simulated hill of vegetable-covered terracing over a vaulted substructure that in Hellenistic times, according to **Encyclopedia Britannica**, was deemed one of the "Seven Wonders of the World". Each terrace was irrigated by canals that formed a complex network. The *Hanging Gardens of Babylon* were built by King Nebuchadnezzar who died in 562 B.C.

The construction of an irrigation canal in China was first recorded in the third century, B.C. Two centuries later, Chinese emperor Wu Ti issued an edict ordering his subjects to build canals, ditches, drains and reservoirs as a protection against droughts. However, irrigation must have been practised in China at a very much earlier date.

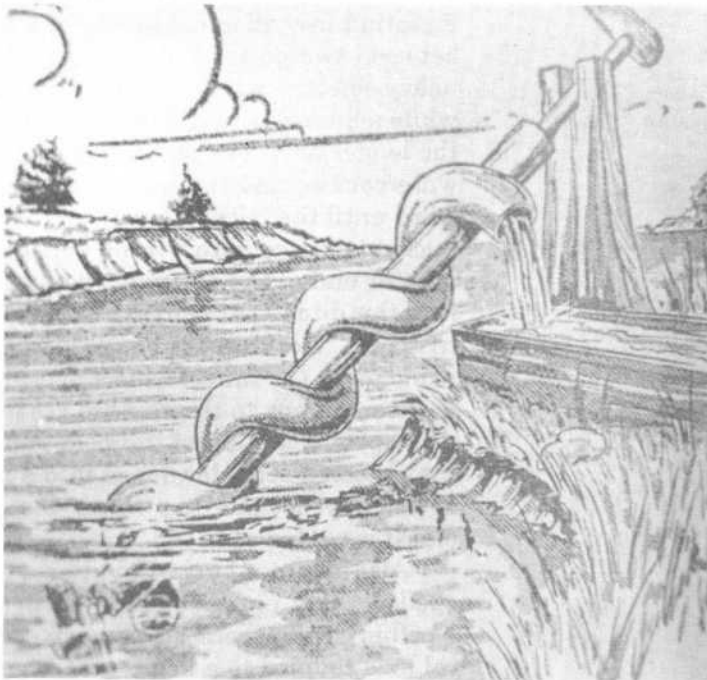
Irrigation Devices. Among the primitive irrigation devices used by peoples in ancient times were the *shadoof*, *sakieh* and Archimedean screw.

The *shadoof* (called *denkli* or *paecottah* in India) is an Egyptian invention consisting of a long crossbar pivoted between two posts. A stone, ball of clay or some kind of heavy object is attached to the shorter end of the crossbar while a bucket is tied by a rope or long stick to the end of the longer part. The *shadoof* is set up over a pool, well or watercourse, and the worker tilts the longer end downward until the bucket dips into the water. When full, the bucket is raised with the aid of the counterweight at the shorter end of the pole, and the worker pours the water into the ditch that conveys the water to the land to be irrigated. Working the *shadoof* was a tedious chore. To while away the time, farmers operating the device began to utter sounds to the rhythm created by the downward and upward motion of the pole and bucket. The sounds they uttered soon developed into a pleasing melody that eventually became known as the *Shadoof Chant*, the oldest recorded song.

Also invented by the Egyptians, the *sakieh* (sometimes spelled *sakia* and known as *harat* or Persian wheel in Northern India) consists of a vertical wheel on a horizontal axis coupled to a horizontal wheel with simple gears. With pots attached to its outer rim, the vertical wheel is partly submerged in the water. A cow or horse is hitched to the horizontal wheel which turns as the animal walks in



Shadoof (reprinted from Encyclopedia Americana)



Archimedean Screw (reprinted from Encyclopedia Americana)

circles. The gears cause the vertical wheel to turn and when a water-filled pot reaches the top before it starts downward, it is emptied into a trough leading to a field ditch. In some places today, a windmill instead of an animal is used to turn the horizontal wheel.

The Archimedean screw consists of a hollow wooden cylinder with a helix inside. The apparatus is mounted slantwise on posts so that the end of the cylinder is submerged in the water. When the cylinder is rotated vigorously by means of a crank, the water rushes up the helix and flows out of the top of the cylinder. The device was named after its inventor Archimedes, a Greek mathematician who discovered the law of fluid mechanics or displacement. He died in 212 B.C.



Irrigation Water Court. Early men, recognizing the critical importance of irrigation in growing their crops, especially in areas with light rainfall, evolved principles and procedures governing the appropriation and use of water, maintenance of irrigation structures and settling of conflicts among water-users. The world renowned Irrigation Water Court (*Tribunal de Aguas*) of Valencia, a southern city in Spain, came into existence through this age-old process.

As reported in the **NIA Digest** (Vol. XIII, No. 1), Valencia's ancient irrigation regulations were enforced by the administrative committee of each community of water-users whose chairman, the *sindico*, was elected by popular

vote. The main responsibility of the *sindico*, who may be a Christian or an Arab, was to act as judge of the tribunal. To ensure impartiality, a *sindico* must be of average economic means and must actually cultivate his own land. The court held sessions starting just before noon every Thursday at the doorway of the "Door of Apostles" of the city's cathedral. A farmer summoned to appear before the court to answer a complaint against him invariably had to appear, otherwise, he was automatically convicted for failure to attend after the third summons. The proceedings were oral and the verdict, final.

The exact origin of Valencia's Irrigation Water Court has been lost in the thick mist of time, but some historians say that it is the oldest judicial tribunal in the world - at least 1,000 years old. In fact, when James I of Aragon recaptured Valencia for good from the Moors in 1233, the court had long been an established institution. James I was so impressed by the tribunal that he issued a *fuero* reaffirming the authority it had exercised under the rule of the Arabs. The Irrigation Water Court of Valencia showed the way for peaceful co-existence, justice and fairness in the use of scarce irrigation water and in the relations among water-users. The United States, as a young nation, was able to accelerate its westward thrust by adopting Valencia's irrigation principles and procedures, thus making its new desertland territories productive.

The Rice Terraces

Like other peoples of the ancient world, early inhabitants of the Philippine archipelago engaged in irrigated agriculture. Robert B. Fox, who headed the Anthropology Division of the National Museum of the Philippines for several years, writes that, theoretically, pre-Spanish Filipinos began practising agriculture during the Neolithic Age or "New Stone Age". When irrigation was first practised in the islands cannot be determined, but historical accounts and archaeological findings give reliable clues to the approximate date of its origin.

According to historians, the first wave of immigrants landed in the archipelago around 1,500 B.C. These immigrants, known as the proto-Malays, came from South China, Indochina and Formosa through Indonesia. They settled mostly in the coastal areas of Northern Luzon. Between 800 and 500 B.C., a second wave, the Malays,

arrived in Northern Luzon. The newcomers pushed the proto-Malays from the coastal areas and plains to the highlands in and around the mountain provinces of Northern Luzon. Some of the proto-Malays found their way to the Sierra Madre range in Western and Southern Luzon in their exodus from the north. H. Otley Beyer, the eminent anthropologist who devoted a lifetime studying Philippine



Rice Terraces in Banawe

history and archaeology, postulates that the rice-eating proto-Malays, forced to live in pockets between mountains and plateaus, constructed the first rice terraces in Northern Luzon. This would place the age of the earliest rice terraces at approximately 2,000 years old, with which most experts agree. In his book the **Origin and History of the Philippine Rice Terraces**, Beyer writes:

"It seems probable that the advance groups introduced irrigated rice culture and built the first rice terraces. They also introduced Central Asian methods of mining and smelting and used the forge and bellows. This culture is usually known as the copper-bronze culture, although it might as well be called the Terrace Culture".

Terrace-building is a backbreaking job, which Beyer describes vividly:

The rice terrace properly built consisted first in digging out a terrace from the hillside and then building up on the edge of that terrace a stone wall. The back of the wall is filled with layers of materials carried up from riverbeds or brought down

from the hillsides which required a great deal of labor to get into place.

First, they level the area behind the wall so as to form a foundation. Over that, they put gravel and sand; then over that, some clay. This is to make the terrace water proof. Then inside the lining they put a foot or so of sand again and then some gravel....

When people in the mountains build rice terraces, they do not build them out of river stones in the rugged terraced areas in the hills and mountains. They build them out of broken stones. But later on, nature dissolves these broken stones, and one by one they are eroded away. As they decay and fall out, one by one, the people who own these terraces carry up round hard stones from the river which may be far down the mountain side. After filling the first hole, they may see another hole. They then bring up another round stone and fill it again. And they do this month after month, until finally that wall is all made of round stones until there is not a single broken stone in it.

The estimated human labor used in the construction of the rice terraces is enormous. To terrace one hectare of mountain slope would require 10,000 cubic meters of excavation, filling and rock masonry.

Council of Elders. Rice terraces are tilled by hand without the aid of work animals. A large paddy is usually constructed near the water source to serve as a reservoir. This kind of distribution system travels for some distance from paddy to paddy. In some areas, streams are tapped and the water conveyed through long canals, some sections of which are dug through solid rock. Excess water is drained through adjacent gulleys, where such exist, or through drainage canals constructed at the edge of the terraces where spillways are provided at the dikes bordering the drainage canals.

William Beyer, in his **Art and Culture in the Mountain Provinces** writes that, through the centuries, the mountaineers of Northern Luzon had developed practices and traditions in the construction, operation and maintenance of the rice terraces which are enforced by a council of elders called *ty nibah*. Land preparation and planting are done by the women in the belief that since women are childbearing, what they plant will likewise be fruitbear-

ing. In the operation of the irrigation system, no one has exclusive right to the use of water. However, the topmost terraces have priority. The owners of these terraces are obliged to release excess water so that the next lower terraces will be benefitted, and so on down to the lowest farms. When water is scarce, the terrace owners are required to contribute chickens, pigs and food, and the whole village holds a *cañao*. This is an offering to their *anitos* or gods so that the water supply may be increased. The ritual involves some dancing and incantations to the accompaniment of musical instruments very much like the rain dance performed by primitive peoples in other parts of the world.

Massive Modification. In their simple and primitive ways, the people of the mountain provinces of Northern Luzon stand out as a paragon of man's ceaseless struggle for survival. In the process of building the rice terraces in a span of two millennia, these ingenious highlanders incidentally gave the Philippines and the world an awe-inspiring and breathtaking engineering legacy whose sheer magnitude and spectacular beauty never fail to move those who lay eyes upon them.

An American visitor, upon viewing the Ifugao terraces for the first time, is said to have exclaimed: "Here is a modification by men of earth's surface on a scale unparalleled elsewhere - a massive modification beside which the Suez and Panama Canals are quantitatively insignificant!"

The magnitude of the rice terraces is typified by those located in Ifugao, the most extensive and famous. A stone marker placed by the Philippine Historical Commission at the entrance of the municipality of Banawe partly reads: The Ifugao rice terraces cover an area of nearly 400 square miles, and if the walls were placed end to end, they would reach halfway around the earth.

Other Rice Terraces. Extant records and structures reveal that the terrace culture was also practised by other inhabitants of the islands before the coming of the Spaniards. There are stonewalled rice terraces in Binangonan and Tanay in Rizal province and other towns around Laguna de Bay, and remnants of similar structures can also be found in Lukban in Quezon province. Vestiges of rice terraces can likewise be seen in the southeastern part of Panay Island in Western Visayas. Paiburong, one of the 10 datus who landed on the island from Borneo in the mid-

13th century, is credited with introducing the terrace culture there when he was ruler of the area comprising of what are now the towns of San Joaquin, Guimbal, Miagao, Tubungan and Igaras, all in the province of Iloilo. The introduction of rice terraces in pre-Spanish Iloilo apparently corroborates Beyer and other archaeologists who theorized that the culture was brought to the islands by immigrants from the Asian mainland and Southeast Asia through Indonesia.

CHAPTER II

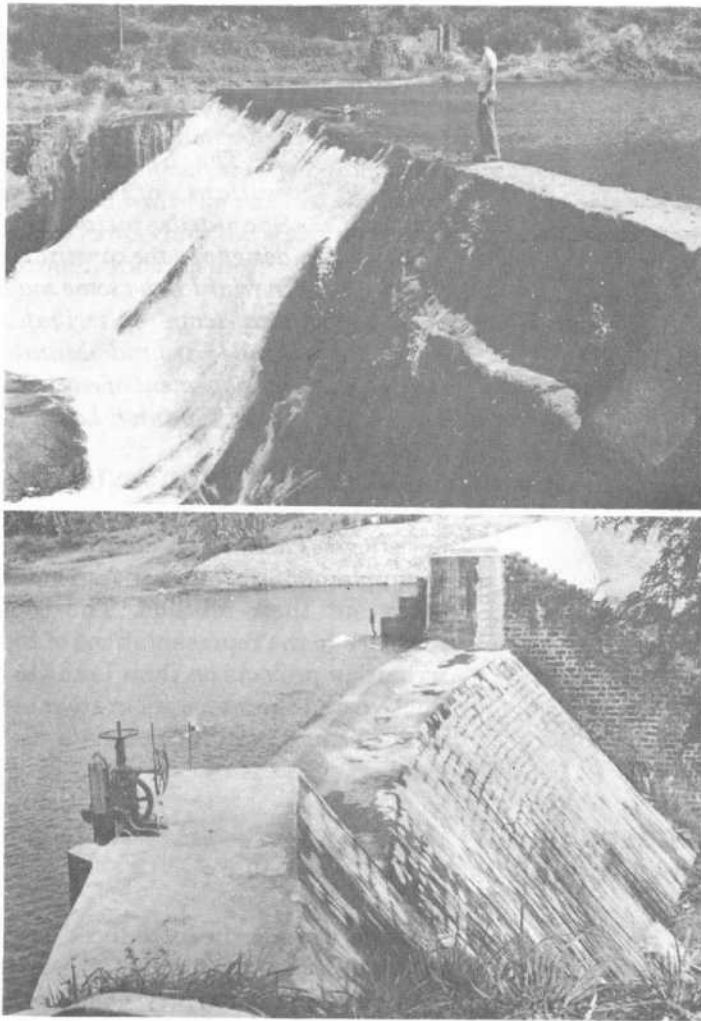
THE SPANISH REGIME

The Spanish Crown grants lands to military officers and religious orders; Spaniards introduce new techniques and designs in the construction of irrigation projects in friar lands; some major irrigation structures and scope of irrigation activities in friar lands around Manila; organization and management of zanjeras; and implementation of the Spanish Law on Waters.

DURING THE SPANISH rule, the King of Spain granted lands to religious orders to support their missionary efforts. These religious orders grew rice as a major crop to supplement the allowance granted to them by royalty to carry out their mission. The colonial government, in response to the representations of these orders, constructed irrigation projects on their lands to make them more productive and therefore generate more income. These lands later became familiarly known as "friar lands" or "friar estates".

Unexcelled Constructions

The Spaniards introduced new techniques and designs in the construction of irrigation projects for efficient operation and durability. Of all constructions undertaken during the Spanish regime, nothing excels in conception, execution or useful worth the irrigation systems built on friar lands in the five provinces around Manila, namely: Bataan, Bulacan, Rizal, Cavite and Laguna. The dams of these irrigation systems, for instance, are massive and are made of heavy stones, have no sluice channels and range in height from a few meters to as much as 40 meters from the base. The distribution system in some cases includes great networks of channels driven through rocks to convey water to canals. The tunnels vary in width from 0.11 meters to 0.20 meters and have a height of 0.15 meters. They are not lined but are faced at the vents where workers pass through in going down to clean the tunnels of sediment.



Unexcelled constructions as typified by those in Laguna and Cavite, above.

An example of an irrigation system in friar lands is the Prenza system in Marilao, Bulacan built in 1875. ("Prinza" is the Spanish term for dam, which was vulgarized by the local inhabitants into "prenza".) The original purpose of the project was to irrigate an orchard to be established in the Lolombcy Estate and its suburbs by the Dominicans. But it turned out that the soil in the area was not suitable for fruit trees and other orchard plants, so rice was planted instead. The system is still operational as part of the integrated Angat-Maasim River Irrigation System.

The system consisted of a diversion dam, canals and canal structures with a 50-meter flume and 100-meter barrel-type roadcrossing. The whole network of canals had

a total length of about 13 kilometers that served some 830 hectares of riceland. It drew water from the Prenza River. The canals were also used by the residents as transportation routes in bringing their produce to residents in the area. The project was constructed over a period of 800 working days. Construction was carried out by able-bodied residents and rehabilitated inmates of the Lolombboy Estate through forced labor. The estate was set up as a rehabilitation center for juvenile delinquents.

An anonymous author, in an article entitled "Friar Land Irrigation Systems in Nearby Provinces" (December 1932 issue of the **American Chamber of Commerce Journal**), says that 30 irrigation projects servicing 27,681 hectares of friar lands in the abovementioned provinces were constructed at a total cost of P6.13 million during the regime. The friar lands in Cavite attained the highest level of irrigation development. The 18 irrigation systems serving 18,000 hectares in that province represented 60 percent of the total number of irrigation systems and 65 percent of the aggregate irrigated area of friar lands in those five provinces.

Table 1

IRRIGATION SYSTEMS CONSTRUCTED IN FRIAR LANDS

Province	Estate	No. of Irrigation Systems	Area (Ha.)
Laguna	Binan	3	1,370
	Calamba	3	880
	Sta. Rosa	2	2,000
Cavite	Imus	8	7,500
	Naic	3	4,000
	San Francisco de Malabon	4	6,000
	Sta. Cruz de Malabon	3	3,500
Bataan	Orion	1	521
Bulacan	Lolombboy-Sta. Maria		
	de Pandi	2	1,850
Rizal	Muntinlupa	1	60
Total		30	27,681

The Zanjeras

Unlike irrigation systems in friar lands, communal irrigation systems were simple affairs and were constructed without any assistance from the central government. Thus, only a few of such systems were built. Although the construction, operation and maintenance of most communal systems were unrecorded, we have ideas of their structures and practices that were observed in their management based on research findings in the Ilocos region and the Cagayan Valley.

Irrigation societies were reported as early as 1914 by Filipiniana researchers. These provided the first substantial ethnographic reports on indigenous irrigation systems, mostly located in the Ilocos area. *Zanjera* or *sanjera* (Spanish term for turnout) is the local name for a cooperative irrigation society and is a unique development of farmers in the Ilocos region. On the basis of early Spanish reports, these societies came into existence starting 1630 and are still operating.

The function of a *zanjera* is simply to procure a stable, reliable supply of water for the use of its members. Most *zanjeras* have members from two or more *sitios* or *barrios*. In some instances, the members are all landowners; in others, landowners and tenants; and in several, all are tenants. Water for these indigenous systems is obtained usually from a river by means of locally-constructed bamboo and rock diversion structures placed across the river. Different *zanjeras* may share the use of a main or even a single diversion dam. Whenever physical complexities occur, a form of social adaptation is agreed upon to settle conflicts among individuals or groups of *zanjeras*. The construction costs of the dam, main canal and other engineering facilities are all shared by the members either by giving construction materials or contributing labor. This practice of sharing also governs the repair and maintenance of the system.

The operation of the *zanjeras* is a complex organizational enterprise that involves engineering and construction activities, soil-water relationship, management and allocation of water rights to groups and individuals. There are three main tasks involved in the operation of the irrigation systems: water allocation, physical maintenance activities and conflict management.

Lands irrigated by a *zanjera* are usually divided into several field units generally called *sitios*, each of which is composed of lands farmed by tenants and most of whom

live in the residential neighborhood within the *sitio* ricefields. Within each *sitio* is a fixed number of membership shares (locally referred to as *atars*). Each *atar* has a claimant, who may have more than one share. The claimant holds the right to till the land corresponding to his share/shares and has the responsibilities and privileges that the irrigation association assigns to each *atar*. The main privileges allotted to a share are the right to a portion of the system's water and the right to vote within the *sitio* unit and the larger association. The major responsibility is to provide labor and construction materials and other resources required to operate and maintain the system.

The *atar* as a unit of land is composed of several parcels which are non-contiguous and located within different blocks of the *sitio* unit in a patterned arrangement. The blocks are laid out perpendicular to the source of water and therefore represent differential distances from the water source. Some blocks and parcels are at the upstream portion of the canal, while others are at the tail end. In addition, each of the blocks is divided into strips of land, again perpendicular to the source. Within a block, a parcel is allocated to each of the *atars* represented in the *sitio*. At the lower portion of each *sitio*, one or more parcels of land are set aside for the use of the *sitio's* irrigation leaders who are selected by the water-users.

This arrangement of canals and lands permits equitable adjustments to situations of water scarcity. If the system is unable to provide sufficient water to irrigate all the land of particular *sitio* units, water-users may decide not to irrigate one or more blocks within their *sitio*. Consequently, all the farmers of that *sitio* would have their total farm size reduced proportionately, since all will have a parcel of land in each irrigated block and the burden of scarce water will not fall upon a few members who happen to be disadvantageously located. This is evident because almost all water-users have parcels at the head and tail portions of the system. Each farmer has his landholdings equally dispersed across different zones of the irrigated area and decisions not to irrigate a particular zone will have the same relative effect on all water-users.

In the last quarter of the 19th century, the Spanish authorities started the implementation of the *Ley de Aguas* (Law on Waters) in the operation and maintenance of irrigation systems in the Philippines. This law, passed by the Spanish Cortes on August 8, 1866, was a codification of all rules and regulations pertaining to irrigation.

CHAPTER III

RAPID GROWTH -- THEN DORMANCY

Creation of the Irrigation Division under BPW; passage of the "Irrigation Act" and other irrigation laws; construction of the first national irrigation system in San Miguel, Tarlac; intensive irrigation activities in the 1920s; dormancy of irrigation development after 1930; pork barrel funds for communal irrigation projects; and construction of two national systems during the Japanese regime.

AFTER ALMOST four centuries of Spanish rule, the Philippines became independent when President Emilio Aguinaldo of the Revolutionary Government proclaimed on June 12, 1896, the establishment of the Republic of the Philippines — the first democratic state in Asia. But an event that occurred halfway across the world was to change the course of Philippine history. This was the blowing up of the United States battleship *Maine* on February 15, 1898, in the harbor of Havana, Cuba, a Spanish possession. The event precipitated the Spanish-American War which broke out on April 19, 1898. Less than two weeks later, on May 1, Admiral George Dewey defeated Admiral Patricio Montojo in the historic Battle of Manila Bay. Under the Treaty of Paris signed on December 10 that year, Spain ceded the Philippines to the United States for US\$20 million.

Need for Irrigation

The Americans recognized the need for irrigation development to stimulate the economic growth of the country. In August 1907, the Philippine Legislature appropriated a permanent reimbursible sum of P250,000 for irrigation construction. However, irrigation projects could not be undertaken due to lack of sufficient data on which a sound construction program could be based. On June 17, 1908, the legislature passed Act No. 1854, which increased the permanent reimbursible sum for irrigation construction to P750,000 and created an Irrigation Division under the Bureau of Public Works (BPW). An irrigation commit-

tee of nine members was appointed by the Secretary of Commerce and Police to help the Irrigation Division in formulating an irrigation program for the country and establishing rules and regulations on the operation and maintenance of irrigation systems in friar lands. Pope Leo XIII had sold in 1902 the friar lands to the Insular Government, which in turn sold them to the tenant-farmers working on those lands.

C.G. Wrentmore, an expert American civil engineer, was recruited by the Philippine government to head the Irrigation Division on contractual basis. Upon the termination of his contract in 1912, Wrentmore became dean of the College of Engineering of the University of the Philippines (UP). His successor, W. L. Corton, served from 1912 to 1914. It was during the term of Corton that the Irrigation Division undertook the construction of the first national irrigation system in the Philippines — the San Miguel River Irrigation System (RIS) in San Miguel, Tarlac, with a service area of 6,000 hectares. This system cost P789,000 to build and was inaugurated on August 1, 1913.

On February 6, 1912, the Philippine Legislature passed Act No. 2152, known as the "Irrigation Act". The law regulated the appropriation of public waters, prescribed rules on water rights, provided for the investigation, construction, operation and maintenance of irrigation systems and payments therefor, among others. In determining the priority of appropriation of public waters, the order of preference established was as follows: domestic purposes, agricultural purposes or power development for agricultural purposes, industrial purposes, ponds for fisheries and mining purposes or milling connected with mining activities.

When World War I broke out in Europe in August 1914, the United States reallocated her resources in preparation for her eventual entry into the war on the side of the Allies. Consequently, all appropriations for irrigation construction were withdrawn from the Bureau. At the same time, virtually all American engineers of the Bureau volunteered their services to the war effort by joining the Army Corps of Engineers as reserve captains. Due to the stoppage of irrigation construction activities and the decimation of its complement of engineers, the Irrigation Division was reduced to a mere section of the Bureau's Designing Division.

On February 24, 1916, the Philippine Legislature passed Act No. 2652 to provide financial assistance in the

Intensive Activities

operation, maintenance, repair and improvement of existing private irrigation systems. However, only duly organized corporations or associations of landowners of the farms to be irrigated (minimum area: 25 hectares) were qualified for loans under this law. A loan applied for was not to exceed one-half of the estimated cost of the works to be undertaken, with the applicant corporation or association shouldering the balance. The Act set a loan limit of P50,000 payable in twenty years. Through this loaning scheme, the government inaugurated a program to assist communal irrigation development in the country.

Act Nos. 2753 and 2755 passed on February 23, 1918, gave more momentum to irrigation development by authorizing the establishment and management by their governments of provincial and municipal irrigation systems.

Towards the end of the war, Jose Paez was appointed Director of the Bureau, the first Filipino to hold the position. His promotion was a meteoric rise that came after only five years of service starting as junior engineer. Paez was also the first Filipino to obtain the degree of Master of Science in Civil Engineering at Cornell University, New York, USA. Shortly after the war, the Irrigation Division was revived with A.D. Williams as head and Emilio Quisumbing as assistant. Aside from irrigation, the division undertook activities on hydrology and water rights and the construction of waterworks, artesian wells, river control, drainage and sea protection projects. Funds were again appropriated for irrigation construction, and the division formulated a program for the first intensive and extensive development of national irrigation systems in the Philippines.

The program sought to irrigate such area of land as was deemed necessary to make the country self-sufficient in rice.



Jose Paez

The policy of the Irrigation Division was to construct only projects that would cause the generation of annual yields, the value of which would considerably be in excess of the interest on the construction cost plus all expenses incidental to their operation and maintenance. Under this policy, eleven projects were lined up for construction: four in Central Luzon, four also in Northern Luzon and three on Panay Island. The first project completed under this construction program was the Sta. Barbara RIS in Iloilo province on Panay Island with a service area of 4,600 hectares, inaugurated on December 1, 1922.

Meanwhile, the Insular Government provided more funds for irrigation through two laws passed on March 8, 1922. The first, Act No. 3011, authorized the issuance of bonds in the amount of P20 million as a revolving fund for the construction of irrigation projects. The second, Act No. 3013, further bolstered funding support by appropriating another P20 million under the "Irrigation and Permanent Public Works Bond Issue".

When Paez moved over in 1924 to the Manila Railroad Company, Williams assumed the directorship of the Bureau. He continued to head the Irrigation Division in a concurrent capacity, but it was Quisumbing, his assistant, who actually managed the Office. Nicanor Cortez became the first Filipino chief irrigation engineer when he succeeded Williams at the height of construction activities in the 1920s. On July 1, 1930, the Peñaranda RIS in Nueva Ecija was inaugurated, bringing to a close a decade of rapid irrigation growth in the country.



A.D. Williams

Table 2

NATIONAL SYSTEMS COMPLETED IN 1922-1930			
Irrigation System	Provinces and Municipalities Covered	Service Area (Ha.)	Date of Official Opening
1. Santa Barbara, ILOILO:	Santa Barbara, Pavia, Leganes, Jaro, La Paz and Iloilo City	4,600	Dec. 1, 1922
2. Dingras, ILOCOS NORTE:	Dingras	1,070	Jan. 1, 1923
3. Talavera, NUEVA ECIJA:	San Jose, Muñoz, Talavera and Sto. Domingo	9,120	Nov. 15, 1923
4. Aganan, ILOILO:	San Miguel, Oton and Iloilo City	5,520	Jan. 1, 1925
5. Tagudin, ILOCOS SUR:	Sevilla and Tagudin	1,370	Jan. 1, 1926
6. Amburayan, LA UNION:	Luna, Sudipen, Bulacan and Bangar	3,700	June 1, 1926
7. Sibalom-San Jose, ANTIQUE:	San Jose	4,430	July 1, 1926
8. O'Donnel, TARLAC, Tarlac,	Capas and Concepcion	3,270	Jan. 1, 1927
9. Angat, BULACAN:	Plaridel, Malolos, Bustos, Calumpit, Baliuag, Bigaa, Bocaue,		

	Bulacan, Guiguinto, Hagonoy, Pandi, Paombong and San Rafael	26,980	July 1, 1928
10. Laoag-Vintar, ILOCOS NORTE:	Laoag, Vintar, Bacarra, Sarrat and Piddig	2,400	Jan. 1, 1930
11. Peñaranda, NUEVA ECIJA:	Peñaranda, Gapan, San Isidro and Cabiao		
	BULACAN: San Miguel		
	PAMPANGA: Arayat and Candaba	17,670	July 1, 1930
1930			
TOTAL AREA IRRIGATED		80,130	

Due to the worldwide depression following the "Black Friday" crash of the New York stock market in October 1929, the government diverted the balance of P4 million out of the original P20 million bond issued for other purposes. Furthermore, the Irrigation Division was renamed Division of Hydraulics under Act No. 4007 passed on December 5, 1932. The division consisted of seven sections, one of which was an Irrigation Section. No major activities were undertaken since the completion in 1930 of the Peñaranda RIS up to the outbreak of World War II.

Pork Barrel

Meanwhile, the Philippine Commonwealth was established in 1935 pursuant to the Tydings-McDuffie Act providing for full independence of the country after a 10-year interim period. Manuel L. Quezon became the first President of the Commonwealth, with Sergio Osmeña as Vice President.

On October 26, 1936, the National Assembly passed Commonwealth Act (CA) No. 87. The law authorized the President of the Commonwealth, through the director of Public Works, to administer irrigation systems constructed under Act No. 2152, as amended, and to make adjustments

proceedings on unpaid irrigation charges and to grant persons the right to repurchase their lands which were sold to satisfy unpaid irrigation accounts.

Less than a month later on November 13, 1936, CA No. 176 was passed. This Act created an irrigation insurance fund for the purpose of meeting the costs of the repair, reconstruction and improvement of irrigation systems constructed by the national government that were damaged or destroyed or in danger of destruction by earthquake, fire, flood or other forms of *force majeure*. The fund was generated by the addition of fifty centavos per hectare in the irrigation charges collected from irrigation-users.

In 1938, pork barrel funds were allotted for the first time for communal irrigation projects. A "pork barrel", a term of American origin, is a government project or appropriation yielding rich political patronage benefits. In spite of its evident political purposes, this form of government assistance was significant: communal irrigation projects had emerged from the status of community affairs to national undertakings. By their very nature and purpose, pork barrel allotments were subject to the whims of favored politicians and were usually spread out thinly over many public works projects. The amount available to each legislator was inadequate for the proper construction of projects within his district. This resulted in the construction of dams in streams with insufficient water supply or on sites where foundations were unstable, causing the collapse of dams during heavy floods. In many instances, projects were left unfinished, completed and operating systems abandoned. The pork barrel system was later replaced by "community project allotments" to finance the construction of communal projects. Congress also legislated direct appropriations to fund Public Works Acts.

Under the Japanese Regime

During the Japanese regime, the Irrigation Section of the Division of Hydraulics was converted into the Irrigation and Drainage Division and placed under the Bureau of Plant Industry (BPI) of the Ministry of Agriculture and Commerce. The new Division was headed by Julian A. Buendia. The amount of P3 million was appropriated for the operation and maintenance of existing national systems and for the construction of new ones. The separation of the Irrigation Section from the Division of Hydraulics

and its placement under the BPI as the Irrigation and Drainage Division was resorted to as the best move to alleviate the acute lack of food as a consequence of the war.

Only two national systems were constructed during this period—the Hanagdong RIS in Sariaya, Tayabas (now Quezon) province, with a service area of 270 hectares and the Rizal RIS in Nueva Ecija with a service area of 1,000 hectares. Due to wartime conditions and inadequate funds allocated for operation and maintenance, most national systems rapidly deteriorated.

The result was predictable: palay yields fell to low levels. To make matters worse, Japanese authorities required farmers to turn over one-half of their palay produce to feed the 250,000-man occupation army. Furthermore, huge quantities of rice from the meager domestic production were shipped to the so-called "southern regions" occupied by 17 Japanese armies made up of some 750,000 soldiers.

CHAPTER IV

RICE PROGRAMS AND IRRIGATION DEVELOPMENT (1945-1962)

The urgent need to attain self-sufficiency in rice and raise the level of irrigation development after World War II; rice programs of the different administrations and the various palay production factors; reactivation of the Irrigation Division; accomplishments in irrigation development during the Quirino and Magsaysay regimes; direct relationship between irrigation growth and increased palay productivity; reasons for failure to attain self-sufficiency in rice, resulting in costly rice imports; Macapagal presents a comprehensive socio-economic program; and establishing a planning program for the water resources development of seven major river basins.

BY THE END of World War II, there were 14 national systems with an aggregate service area of 87,400 hectares and numerous communal systems irrigating approximately as much area, or a combined total of about 173,800 hectares. Together with the 27,681 hectares covered by 30 irrigation systems in friar lands, the area served by different types of government-built and private irrigation systems throughout the country at the time was around 201,481 hectares. This aggregate area represented an irrigation development level of 6.44 percent based on the potential irrigable area of 3.16 million hectares nationwide. With the exception of the newly-constructed Hanagdong RIS in Quezon and the Rizal RIS in Nueva Ecija, all national systems in the country were in a bad state of deterioration and disrepair.

Given the immediate postwar conditions and considering that the Philippine economy was still based on agriculture upon which 70 percent of the population depended directly or indirectly for its livelihood, it was imperative and logical that this sector had to be given priority under the national rehabilitation program. The initial step in agricultural growth, however, was to increase palay production so that the country could be self-

sufficient in its staple food in the shortest time possible. In addition, the rice industry had been, and continues to be, a major feature of Philippine agriculture for two other reasons. First, the rice industry generates diverse and large-scale business activities and second, the price of rice is highly sensitive to the law of supply and demand and consequently serves as one of the primary indices of the cost of living standard.

In 1946, the total area planted to palay was 1.64 million hectares yielding 36.89 million cavans (average: 22.5 cavans per hectare), a mere 67 percent of the 1937 level. The rice shortage was filled by commodity aid as part of the United Nations Relief and Rehabilitation Administration (UNRRA) operations. All postwar administrations, therefore, enunciated the policy of increasing palay production so that self-sufficiency in rice could be attained as early as possible.

Expansion of Cultivated Area

On April 23, 1946, Manuel A. Roxas won in the last presidential election under the Commonwealth Government. The following July 4, the Philippines regained her independence.

Roxas offered a program of government with industrialization as the underpinning of the rehabilitation effort. Under the conditions at the time, agricultural development was a *sine qua non* in industrialization, which was meaningless unless the mass market - the impoverished rural population - was elevated to an economic position whereby people could purchase the products of industry.

But Roxas did propose a program to increase rice production which called for the cultivation of 100,000 hectares of new areas every year for five years by developing disposable forest lands and lands of the public domain with the use of large-scale mechanized farming. Based on a projected average yield of 30 cavans per hectare (quite a high estimate since the national production average in 1946 was only 22.5 cavans per hectare), the total area of 500,000 hectares at the end of the program period was expected to yield 15 million cavans, or an increment of three million cavans a year.

The Roxas rice program was actually a continuation with some modifications, of the "land-for-the-landless"

movement launched in the late 1930s by Quezon through CA No. 441, which created the National Land Settlement Administration (NLSA). The settlement program, however, was not implemented effectively due to lack of funds, inadequate orientation of government field workers, skepticism and reluctance of landless farmers and other problems. The war broke out before any appreciable results could be achieved.

The settlement program was resumed after the war with the enactment of CA No. 694 on October 15, 1945. This Act created the Agricultural Machinery and Equipment Corporation (AMEC) for the purpose of providing settler-farmers with machinery at cost, to be paid on easy installments. The AMEC was later absorbed by the National Development Company (NDC) as a subsidiary and renamed Machinery and Equipment Department (MED).

In 1947 the Irrigation Division of BPW was reactivated. The Division updated the prewar plans and designs of three national irrigation projects and began their construction when funds were made available. These projects became operational in 1949. They were the Maasim RIS serving 2,500 hectares in Bulacan, inaugurated on July 15, 1949; Bical-Bical RIS in Nueva Ecija with a service area of 1,050 hectares, opened on August 9, 1949; and Miray-Aca RIS in Bataan benefiting 150 hectares, which started operations on October 8, 1949. These projects were constructed at a total cost of P634,068.65. By the end of 1949, therefore, the total number of national systems had increased to 17 with an aggregate service area of 91,100 hectares. In addition, the Bureau had five national projects under various stages of construction, and plans and designs for more projects were steadily flowing from the drawing boards.

As corollary to settlement, the Rice and Corn Production Administration (RCPA) was organized on March 24, 1949. Its main objective was to bring about increased production of rice and corn. The RCPA program was carried out in three reservations located in Buluan, Cotabato; Maramag-Wao straddling the Bukidnon-Lanao border; and Panacan in Palawan.

Pump irrigation development as a government program started in 1949 when the secretary of the Department of Agriculture and Natural Resources (DANR) issued General Administrative Order No. 1-A creating an Irrigation Pump Administration (IRPA). IRPA was established for the purpose of purchasing irrigation pump

equipment and supervising their installation, operation and maintenance. Also, the newly-created Central Bank (CB) released P11 million to finance the construction of irrigation projects.

In the first three years of the Roxas' five-year rice program, the goals for both cultivated area and production were surpassed. In the first year of the program period, for instance, total cultivated area for palay increased by 229,640 hectares, while total production posted an increment of 10.5 million cavans over the previous year. In spite of this huge increase in palay output in 1947, total production fell far below consumption requirements and the country was forced to import 125,383 metric tons of rice valued at P58.2 million. This marked the start of the country's rice importation that spanned 21 uninterrupted years.

Table 3

**PALAY AREA AND PRODUCTION; RICE IMPORTS
(1946 - 1949)**

<u>Year</u>	<u>Area</u> (Ha.)	<u>Production</u> (Cav.)	<u>Import</u> (Cav.)
1946	1,649,960	36,893,940	—
1947	1,879,600	47,460,000	2,507,660
1948	2,026,300	50,928,480	2,402,220
1949	2,164,100	56,620,200	2,911,140

Due to a paucity of data, the total increase in the hectarage of rice area and production generated by the program could not be determined since the increments also included those outside the program areas.

The shortcoming of the Roxas rice program lies in its failure to forecast correctly consumption requirements. Thus, while the program may be considered a success for surpassing the goals in cultivated area and production, it was also a failure in the sense that it did not attain the paramount objective of rice self-sufficiency.

It will be noted that the Roxas rice program leaned heavily on the expansion of the cultivated area through large-scale mechanized farming complemented by the provision of agricultural credit, farm inputs, technical services and motivation of farmer-settlers to increase

their production through land ownership in the settlement areas. The strategy failed because a critical element was missing: **irrigation**. In fact, a high official of the Roxas administration had expressed grave reservations with the five-year rice program. Cornelio V. Crucillo, who headed a Philippine agricultural mission to the United States in December 1945, cautioned against the use of large-scale mechanization in palay production *without the implementation of an irrigation development program as a support measure*.

Rapid Rehabilitation

Vice President Elpidio Quirino succeeded Roxas who died of heart attack during the joint observance of Philippine-American independence on July 4, 1949 at the Clark Air Force Base in Angeles, Pampanga.

A salient feature of the Quirino program of government was the immediate increase in agricultural production through rapid rehabilitation and development for which the amount of P15 million was set aside. This program, to be implemented by the RCPA, included the adoption of mechanized farming, provision of irrigation facilities, use of high-yielding rice varieties and application of improved farming techniques. Through this program, it was projected that the annual increment in palay production would reach 10 million by 1954.

The Quirino rice program was augmented in 1952 with agricultural credit support through the passage of the Rural Banking Act and the creation of the Agricultural Credit and Cooperative Financing Administration (ACCFA). The ACCFA charter ushered in a revolutionary concept of agricultural credit in the Philippines. For the first time, liberal credit in the form of production loans without collateral was made available to qualified rice and corn farmers.

Meanwhile, on August 13, 1952, the DANR secretary, the chairman of the Philippine Council for U.S. Aid (PHILCUSA) and the chief of the United States Mutual Security Agency (MSA) mission in Manila reached an agreement concerning the irrigation pump program for the Philippines. Under the agreement, the Irrigation Service Unit (ISU) was created under DANR with the initial appropriation of P2.5 million as local counterpart funds. By 1953, the ISU was transferred to the Depart-

ment of Public Works and Communications (DPWC).

During the term of Quirino (1950-1953), 11 national systems with a combined irrigable area of 28,780 hectares were completed, increasing the number of these systems to 28 and their aggregate irrigated area to 119,680 hectares. Communal, pump, friar lands and privately-owned irrigation systems irrigated roughly the same size of area, bringing total irrigated lands nationwide to approximately 266,000 hectares.

Palay output during the period rose significantly, reaching a peak of 71.45 million cavans in 1953, up by 14.83 million cavans, or 26.1 percent over the 1949 yield. On the other hand, rice import plummeted to a mere 1.9 metric tons in 1953 compared to the huge volume of 145,557 metric tons in 1949. The country came tantalizingly close to becoming self-sufficient in rice in 1953.

More Irrigation Systems

Ramon Magsaysay, who won in the presidential election in November 1953, gave more emphasis to rural development, with focus on the *barrio*. Like his predecessors, Magsaysay formulated a program to attain self-sufficiency in rice as one of the major objectives of his administration. He said in his state of the nation address on January 25, 1954: "We shall hasten the construction of more irrigation systems and encourage increase in rice production....". True to his word, he made available the funds needed by BPW to prosecute its irrigation development program. During Magsaysay's incumbency, 16 new national systems with an aggregate irrigable area of 76,770 hectares were completed. In addition, 27 new communal systems with a combined service area of 57,410 hectares went into operation during his term in office. Magsaysay also accelerated the construction of other community-based irrigation systems by creating the office of the Presidential Arm on Community Development (PACD).

At the close of 1957, the total number of national systems had risen to 44 with an aggregate irrigable area of 196,650 hectares. Including areas irrigated by other types of government-constructed systems, the total irrigated area throughout the country increased to approximately 400,000 hectares, pushing up the rate of irrigation development to 12.8 percent. The prodigious accomplish-

ments in irrigation during the Magsaysay regime virtually matched all accomplishments from 1913 to 1953.

On the other hand, cultivated area and palay production posted modest gains at an annual average of 30,000 hectares and 2.38 million cavans, respectively, and the average production per hectare rose from 26.9 cavans in 1953 to 27.5 cavans in 1957. However, the faster growth of the population created greater demands for rice and rice imports again rose to cover shortfalls in palay production.

"Filipino First"

Magsaysay died in a tragic air accident on the night of March 17, 1957 and was succeeded by Vice President Carlos P. Garcia. Garcia shifted government thrust to foreign affairs and although his administration was guided by the "Filipino First" policy which he set, agricultural development remained at a *status quo* at the most. Some areas, in fact, suffered major setbacks.

During the incumbency of Garcia, the ACCFA was given additional functions, such as administering the fertilizer program as part of Japanese reparations and the tobacco-buying operations of the government. These extra functions greatly slowed down the agency's loaning operations and cooperative development program due to the keen competition among its regular operations and special activities for the limited manpower and financial resources. An indication of this slowdown was the substantial reduction in the palay production loans extended by the ACCFA to small farmers.

In 1958, Congress created under Republic Act No. 2084 the Rice and Corn Production Coordinating Committee (RCPCC). A government inter-agency body composed of seven members, the RCPCC was charged with coordinating and implementing a rice and corn program to attain self-sufficiency in those cereals in the shortest time possible.

Due to lack of adequate support to the rice production program notwithstanding pronouncements to the contrary, palay yields actually declined in relative terms during the four-year term of Garcia. Although total cultivated palay area in 1961 registered a net increase of 429,630 hectares over the 1951 area, palay production rose by only 8.15 million cavans. Consequently, per hectare yield that year plunged to 23.2 cavans, much lower than

the 1947 figure of 25.3 cavans. Huge volumes of rice imports continued to fill the gap between actual production and consumption requirements.

Comprehensive Program

Diosdado Macapagal defeated Garcia in the 1961 national elections. The new president offered a comprehensive program of government entitled "Five-Year Integrated Socio-Economic Program for the Philippines". A major feature of the program was a rice and corn plan "to bring about, at the shortest time possible, sufficiency in those cereals at prices within the reach of the masses". Macapagal stressed that it was incumbent upon government "to provide improved irrigation and water control facilities....".

Significantly, Macapagal appended to his five-year program a copy of the preliminary report prepared by a mission sent to the Philippines the previous year by the International Bank for Reconstruction and Development (IBRD), better known as the World Bank (WB), to conduct an in-depth economic study of the country. Quoted below are the mission findings on the status of the irrigation and drainage program in the country:



Diosdado Macapagal

In the main, water resources have developed by fits and starts under strong political influence. Maintenance has been mediocre: water charges, although unrealistically low, have not been paid by many farmers, and research and planning have been relegated into the background. Drainage, an increasingly serious problem in some areas, has suffered from lack of vision and inadequate financial support. The Mission cannot recommend sizeable new irrigation projects until a basic study of water resources national in scope is under-

taken. Such basic research is costly but more economical in the long run than the haphazard progress of the past. Maintenance expenditures on existing irrigation works could be usefully increased, and there are several river control and drainage projects on which sufficient information is or soon will be available to warrant expanded outlays in the next five years. Capital expenditures for these purposes in 1956-60 were around P160 million.... We suggest that for 1962-66 an allowance of about P210 million be made. Current outlays for maintenance and research work should be at least doubled—from about P25 million in the past to P50 million or even more in 1962-66.

In October 1962, the National Economic Council (NEC) and the United States Agency for International Development (USAID) concluded an agreement to establish a planning program for water resources development in seven major river basins in the country. The program included an investigation and completion of a feasibility report for a selected multipurpose project in Central Luzon. For this purpose, the United States Bureau of Reclamation (USBR) would provide a team of technical consultants to work with Philippine government agencies in the formulation of water resources development plans.

CHAPTER V

ADVENT OF NIA

Creation of NIA - its powers, functions, objectives and capitalization; implementation of the NIA charter; first set of Board of Directors; appointment of Tomas de Guzman as administrator and Conrado G. Mercado as assistant administrator; the agency's first two years of operation; appointment of Alfredo L. Juinio as acting administrator; recovery of momentum in irrigation development; attainment of self-sufficiency in rice for the first time in 1968; NIA starts to metamorphose into an agency with broader powers and multifarious functions with the approval of the Upper Pampanga River Project; decline in palay production due to destructive typhoons; preparation of the feasibility study for the Magat River Multi-Purpose Project.

ON JANUARY 11, 1962, before the opening of the first session of the fifth congress, Congressman Eugenio Baltao of the first district of Nueva Ecija filed a bill seeking the creation of an irrigation agency. The measure, designated as House Bill No. 21, was co-sponsored by 27 other congressmen. After minor amendments, the lower house passed the bill on May 11, 1962. But it was not taken up in the Senate because Congress adjourned shortly thereafter. The Senate deliberated on the bill the following year and passed the measure on May 18, 1963, after minimal amendments. President Macapagal signed the bill into law on June 22, 1963, which became known as Republic Act No. 3601 entitled "An Act Creating the National Irrigation Administration".

The passage of the bill was prompted by the need to construct more irrigation systems throughout the country to boost production of food crops both to meet the rising consumption requirements of a rapidly growing population and to strengthen the national economy.

Among the outstanding features of the Act was the grant of corporate status, broad powers, functions and objectives to the new irrigation agency.

Powers and Capitalization

Under its charter, NIA had the following powers and objectives:

- To investigate, study, improve, construct and administer all irrigation systems in the Philippines;
- To investigate all available and possible water resources in the country for the purpose of utilizing the same for irrigation;
- To plan, design and construct the necessary projects to make the ten to twenty-year period following the approval of the Act as the "Irrigation Age" of the Republic of the Philippines;
- To collect from the users of irrigation systems constructed by it such fees as may be necessary to finance their continuous operation and reimburse within a certain period of not less than twenty-five years the cost of construction thereof; and
- To do all such other things and to transact all such businesses as are directly or indirectly necessary, incidental or conducive to the attainment of the above objectives.

The powers and functions of NIA were exercised by a Board of Directors of seven members, to wit: Secretary of Public Works and Communications, chairman; Secretary of Agriculture and Natural Resources; Chairman of the Board of Directors of the National Power Corporation; Director of Plant Industry; Director of Agricultural Extension; and two other members to be appointed by the President of the Philippines, one on the recommendations of any national rice and corn organization and the second on the recommendation of the minority party.

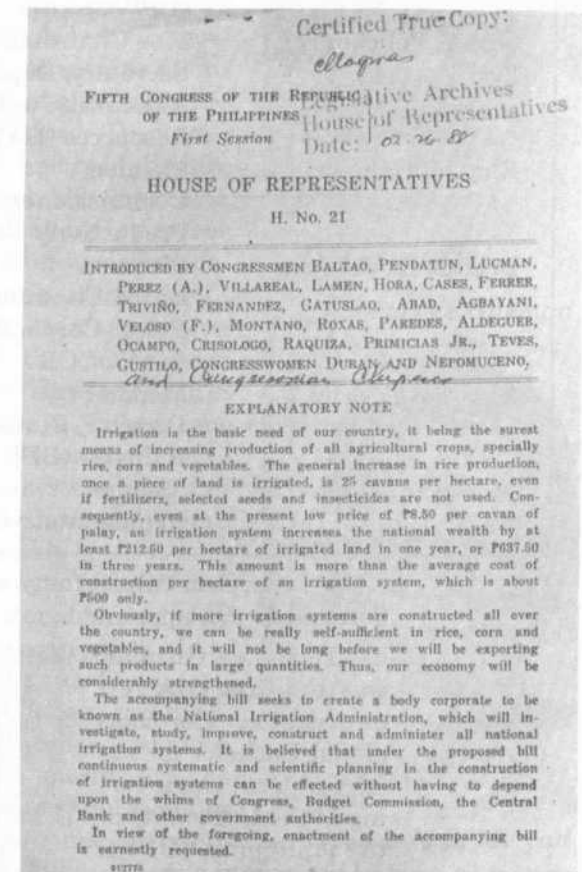
As a governing body, the board is empowered, among others, to prescribe rules and regulations relative to the manner in which the general business of NIA may be conducted, to appoint and fix the compensation of an administrator, an assistant administrator, a secretary and a treasurer and to approve the annual/supplemental budget of the agency, subject to the approval or action of the President.

The general management of NIA is vested in an administrator, assisted by an assistant administrator. The administrator is charged with the responsibility, among others, of directing and managing the affairs and business of the agency on behalf of the Board, appointing subordi-

nate personnel as may be necessary, sitting at meetings of the Board and participating in its deliberations.

NIA was authorized a capitalization of P300 million, which it could supplement by obtaining loans for and in behalf of the Republic of the Philippines out of the proceeds of the sale of imported surplus commodities under Title IV of United States Public Law (USPL) 480.

All personnel, functions, unexpended appropriations, equipment, records and other assets and liabilities of the abolished BPW Irrigation Division were absorbed by NIA.



Explanatory Note

RA No. 3601 was implemented by Executive Order (EO) No. 91 dated August 13, 1964, which also provided for the transfer to NIA of the Irrigation Unit of the Bureau of Lands and the Friar Lands Irrigation System (FLIS)

under it, including all their personnel, unexpended appropriations, records and equipment. EO No. 98 dated September 15, 1964 made the implementation of the Act, effective March 17, 1964. The first set of NIA directors follows:

NIA Board of Directors (1964)

Jorge A. Abad	Chairman Secretary, Department of Public Works and Communications (DPWC)
Jose Y. Feliciano	Vice Chairman Secretary, Department of Agriculture and Natural Resources (DANR)
Eloy M. Baluyot	Member Commissioner, Agricultural Productivity Commission (APC)
Brigido R. Valencia	Member Board Chairman, National Power Corporation (NAPOCOR)
Eugenio E. Cruz	Member Director, Bureau of Plant Industry (BPI)
Florencio Moreno, Jr.	Member Representative, Minority Party

No representative of any national rice and corn organization was appointed.

Tomas de Guzman was the first NIA Administrator. He completed Bachelor of Science in Civil Engineering at the University of the Philippines (UP) in 1928 and passed the Board examination for civil engineers the same year. De Guzman started government service in 1926 as inspector in the District Engineer's Office in Pangasinan. He was the



Jorge A. Abad

chief of the Irrigation Division of BPW before his appointment as administrator.

Conrado G. Mercado was the first assistant administrator of the agency. Mercado obtained his Bachelor of Science in Civil Engineering degree from the University of Santo Tomas (UST) in 1937 and passed the Board examination the same year with a rating of 92 percent. He entered government service as instrument man under the Irrigation Division, BPW, and rose steadily through the ranks. As assistant civil engineer and later assistant design engineer in 1943-



Tomas de Guzman

1944, Mercado supervised the construction of the Hanagdong RIS in Sariaya, Quezon, one of the two national irrigation systems built during the Japanese regime. Before his appointment as assistant administrator, Mercado was staff civil engineer. A stickler for procedures, cost-effectiveness and discipline, he deserved much of the credit for the agency's reputation for high engineering standards and for placing it on a solid financial footing.



Conrado G. Mercado

The rest of the organizational setup of the agency consisted of a Legal Staff under the administrator and the assistant administrator, Finance Department, Development Department, Construction and Operation Department.

ment, and Administrative Department; and 10 Regional Offices throughout the country which implemented irrigation projects and operated and maintained national irrigation systems. In 1964, there were 79 national, 771 communal and 2,540 pump irrigation systems with an aggregate service area of 541,000 hectares nationwide.

Maiden Year

NIA started operations on March 17, 1964 when its Board of Directors met for the first time. The new agency had an initial complement of 631 personnel, all on monthly basis, absorbed from the former BPW Irrigation Division.



Ablaza Bldg. (Top Photo) & Doña Venancia Bldg. (Lower Photo)

All personnel in the central office were housed in two locations: the Ablaza building on E. Rodriguez Avenue and the Doña Venancia building across Araneta Avenue in Quezon City.

At the outset, the fledgling agency was plagued with financial problems due to scarcity of funds. In fact, the national budget in Fiscal Year 1964-1965 was less than P3 billion. In its first two years of operations, only P5 million was released as part of NIA's capitalization instead of P60 million at the rate of P30 million a year as provided by its charter. It was able to borrow P3.65 million under US Public Law 480, which augmented its funds for administration expenses.

Macapagal believed strongly in irrigation as a vital support for agricultural growth. At the time, NIA proposed the construction of 10 projects with a potential irrigable area of 77,000 hectares estimated to cost P50 million, one-half of which would be financed with a loan from USAID. It later revised its construction program by reducing the number of projects to five and including 67 existing national systems for rehabilitation. These projects were overtaken by events because Macapagal lost in his reelection bid in November 1965. They were completed in the early years of the term of his successor.

Continuing Low Yields

Due primarily to a standstill in irrigation development, the rate of palay production remained virtually static. In 1965, the second year of NIA's operation, production posted an increment of only 5.75 million cavans over the 1961 output or an insignificant production growth of 0.77 in four years. However, it is noteworthy that while irrigated area in 1965 accounted for only 29.9 percent of the total area planted, it contributed 39.5 percent to total production. As a result of continuing low palay yields and increasing consumption requirements, the country had to import 569,275 metric tons of rice valued at US\$60.98 million to fill the huge supply gap in 1965 — the biggest volume ever imported before or since.

Had Macapagal adopted the proposal of his economic czar, Sixto K. Roxas, perhaps the rice crisis during his administration could have been greatly minimized. Roxas submitted a crash program in 1964 to increase rice production. It called for the marshalling and concentration of government resources to increase the productivity of 180,000

hectares of prime ricelands under irrigation, mostly in rice-producing areas in Central Luzon. The Roxas plan, in the words of Napoleon G. Rama, writing in the November 13, 1965 issue of the **Philippines FREE PRESS**, "recognizes the commonsensical notion that it is much easier to hike production in cultivated fields than in rawlands". The plan proposed the deployment of workers of eight government agencies whose resources and services would be pooled and coordinated. The plan envisioned a modest increase of 15 cavans per hectare or a total of 2.7 million cavans with the first harvest.

Recovery of Momentum

Ferdinand E. Marcos won in the 1965 election and became the sixth President of the Republic.

Prior to the Marcos regime, irrigation development in the country was a sporadic undertaking characterized by short bursts of activities followed by long periods of slack. Hence, of the 282,000 hectares of service area covered by national irrigation systems constructed in 1913-1966, some 29 percent was generated in 1922-1930 and approximately 38 percent in 1950-1960. The balance of 33 percent was generated in the intervening period and after 1960. The lack of a sustained program disrupted the planning and implementation of projects.

On August 8, 1966, NIA held groundbreaking ceremonies for the Angat River Multipurpose Project (ARMP) at the damsite of the Angat RIS in Bustos, Bulacan. The project was principally a NAPOCOR undertaking featuring the construction of a hydro-electric power plant and an irrigation component designed to increase the system's irrigable area from 24,000 hectares to 27,000 hectares. After the project was completed, it boasted the longest afterbay regulator in the world with six sector gates, each measuring 79 meters long and 2.5 meters high. As part of the groundbreaking ceremonies, the entire second district of Pampanga consisting of 12 towns was declared as a land reform area to mark the third anniversary of the signing of RA No. 3844, better known as the "Agricultural Land Reform Code of 1963".

Recognizing that irrigation development was the key to increased palay productivity, the President gave the program his full support by directing the release of funds to NIA in increasing amounts and on a regular basis starting September 1966.

Up to this time, the concept of irrigation development in the Philippines was limited to the construction of projects, operation and maintenance of national systems, collection of irrigation fees and related activities—all for one purpose, irrigation. Although NIA was tasked to make the ten to twenty-year period following the approval of RA No. 3601 the "Irrigation Age" of the Republic of the Philippines, which required massive expansion of resources and services, its charter still maintained this concept. This is obvious from the definition of NIA's functions. Thus, while its charter gave it a formidable mandate, the agency's capability to fulfill that mandate was limited.

Under the situation, perhaps no one—not even Congressman Baltao and his co-sponsors of the NIA bill—ever imagined that the agency would eventually evolve into a big organization with multifarious functions and broad coverage that it is now. But this evolution of NIA was inevitable in the context of its mandated duty to help meet the heavy and pressing demands of socio-economic development.

On September 28, 1966, USBR submitted the first feasibility report to USAID pursuant to the NEC-USAID agreement of October 1962 to establish a planning program for the water resources development in seven major river basins in the country. This first report contained an engineering and economic appraisal of the Upper Pampanga River Project (UPRP) proposed to be constructed at the upper reaches of the Pampanga River. The proposed project was a primarily irrigation undertaking to control, regulate and fully utilize the flow of the Upper Pampanga River and its two tributaries. Among its objectives were to provide year-round irrigation to 81,000 hectares of farmlands in Nueva Ecija, generate power, provide domestic and industrial water supply and subsidiary benefits, such as flood control, fish culture and recreational facilities, and limited means of water transportation. The report concluded that the project had both engineering feasibility and economic justification.

After the submission of the USBR report, a UPRP Coordinating Committee was created. It was composed of representatives from NIA, NAPOCOR, BPW, National Waterworks and Sewerage Authority (NAWASA) and RCPCC. The committee evaluated the report and recommended its implementation after making some modifications.

USBR also submitted feasibility reports on six other major river basins between November 1, 1966 and January 15, 1967. These reports covered proposed projects for the Central Luzon Basin, Cotabato River Basin, Agusan Basin, Ilog-Hinabangan River Basin in Negros Occidental, Cagayan River Basin and Bicol River Basin.

Longest Six Months

In order to expedite the implementation of the infrastructure program, there was a need for close monitoring of all projects by utilizing military communications network nationwide. For this purpose, the Infrastructure Operations Center was set up with headquarters at Camp Aguinaldo, Quezon City. Since irrigation was given priority in the infrastructure program, Administrator De Guzman was logically chosen to head the irrigation component of the center.

The President needed a capable man to run NIA for which there were several prospects. Among those strongly recommended for the job was Alfredo L. Juinio, who was at the time chairman of the Civil Engineering Department, College of Engineering of UP.

Juinio had built up a solid record in the academe and was then undertaking an additional assignment as project manager of the UP Utilities Planning Project at the university campus in Diliman, Quezon City. His able handling of the project caught the attention of Executive Secretary Rafael M. Salas, who had known Juinio when the former was the secretary of then UP President Carlos P. Romulo. Juinio was also highly recommended by Alejandro Melchor, director-general of the Presidential Economic Staff (PES) and DANR Undersecretary Dioscoro Umali, among others.

When Juinio was called to Malacañang, he candidly told Marcos that he might not be fit for the job because he was a structural and not an irrigation engineer. Besides, he added, he was not a politician by inclination and preparation.

But Marcos was not to be dissuaded. He said, "You do your job, I'll take care of the politics. Don't worry about funds, but make every centavo count".

The President finally requested Juinio to give the job a try for six months, and if after that period he did not feel up to it, he could always go back to the academe. Juinio capitulated "because I considered the request of the President a command. But it turned out to be the longest six months of my life!" He was designated as acting administrator of NIA on December 1, 1966, while keeping his post at UP.

Juinio graduated Bachelor of Science in Civil Engineering at UP in 1939 and passed the board examination the same year with a rating of 88.3 percent. He started his government career in 1938 as student assistant in the UP College of Engineering.

When he graduated, he got a three-month detail at the Atlantic Gulf & Pacific Co. as design engineer. He was already an instructor when the Pacific War ended. Juinio earned his Master's degree at the Massachusetts Institute of Technology in Massachusetts, USA, in 1947, and by early 1952 was acting head of the Civil Engineering Department while still an assistant professor. He was appointed as permanent head of the Department on February 1, 1953. From August 15, 1965, up to December 31, 1966, Juinio was concurrently project manager of the UP Utilities Planning Project.



Alfredo L. Juinio

With Juinio at the helm of the agency, with the full backing of the President and the able support of his staff, irrigation development in the Philippines recovered the momentum it had lost after the intensive activities in the 1950s.

Irrigation was the crying need of the hour, but to answer that need the government required outside assistance due to its limited resources. At the time, USAID was lining up some assistance for the agency. NIA urgently needed heavy equipment to repair and rehabilitate several deteriorated national systems. USAID director Wesley C. Haraldson said that, as organized at the time, NIA did not have the capability to function effectively, and that unless it was reorganized, USAID would be reluctant to extend assistance. The World Bank held the same view, adding later that there should be a continuity in the tenure of top management officials to ensure proper project implementation. The Philippine government agreed and the necessary steps were taken. Rapid irrigation development followed and with it NIA grew equally rapidly. An indication of this growth was the tremendous increase in the number

of its personnel. On July 1, 1966, the agency had 635 permanent and 2,101 temporary or casual workers. By June 30, 1967, in view of the marked increase in field activities, the numbers had shot up to 1,632 and 13,616 workers, or increases of 157 percent and 548 percent, respectively.

Major Problems

In addition to its primary functions of constructing, operating and maintaining irrigation projects and facilities, NIA became increasingly involved in research and coordination with other government agencies whose functions were related to, among others, land reform, agricultural production, infrastructure, and power generation. Internal and external problems, however, threatened the prospect of maintaining the regained momentum. Two major problems that had been stymying the agency since it started operations particularly needed to be resolved. These were the extremely low collection of irrigation charges or fees and the irregular release of funds, often-times insufficient, for the construction of projects.

To solve these problems, the agency recommended to the President that: (1) the agency be granted an initial annual subsidy of P4 million for the operation and maintenance of national systems; (2) the condonation of the liabilities it had absorbed from the defunct BPW Irrigation Division; (3) the enactment of legislation to collect the huge back accounts that had accumulated (such as increasing penalty rates for delinquencies and facilitating the filing of cases for collecting back accounts); and (4) the enactment of legislation to provide a steady source of funds for the payment of foreign or domestic loans used in the construction of irrigation systems. The last recommendation was of vital importance because, pending the achievement of full agricultural development when farmers' income would have been sufficiently raised, irrigation fees had to be maintained at a rate that would at least cover the costs of operation and maintenance.

First ADB Loan Recipient

From January to May 1969, a task force from the United Nations Development Program (UNDP) conducted

a general review of the Philippine agricultural program. The group carried out its mission in close coordination with its counterpart Philippine panel composed of representatives from government agencies involved in agriculture and water resources development activities.

Among the more important recommendations of the task force were: (1) the formulation of water development plans on a wider perspective and within the framework of national policy objectives; (2) adoption of a rigorous methodology in the technical design and economic evaluation of projects; (3) incorporation of projects in provincial development programs; (4) amendment of procedures in budgeting and public accounting practices; (5) unification of various independent agencies dealing with water resources development; (6) creation of research and experimentation stations; (7) development of small or medium water development programs; and (8) bringing about a change in the traditional attitude and methods of the farmers. The team also advocated the integrated use of surface and groundwater for irrigation; conversion of selected irrigation projects into multipurpose schemes; intensification of irrigated agriculture and detailed soil and land classification surveys.

During the fiscal year, NIA became the first recipient of a loan from the newly-organized Asian Development Bank (ADB), of which the Philippines was a founding member. The loan was extended for project formulation and water management. Under the assistance agreement, the ADB would provide the services of experts for varying periods of from six months to one year. NIA, on the other hand, would put up a counterpart panel of local experts who would eventually form the nucleus of a research division of the agency.

Demonstration projects were set up during the period. The objective of these projects was to bring about increased production per unit area through the adoption and use of improved cultural practices, irrigation water management and education of the farmers in crop production in cooperation with other government agencies. High-yielding rice varieties were planted in these projects in conjunction with the application of improved methods of seedbedding, weeding, pest and disease control.

Cotabato
Project

In February 1968, the NIA-ADB Water Management Project was launched to keep NIA abreast of modern trends in irrigation techniques and practices. The initial outlay of P200,000 for the project was provided by RCPCC.

The Angat Pilot Project at the Angat-Maasim RIS was selected as the main staging area of operations. In June, a UNDP consultant mission appraised the proposed project for improving irrigation service through groundwater development. The project involved the establishment of two irrigation pilot projects in the Peñaranda RIS and Guimba RIS, both in Nueva Ecija, and pre-development (hydrological) survey of the groundwater potential within selected areas in the provinces of Cagayan, Isabela, Cotabato, Laguna and Negros Occidental.

Another package undertaking, the Cotabato River Irrigation Project (CRIP) consisting of three smaller ones within the Cotabato River area was formulated at this time. The irrigation facilities would consist of three diversion works, concrete-lined and earth canals, canal structures and farmditches with corresponding measuring devices. An additional feature was a 740-kilowatt hydro-electric plant to be installed along the main canal of the Marbel RIP to augment the power needs of Koronadal, capital of the new province of South Cotabato. The total cost of the project was estimated at P17.84 million.

Around the middle of the year, the Philippine government requested a loan from the World Bank to meet the foreign exchange cost of UPRP. A mission composed of Messrs. Amnon Golan, J. C. Douglas, J.A. Marinet and C.J. Hoffman came to the Philippines in September 1968 to conduct an appraisal and review of the feasibility study of the project. In its appraisal report, the mission concluded that the project was technically sound and economically justified and was eligible for a loan of US\$35 million on a 25-year term including a grace period of seven years. In the preliminary negotiations for funding support, Administrator Juinio convinced the World Bank that the huge project should rightfully be undertaken by NIA.

The Decisive
Factor

More than two decades after World War II, the country still suffered huge shortfalls in its annual palay production and continued to depend heavily on rice imports to meet the consumption requirements of a population that grew at a rate of 3.2 percent, one of the highest in the world. Since the end of WWII, the attainment of self-sufficiency in rice was so frustrating and elusive that it had become not just an economic goal but an obsession of every administration as well. The elusive goal was finally attained in 1968 when a bumper crop of 91.21 million cavans was harvested. That year, the country ceased to import rice for the first time since 1947 and appeared to have licked its perennial rice shortage.

Why was self-sufficiency in rice attained only in 1968 and not before, considering the massive efforts and resources the government had earlier expended towards that end? The answer: **accelerated irrigation development**. A major factor that also contributed to the unprecedented attainment of self-sufficiency in rice in 1968 was the extensive use of IR-8, the so-called "miracle rice", the first of a series of high-yielding varieties (HYVs) developed by the International Rice Research Institute (IRRI). IRRI, located adjacent to the UP College of Agriculture in Los Baños, Laguna, was established by the Rockefeller and Ford Foundations in 1960.

Table 4

PALAY AREA, PRODUCTION AND AVERAGE YIELD; NATIONAL AND IRRIGATED, 1961-1968						
Year	Area (Has.)	Production (Cavs.)		Area (Has.)	Production (Cavs.)	Ave. Yield
1961	3,197,750	74,095,100	23.2	959,790	28,995,600	30.2
1962	3,179,190	78,201,100	24.6	987,370	30,186,400	30.6
1963	3,161,320	79,339,700	25.1	1,013,570	31,777,700	31.4
1964	3,087,450	76,857,200	24.9	929,880	30,509,200	32.8
1965	3,199,670	79,849,300	25.0	958,380	31,555,800	32.9
1966	3,109,180	81,452,700	26.2	960,460	34,685,300	36.1
1967	3,096,120	81,880,400	26.4	1,170,640	37,280,400	31.8
1968	3,303,600	91,213,900	27.6	1,309,020	45,410,000	34.7

The use of IR-8 alone, however, could not have brought about the high level of production in 1968 and in subse-

quent years without irrigation. Vicente B. Valdepeñas and Gemelino Bautista stressed this fact in their book, **The Emergence of the Philippine Economy**, thus:

The use of HYVs by itself cannot accelerate the growth of output. *Sufficient irrigation* must complement their use. Thus, in irrigated areas where the use of high-yielding seeds was quite large, the yields exceeded the national average of local varieties by about 11 percent and as much as 50 to 100 percent in certain areas. Edward Rice of USAID agreed: All the impressive IR-8 stories involve irrigated acreage. In fact, one of the most important characteristics of the Green Revolution is that it has been confined to well-watered lands.

The decisive effect of irrigation is shown by the fact that while irrigated area constituted only 39.6 percent of the total cropped area, it contributed 49.7 percent of the national harvest. Average yields per hectare in irrigated and unirrigated areas were 34.7 cavans and 27.6 cavans, respectively.

While NIA chalked up significant accomplishments during this period, it continued to be hamstrung by a host of problems, principally lack of stable financing. Foreign borrowings, therefore, remained the major source of funds for the prosecution of its various programs. In fact, the fiscal position of NIA at the time was so precarious that the agency seriously considered the suspension of some projects under construction. Some contract projects were imperilled because some contractors could not be paid on time. This threatened the credit standing of the agency, a matter of utmost importance since it was heavily dependent on foreign financing for counterpart funds to support the completion of ongoing projects and the prosecution of new ones. At this time, the World Bank was evaluating the loan proposal for UPRP and ADB was reviewing a package proposal for assistance on project formulation involving the development of three national projects in the two Cotabato provinces and on water management in eight selected national systems.

Another problem was the improper operation and maintenance of communal systems by irrigators' associations. NIA was limited by its charter to the construction of communal projects, which constituted some 50 percent of the aggregate irrigated area. At the time, no government agency was charged with the supervision of the operation and maintenance of communal systems. This was aggravated by the shortcomings of irrigators' associations due to mismanagement, internal squabbles and lack of interest

of most officials and members in irrigation affairs. A contributory factor to this deterioration was the substandard nature of construction because, lacking in adequate funds



Agricultural Productivity Commission (APC) Bldg. now (BAEx)

and at the mercy of irregular fund releases, NIA had to make the best of a bad situation by adopting inexpensive schemes capable of serving small tracts of lands on a short-term basis.

There was also a need to unify all irrigation activities being undertaken by several government agencies. The merger of all these agencies was essential to unify planning, manpower resources, budgetary outlay and execution of programs.

The breakthrough in rice production in 1968 created a need for a coordinating body to oversee, unify and integrate the administration and implementation of the total food and agricultural production program of the government. Since RCPCC operated within a limited scope, jurisdiction and authority, the National Food and Agriculture Council (NFAC) was created on May 6, 1969, under Executive Order No. 183. The new coordinating body supplanted RCPCC.

As a consequence of the steady growth of its personnel and the pressing need for more space for its records, supplies, equipment and other property, NIA transferred in 1969 to the Agricultural Productivity Commission (APC) building on Elliptical Road in Diliman, Quezon City. APC is now known by its old name, Bureau of Agricultural Extension (BAEx). At first, NIA occupied only the entire

third floor but later occupied also the fourth when its construction was completed.

Start of Metamorphosis

In spite of myriad problems, NIA started to metamorphose into a dynamic agency and to demonstrate its capability to meet the expanding needs of national development and the high standards of modern irrigation science.

On June 18, 1969, RA No. 5499, the enabling law for the Pantabangan project was approved. The Act appropriated P200 million as local counterpart fund for the project. Shortly thereafter, a Philippine delegation proceeded to Washington, D.C., USA, for final negotiations with the World Bank. The delegation was composed of Finance Secretary Eduardo Z. Romualdez, PES Deputy Director General Placido Mapa, Jr., NAPOCOR General Manager Ramon R. Ravanzo, NIA Administrator Alfredo L. Juinio and NIA Engr. Cesar E. Gonzales. The World Bank approved on August 18, 1969 a loan of US\$34 million to finance the foreign exchange requirement of the project.

Engineering Consultants, Inc. of Denver, Colorado, USA, was selected to prepare the feasibility study and render consultancy services. Initial activities under the project consisted of the construction of an access road leading to the site, detailed structure site surveys, studies on the resettlement of those who might be displaced and additional investigations and surveys pending the arrival of the consultants. Due to its magnitude and requirements, the project was implemented by a separate and completely staffed unit with Gonzales serving as project manager.

The inexorable expansion of irrigated areas was, again, the critical factor in the attainment of self-sufficiency in rice in 1969. That year, the total irrigated area was 1.48 million hectares which accounted for only 44.4 percent of the total palay area of 3.33 million hectares but yielded 50.9 million cavans or 57.4 percent of total palay production of 88.93 million cavans. Average output per hectare in irrigated and rainfed areas was 34.3 cavans and 22 cavans, respectively, a whopping difference of 12.3 cavans.

Palay production topped the 100-million-cavan mark for the first time in 1970 with a prodigious output of 109.28 million cavans from 3.19 million hectares. The irrigated

area contributed 57.59 million cavans or 52.7 percent of total production harvested from 1.38 million hectares that represented merely 48.2 percent of total planted area. Comparative average production per hectare was 41.7 cavans in irrigated areas and 30.8 cavans in rainfed areas. The country thus continued to enjoy rice self-sufficiency for the third straight year.

Unseasonal Typhoons

Irrigation development activities maintained its vigorous pace at the start of the seventies as funds for NIA's construction and rehabilitation programs were released in increasing amounts. However, a series of unseasonal typhoons and floods in the second quarter of 1971 caused heavy damage estimated at P2.2 million on 39 national systems and seven projects under construction. The major causes of damage were heavy siltation of canals and strong flood currents that dragged along debris, sand, gravel and even boulders, resulting in the collapse of canal linings and washout of embankments, protection dikes and earthdams. The heavy damage sustained by irrigation facilities and structures once more underscored the disastrous effects of unchecked forest denudation against which NIA and conservationists had time and again warned.

Quick restoration and repair works, however, made possible the irrigation by 105 national systems of a total of 438,436 hectares which yielded an average of 44 cavans per hectare compared to 41 cavans per hectare in the rest of the irrigated areas that year. And although the aggregate cultivated area remained practically constant at 3.19 million hectares, palay yield reached 111.56 million cavans, 2.28 million cavans more than the 1970 output. The production increment was due to an increase in the irrigated area by 124,780 hectares.

In spite of the record palay production that year and the reserves accumulated in the three preceding self-sufficient years, the actual rice supply in the market was at a low level, pushing prices up. The only explanation was that there was widespread hoarding by households and speculating rice traders. The inevitable result was an artificial rice shortage, forcing the country to import 331,000 metric tons of rice at a cost of US\$28 million.

Bigger Undertaking

Groundbreaking ceremonies marked the start of construction of UPRP on June 11, 1971. By this time, NIA had begun gathering data for the feasibility study of the proposed Magat River Multipurpose Project (MRMP) in Isabela, a much bigger undertaking than UPRP. So far, some 10,000 hectares in the proposed project site had been classified, and the contract for an aerial topographic survey by photographic method of the service area had been awarded to the Certeza Surveying Co. Inc., a Filipino firm. Preliminary studies made in 1967 by the Nippon Koie Co., Ltd., a Japanese consulting firm, placed construction cost of the project at US\$60.4 million. The projected benefits were the irrigation of 74,500 hectares of agricultural lands, generation of 100,000 kilowatts of hydroelectric power and the mitigation of the destructive floods that annually ravaged the Cagayan Valley, among others.

NIA obtained a loan of US\$212,500 under the Feasibility Study Loan Funds of USAID to finance a team of USBR consultants who would provide assistance, guidance and training of personnel for the study. The study was to be a collective project of NIA, BPW, NAPOCOR, and Central Luzon-Cagayan Valley Authority with NIA as the implementing agency.

The primary objective of the study was to prepare an engineering and economic appraisal of the Magat project as the basis of a feasibility report of standard quality acceptable to international lending institutions to support a construction loan application. Another important objective of the study was to develop a nucleus of well-trained Filipino water resources development planners capable of eventually conducting water resources planning and feasibility work with a minimum or complete absence of external technical assistance.

By now, NIA's total accounts payable on foreign loans and repayments made on these loans had grown considerably. Although financial support to the agency continued to improve substantially, the repayment problems had equally increased due to the accumulation of more foreign borrowings. This had to be resolved by legislative action to stabilize the agency's long-range financial planning. For this purpose, NIA submitted to Congress a proposal to increase its capitalization from P300 million to P500

million without repayment or, in lieu thereof, the passage of a subsidy act.

The vigorous prosecution of the agency's construction and rehabilitation program brought the level of irrigation development in the country to 22.95 percent in 1971. At the time, there were 105 national, 4,568 communal and 6,877 pump irrigation systems throughout the country.

Heavy and protracted rains in late July 1972 brought one of the worst floods to Central Luzon, Metro Manila and parts of Southern Tagalog. The floods inundated wide areas for days and destroyed standing crops and irrigation structures and facilities. The big flood negated the repair and rehabilitation efforts undertaken the previous year and was a big setback to the irrigation development program. Palay production that year went down to only 106.49 million cavans, 5.07 million cavans lower than the previous year's output of 111.56 million cavans.

CHAPTER VI

FINEST IRRIGATION AGENCY

Declaration of martial law; transfer of ISU to NIA; first reorganization of the agency; palay production nosedives forcing the country to revert to rice imports; powers of NIA broadened further, its capitalization increased; ten-year irrigation development program (1975-1984) formulated; forecasting the regaining of self-sufficiency in rice in 1976 and the production of surplus in 1977 due to irrigation alone; and the forecast is dead on target.

A STATE of martial law was declared in the country on September 21, 1972. Two days later, Presidential Decree (PD) No.1 was issued. It provided for the restructuring of the government bureaucratic machinery under an Integrated Reorganization Plan. Pursuant to the plan, ISU of DPWTC was transferred to NIA, and NIA was attached to DPWTC. However, NIA continued to exercise a certain degree of independence in the formulation of policies and in the implementation of its programs, being a government corporation. Furthermore, the agency's administrator was designated overall coordinator of the irrigation development program nationwide. The decree thus finally unified in one agency—NIA—the functions, plans and resources that had long been diffused among several government entities.

As of December 31, 1972, there were 105 national, 4,621 communal and 7,344 pump irrigation systems with an aggregate service area of 752,806 hectares nationwide. The service area as of that date represented an increase of 211,806 hectares or 39.15 percent over the 1964 figure and hiked the level of irrigation development to 23.53 percent.

By Fiscal Year 1972-1973, as construction activities on the Pantabangan Project neared their peak, NIA's work force had ballooned to 17,539 individuals. The growth of both its personnel and its activities made imperative the reorganization of the agency in 1973. Among the salient features of this first revamp of its staffing structure were the creation of two more staff offices (Information and Management). In addition to the Legal Staff were a Finance Planning Committee under the Office of the Administrator, a Treasury Department and several divisions,

and the realignment of the functions of some divisions. An Equipment Management Division was added to the three divisions (Engineering, Finance and Administrative) under each of the ten regional offices. UPRP and other major special projects as well as regional offices were placed under the Office of the Administrator. Previously, the regional offices were under the Construction and Operations Department, a situation that compartmentalized field supervision and monitoring.

In Fiscal Year 1973-1974, NIA operated on a budget of P295.25 million, posted savings of P52.89 million and had total assets amounting to P1.38 billion.

In the wet season crop of 1973, NFAC launched the "Masagana 99 Program". This agricultural credit scheme targetted an average palay production of 99 cavans per hectare in irrigated areas by making available to qualified farmers production loans and extension services through a supervised credit package. To support this undertaking, NIA embarked on a crash repair program to facilitate the irrigation of 500,000 hectares under Phase I, for which P373 million in palay production loans was granted.

Notwithstanding the steady growth in irrigation development, the rapid repair of damaged systems and the initial implementation of the Masagana Program on a massive scale during the 1973 wet crop, palay production plunged to 92.18 million cavans that year, the lowest registered since the 88.98-million-cavan yield in 1969. This production decline was the cumulative result of a series of devastating typhoons that had slammed across the country in the two preceding years and the widespread drought in the first semester of 1973. The collective effects of these natural calamities on palay production was evident from the sharp reduction in average yield. In 1970, average national output per hectare was 34.2 cavans compared with the 41.7 cavans per hectare in irrigated areas. In 1973, however, the yields plummeted to 28.9 cavans and 38.4 cavans per hectare, respectively. Due to the production shortfall, the country imported rice for the third straight year after three self-sufficient years (1968-1970). The 1973 import was a huge volume of 305,705 metric tons valued at US\$86.53 million. Rice imports were to continue up to 1975.

The NWRC

Due to the rapid growth of the agency, Administrator Juinio arranged for the acquisition of a lot on which NIA could build its own building. A good site with an area of

2.08 hectares was found at the National Government Center along Epifanio delos Santos Avenue in Diliman, Quezon City. Right after the acquisition of the lot, for which NIA paid the National Housing Authority (NHA) P4.16 million, the design of the NIA building complex was drawn up. The groundbreaking ceremonies took place on March 17, 1974, NIA's 10th anniversary.

On March 28, 1974, the National Water Resources Council (NWRC) was created by Presidential Decree (PD) No. 424. The Council's objective is to undertake a scientific and orderly development and management of all water resources in the country consistent with the principles of optimum utilization, conservation and protection of these resources to meet current and future needs. NWRC is vested with the following functions:

- Coordinate and integrate, on a sound and logical basis, water resources development activities of the country within the context of national plans and policies for social and economic development;
- Determine, adjudicate, and grant water rights, amending for this purpose Act No. 2152 and other laws relating to the appropriation and utilization of surface and ground-water.
- Formulate and promulgate:
 - General criteria, methods and standards for basic data collection, project investigation, formulation, planning and design, feasibility evaluation; and
 - Rules and regulations for the exploitation and optimum utilization of water resources.
- Review and approve water resources development plans and programs of any agency within the context of the overall national plans and programs;
- Undertake river basin survey, inventory and appraisal of water and related resources and develop comprehensive basinwide plans of storage and control, maximize the conservation and multipurpose use of water in the basin;
- Undertake hydrologic surveys and establish, operate and maintain observation station networks and a centralized water resources data center necessary for the scientific survey and appraisal of surface and groundwater potentials of the country; and
- Conduct and/or promote special studies and researches with other government or private agencies on all related aspects of water resources development, such as weather modification, environmental quality, desalination and the like.

The policy-making body of the Council is a group of

high-ranking government officials composed of the DPWTC Secretary as chairman and the following members: secretaries of Agriculture, Natural Resources and Energy; director-general of the National Economic and Development Authority (NEDA); NIA assistant administrator; NAPOCOR president and general manager of the Metropolitan Waterworks and Sewerage System (MWSS). All policies, rules and regulations and programs approved by the Council are implemented by the executive director, who is assisted by a technical staff.

Pantabangan Dam Inaugurated

Through the rapid restoration of damaged systems and the completion of new ones, complemented with continuing credit, extension and other support services, the decline in palay production in the two preceding years was reversed in 1974 when a total of 118.19 million cavans of palay was harvested, topping the previous high of 111.56 million cavans in 1971.

On September 7, 1974, the huge P242-million Pantabangan Dam, the centerpiece of UPRP, was inaugurated. The major statistics of the dam are:

Height:	107 meters
Length:	1,615 meters
Base Width at Maximum Section:	480 meters
Crest Width:	12 meters
Storage Capacity:	3 billion cubic meters
Type:	Zoned-earthfill
Irrigable Area:	83,700 hectares, wet season 78,700 hectares, dry season

Pantabangan Dam was the first ever built by NIA for multiple purposes. But what made its construction all the more noteworthy was that it was undertaken by an all-Filipino group, the Hydro-Resources Contractors Corporation (HRCC), which completed the project 17 months ahead of schedule. This feat moved Amnon Golan, chief of the Irrigation and Rural Development Division for Far East and Pacific Projects of the World Bank, to say, "NIA is the finest irrigation agency in the whole of Asia and in any developing country in the world". The high standards that characterized the construction of Pantabangan Dam

gave NIA such prestige in the international engineering world that Thailand reorganized its Royal Irrigation Department along NIA's organizational structure.

When the project started operating, it became officially known as the Upper Pampanga River Integrated Irrigation System (UPRIIS).

Major Features

The Dam. Pantabangan Dam is the main structure of the project. It is located at the head of the Pampanga River, in a canyon just downstream at the confluence of the Pantabangan and Carranglan Rivers. The damsite is about 180 kilometers from Manila.

As finally constructed, the dam component consists of two zoned-earthfill dams, the main and Aya embankments



Pantabangan Dam

connected by a saddle dam. It is 1,615 meters long from abutment to abutment and rises 107 meters above the riverbed. The construction of the dam involved some 12 million cubic meters of embanked materials. The dam components consist of a central impervious core, sand and gravel filters and pervious alluvium materials at the outer shell. The construction of the dam and other appurtenant structures was started on June 11, 1971 and completed in August 1974.

Diversion Tunnels. Two diversion tunnels, 30 meters apart, were constructed at the bottom of the main

dam's left abutment to provide for the incorporation of a future power plant. One of these tunnels was designated the outlet tunnel and the other one, the power tunnel. Both are 576 meters long, each provided with a vertical intake shaft, a gate chamber and a common access adit. The appurtenant tower-type structures are 42 meters high and five meters in diameter and provided with hemispherical bulkhead-type gates. The dome-shaped gate chambers with fixed wheel and slide gates are located underground and each is 17 meters high and 10 meters in diameter. As excavated, the tunnels are about nine meters in diameter. The portion upstream of the gate chamber (the pressure side) is circular and heavily reinforced. Downstream of the gate chamber, the tunnel cross-section is a modified horseshoe. The tunnel was constructed through a rock formation of basically conglomerate shale. For tunneling work, a total concrete volume of about 31,400 cubic meters was poured. The construction of these two tunnels will allow the implementation of the Power Phase without interrupting the irrigation program. While the powerhouse was being constructed, one of the tunnels could be used to release water for irrigation purposes.

Spillway. The concrete chute-type spillway with designed discharge of 4,200 cubic meters per second and designed slope of 43.49 percent is located at the end of the Aya embankment. It is 270 meters long and its inlet consists of four bays, three of which are each provided with a radial gate, eight meters wide and 10 meters high and the other, with a 15-meter ungated overflow section. The crest of the gated sections is at elevation 210 meters, while that of the ungated section is at elevation 221 meters. Another feature of the spillway is the flip bucket section at its toe to deflect the onrush of spilled water and dissipate its energy in the fall. The spillway discharges about 2,100 cubic meters per second at elevation 224 meters, and when the reservoir pool level will be at elevation 230 meters, it will discharge about 4,200 cubic meters per second which corresponds to the peak discharge of the BPW-USBR 100-year flood calendar. In the design and construction of the spillway, provision has also been made such that a long-term flood storage of about 305 million cubic meters and short-term flood surcharge of 680 million cubic meters can be attained. For a maximum flood having a peak inflow of 12,200 cubic meters per second, the corresponding peak outflow through the spillway will be reduced to only 3.620 cubic meters per second.

Work on the spillway was started in the middle of 1972 and was completed in mid-1974.

Spillway Operating Criteria. Through a series of flood routing studies, the optimum combination of flood storage and spillway capacity was developed to provide safe passage of the design flood without encroaching on the embankment freeboard and assure proper spilling operation. In determining the proper size of the spillway, the following criteria which were established by BPW and NIA in mid-1970 were observed:

1. Flood storage of 305 million cubic meters will be provided in the reservoir during the period from June 1 through October 15. This corresponds to reservoir elevation between 216 and 221 meters. During the wet/dry season transitional period from October 15 to December 1, the flood storage criterion is linearly reduced to zero, i.e., the maximum reservoir level can be increased from elevation 216 to elevation 221 if sufficient inflow is available. No flood storage requirement exists from December 1 through June 1 (dry season) when irrigation releases will reduce the water level of the reservoir.

2. Floods with a total volume of less than 305 million cubic meters will be stored until after the storm passes. At this time, the water level of the reservoir will be reduced to elevation 216 with spillway discharges not exceeding 800 cubic meters per second; and

3. Floods with a total volume greater than 305 spillway as follows:

- a. Floods less than the 100-year flood magnitude will be passed with discharges limited to 900 cubic meters per second until the reservoir recedes to elevation 221 at which time reduction to elevation 216 will take place at a minimum discharge of 800 cubic meters per second; and

- b. Floods greater than the 100-year magnitude will have discharges limited to 4,200 cubic meters per second with post-flood evaluation as above.

Connecting Channel. The connecting channel measuring some 200 meters long and 50 meters wide at the bottom is an open excavation made across a thin ridge separating Aya from the main reservoir. Since the spillway is constructed at the Aya site of the Pantabangan Dam complex, and the bulk of flood inflows will be coming from the main reservoir, the connecting channel was constructed to allow the flood waters to flow towards the

spillway. The bottom of the open cut connecting channel is at elevation 200 meters. This would mean that at an elevation higher than this, the water surface at the Aya and main reservoirs will be the same, but during drawdown periods, the main reservoir water surface may be lower than elevation 200 meters but water surface at Aya reservoir will remain at about elevation 200 meters, there being no other outlet.

Reservoir. Pantabangan Reservoir is the largest in the Philippines. It has a watershed area of about 853 sq. kms. and if filled to capacity, the reservoir will have a surface area of more than 8,000 hectares and a volume of nearly 3 billion cubic meters. Results of studies made indicated that the total reservoir capacity of 2,996 million cubic meters should be allocated, as follows:

Sediment Storage:	130	million cubic meters
Inactive or Dead Storage:	95	million cubic meters
Irrigation and Power:	1,753	million cubic meters
Flood Control:	330	million cubic meters
Surcharge:	688	million cubic meters
Total:	2,996	million cubic meters

The reservoir is formed by the inundation of the valley and merger of the two erstwhile tributaries of the Pangasinana River, namely: the Carranglan and Pantabangan Rivers. Before the reservoir was filled, clearing operations were undertaken from elevation 170 to 230 meters. These were completed in May 1974. The reservoir submerged the town of Pantabangan and eight outlying barrios. Its northernmost point reaches the fringes of the town of Carranglan and down south it touches the outskirts of the various resettlement sites. The stored water will be released year-round for irrigation and power generation. A large volume will be released during the dry season to meet the water requirements at the service area while releases during the wet season will be much less. Significant flood control can be expected through the retention effect of the reservoir, of which some 330 million cubic meters of space was allocated for flood storage. Impounding of water at the reservoir was started on November 7, 1973 when total closure of the diversion tunnels was effected.

The reservoir is now stocked with different species of fish through the assistance of the Bureau of Fisheries and

Aquatic Resources (BFAR). At present, the reservoir is emerging as a waterbased recreation area, as well as a refuge for wildlife.

Until the completion of Pantabangan Dam, irrigation systems in the Philippines were simple river diversion types heavily dependent on the actual streamflow. Most of these systems were located at the lower reaches of rivers, and not much importance was attached to the conservation and rehabilitation of their watersheds. With the completion of the Pantabangan Dam, NIA started planning a program on watershed management.

Broader Powers, Bigger Capitalization

Expanding irrigation activities coupled with growing demands continuously being made to bear on NIA gave rise to new problems and needs, such as funding and tapping of other water resources for irrigation. In response to these mounting demands and requirements and the need to attain the "Irrigation Age" envisioned under RA No. 3601, PD No. 552 was promulgated on September 11, 1974. Foremost among the amendments introduced by the decree to the NIA charter is the grant of broader powers and authority for NIA to undertake program-oriented and comprehensive water resource projects for irrigation purposes as well as concomitant activities like flood control, drainage, land reclamation, hydraulic power development, domestic water supply, roads and highway construction and reforestation.

The other salient features of the decree are:

- Increasing the capitalization of the agency from P300 million to P2 billion;
- Authorizing NIA to incur foreign loans;
- Empowering it to administer all communal irrigation systems constructed, improved or repaired wholly or partially with government funds as well as to recover the funds expended for the construction or rehabilitation of such systems;
- Reconstituting its Board of Directors.

As reconstituted, the Board membership was reduced to six from the original seven. In addition, its composition was slightly changed, to wit: DPWTC Secretary, Chairman; NIA Administrator, Vice Chairman; NEDA Director-General; Agriculture Secretary; NAPOCOR General Manager; and a representative of a National Rice and

Corn Organization to be appointed by the President, members.

Thus cloaked with broader powers and a beefed-up capitalization, NIA prepared a ten-year irrigation development program for the period starting Fiscal Year 1974-1975. The program forecast that "between 1976 and 1977, the minimum palay and normal palay requirements would be attained *due to irrigation alone*".

The forecast was formulated on two projections: the total palay production based on normal increase due to additional irrigated areas; and the sum of the first projection and the normal increase in other areas due to extension and other services. In support of these projections, the plan was developed on the basis of an increase in new irrigated areas from 80,000 hectares to 134,000 hectares a year, starting 1974-1975, and to 125,000 hectares a year four years thereafter for the rest of the program period. The cropped area was also estimated at 203,000 hectares a year for the first four years, and at 199,000 hectares a year thereafter up to the tenth year. Based on a constant population growth of 3.2 percent a year, the plan predicted that rice surplus would be possible by 1977.

Taking into account the highly variable factors involved, the forecast was quite audacious.

Another important change resulting from the decree was the creation of two more positions of assistant administrator, thus increasing the number of such positions to three. Authority for such increase was specifically drawn from the power of the Board to recommend to the President of the Philippines the appointment of such number of assistant administrators as the exigencies of the service might require from a list submitted by the administrator.

The original assistant administrator, Mercado, had responsibility over the engineering and operations sector, while Cesar L. Tech was appointed assistant administrator in charge of the finance and administration sector. The position of assistant administra-



Cesar L. Tech

tor for the special projects sector remained vacant for a time.

Other important features of the set-up were the creation of an Agricultural Department and a further realignment of the functions of some units. In the field, an Operations Division was created in each regional office for more effective field management.

Tech obtained his Bachelor of Science in Civil Engineering degree at the National University (NU) in Manila in 1947. He subsequently earned some units of post-graduate studies in civil engineering and public administration. After passing the board examination for civil engineers in 1948 with a rating of 84.48 percent, he joined the irrigation division, BPW, the following year as assistant civil engineer. Tech progressed steadily and held the position of supervising civil engineer II when NIA was created in 1963. Before his appointment as assistant administrator, he was special assistant in the Office of the Administrator and concurrently NWRC deputy executive director.

Irrigation development in the country took another giant step when PD No. 693, dated May 7, 1975, was issued. This decree authorized the construction of the Magat River Multipurpose Project in Isabela.

Collection Problem

During its early years through the mid-1970s, the agency concentrated on the construction of new projects and rehabilitation of existing systems to expand as fast as possible irrigation coverage as a vital support to the urgent program of food production. Little attention was given to the collection of irrigation fees with the consequence that annual receipts from this source were low and back accounts continued to pile up. Since irrigation fees accounted for a big percentage of NIA's annual income and considering the huge receivables from this source, the agency considered irrigation fees as its "lifeblood". NIA attempted to solve the irrigation fee collection problem by taking two major steps.

First, it proposed to the Office of the President an upward adjustment of the irrigation fee rate. This adjustment had long been overdue because, as we have seen, as early as 1961 a World Bank mission found that irrigation charges in the country were "unrealistically low". Besides, the costs in operating and maintaining irrigation facilities

had risen considerably. On October 21, 1974, the Office of the President approved the agency's proposal to adjust the irrigation fee rate from a flat P35 per hectare per year to the following rates effective July 1, 1975:

1. For rice crops in gravity irrigation systems: Two cavans of palay per hectare for the wet season crop, three cavans for the dry season crop and three cavans also in case of a third crop.
2. For rice crops in pump irrigation systems: Three cavans of palay per hectare for the wet season crop, five cavans for the dry season crop and also five cavans in case of a third crop.
3. For all other crops, the rates were the same as those for rice crops, except that payment shall be the cash equivalent of the rate of the prevailing government support price for palay.
4. For UPRIS and other systems funded with foreign loans: Two and one-half cavans of palay per hectare for the wet season crop, three and one-half cavans for the dry season crop and three and one-half cavans also in case of a third crop.

Rice farmers were given the option of paying their irrigation fees in cash or in kind. In the latter case, the cash equivalent is based on the prevailing government support price for palay.

Second, the agency launched an information campaign in the latter part of 1975 that lasted up to early 1976. The campaign was undertaken nationwide on the municipal level through interpersonal dialogues. A secondary objective of the project was to encourage irrigation-users to cooperate and be involved in the operation and maintenance of irrigation systems. The theme of the campaign was "Masaganang Tubig para sa Masaganang Ani" which used the multi-media approach. The resources of the Public Affairs and Information Staff and the various units in the central and field offices were pooled in the implementation of the campaign.

In 1976, Tech was appointed to the vacant position of assistant administrator for special projects. He was succeeded by Benjamin U. Bagadion as assistant administrator for finance and management.

Bagadion graduated Bachelor of Science in Civil Engineering at UP in 1944. He passed the board examination for civil engineers right after the end of the war. He started his career in the government service as assistant

civil engineer in Naga City. He was project manager of the UPRP in 1975-1976 before his appointment as assistant administrator.



Benjamin U. Bagadion

Based on the encouraging results of the 1975-1976 campaign, the agency launched in 1977, a more extensive and intensive information drive dubbed "Patubigayan '77". The campaign title was a combination of the Pilipino words *patubig* (irrigation) and *bigayan* (cooperation). This campaign, which revolved around interpersonal dialogues, covered 2,000 barangays, served by 75 national systems. The campaign featured a "Search for Model Irrigation-Users" on the system, regional and national levels and offered attractive prizes in cash and in kind. Due partly to "Patubigayan '77", total irrigation fee collections that year rose to a spectacular P37.003 million, up by P12.958 million or 53.89 percent over the previous year's receipts of P24.045 million.

Participatory Approach

Since farmer-beneficiaries of communal systems were now required to pay back the government the cost of construction or rehabilitation of these systems, it was necessary that they should have a strong and viable association. Towards this end, NIA signed in 1975 a memorandum of agreement with the Farm Systems Development Corporation (FSDC) stipulating that FSDC would carry out institutional activities in the development of communal associations while NIA would be responsible for engineering and construction work. FSDC was created under PD No. 681 dated April 4, 1974. The corporation was mandated to accelerate rural development by promoting the organization of cooperatives and other rural-based associations and to extend assistance to these associations. With the issuance of PD No. 1595 in 1978, FSDC's area of responsibility was expanded to include farming, irrigation, fishing, resource management, forestry, agro-

industrial production, processing, marketing, drainage, rural waterworks and land reclamation for agricultural production. FSDC's major plan of action was the Barangay Integrated Services Association (BISA).

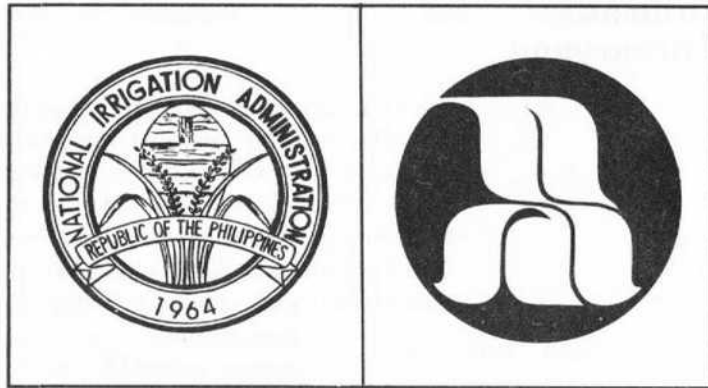
Dramatic Turnaround

In December 1975, several of the major structures of the NIA building complex were substantially completed. The agency's rank and file held their annual Christmas party at the new compound to usher in a new age for NIA. By February the following year, the staggered transfer to NIA's permanent office had started. The P30-million complex was virtually completed on July 19, 1976.



NIA Complex in Diliman

The major structures and facilities of the complex consist of Building A with eight stories, a penthouse and a helipad, Building B with four stories, a two-story annex at the back, a garage and motor pool, basketball, tennis and pelota courts, and parking areas.



Old NIA Logo

New NIA Logo

Late in the third quarter of the year, PAIS proposed to top management the adoption of a new logo to symbolize NIA's dynamic corporate growth. At the time, the official seal of the agency was a conservative, detailed artwork that no longer fitted its new image. The proposed logo depicted the acronym NIA in white, representing water, against a field of brilliant green, symbolizing vigorous plant growth. As rendered, the acronym was suggestive of dam and a spillway over which water flowed.

Top management recommended to the Board of Directors approval of the proposal. In its Resolution No. 2941-76, the Board approved the adoption of the new logo. On November 25, 1976, Juinio issued Memorandum Circular No. 60 to implement the Board resolution and direct the dissemination of information on the new logo.

On December 31, 1976, a "Water Code of the Philippines" was enacted under PD No. 1067. The code revised and consolidated the laws governing the ownership, appropriation, utilization, exploitation, development, conservation and protection of water resources in the country.

Events bore out the forecast in the ten-year irrigation development plan when the country regained self-sufficiency in rice in 1976 with a hefty palay output of 128.61 million cavans. The irrigated area that year represented merely 41.69 percent of the total cultivated area, but it contributed 54.71 percent to the national yield. The decisive effect of irrigation was reflected in average yield per hectare: 45.9 cavans compared with the national average harvest of 35 cavans.

The rise in palay production in 1977 was more significant. That year, a total of 134.81 million cavans was harvested from 3.64 million hectares. Interestingly enough, while the irrigated area decreased by some 12,900 hectares, its production increased by 2.58 million cavans over that of the previous year's. Average yield per hectare in the irrigated area rose to 48 cavans compared with the national level of 37 cavans. This was an indication that irrigation systems had increased their efficiency. More importantly, the high yield in the irrigated area once again underscored the vital importance of the availability of adequate water in palay production. It not only increased cropping intensity but also enhanced the effectiveness of high-yielding rice varieties, fertilizers, modern cultural practices and other inputs.



Rice for Export

The year 1977 marked a dramatic turnaround in the state of the rice economy of the Philippines when the country began exporting the cereal — the first time since the end of World War II. The initial export of 15,000 metric tons valued at US\$4 million went to Indonesia. In the ensuing years, the Philippines continued exporting rice in increasing volumes to a growing host of nations, including faraway Brazil.

This phenomenon had two major economic effects and implications. One is that the country *saved* substantial amounts of its precious foreign reserves that used to go to rice imports and at the same time *earned* for the country foreign receipts through the export of the cereal. The other is that the subsidies and production incentives that went,

in effect, to rice farmers of countries exporting rice to the Philippines now benefitted Filipino farmers instead.



An early picture of NIA's senior engineers with then Admr. Juinio and Lanao del Sur governor studying map of project in Mindanao.

Basis of Self-Sufficiency

Not long after this heady achievement took place, various sectors claimed credit for it. One sector, for instance, alleged that the attainment of rice self-sufficiency and production of surplus were attributable to the Masagana Program. Another said that the expansion of land reform implementation was responsible for the twin feats. A third sector claimed, surprisingly, that the unprecedented achievement was the result of improved and efficient post-harvest technology.

It is not the purpose of this book to engage in arguments, particularly since the issue involves some sectors in the government with which NIA has been working in close and fruitful harmony. It is, therefore, felt that a brief explanation is in order if only to place things in their proper historical perspective.

When the country *first* attained self-sufficiency in rice in 1968 (not 1976, as some claim), the Masagana Program was still four and a half years away although massive liberal agricultural credit through ACCFA/ACA and the rural banks had been available since 1952. Land reform as

a means of bringing about high palay productivity is based on the theory that the improvement of a farmer's tenurial status, complemented with a package of services, motivates him to produce more. But no amount of motivation and package of services would enable the farmer to produce palay beyond a certain level through the present rice culture technology without that critical element, **irrigation**. And, of course, improved and efficient post-harvest technology comes only *after* there is production.

The following excerpts from a statement issued by V.L. Domingo Agribusiness Co. that appeared in the August 21, 1978 issue of **Bulletin Today** is worth quoting:

The increase in national rice production to self-sufficiency as reported was mainly due to the *expansion of irrigated areas* in the country and not to the increased yield per hectare....

Discussing the analysis of the company, the statement went on:

...The growth rate or the expansion of irrigated areas in the country since 1971 was 35 per cent. This means 100,000 hectares are irrigated every year. At an average production of 60 cavans per hectare, this contributed 12,000,000 cavans of palay every year, bringing rice production to self-sufficiency levels to the extent of exporting the surplus produce...

Soaring Surplus

NIA started to undergo some structural changes in 1978. The salient features of the new structural scheme were the creation of a fourth position of assistant administrator, realignment of functions under four sectors and retitling of the positions of the assistant administrators. Under the setup, there was now an assistant administrator each for project development and implementation, for operations, for finance and management and for adminis-



Jose L. Juinio

trative services. Atty. Jose L. Juinio was designated Officer-In-Charge of the Office of the Assistant Administrator for Administrative Services.

Atty. Juinio obtained his Bachelor of Laws degree in 1954 from the Far Eastern University (FEU) in Manila and passed the bar examination the same year. Since 1969 he had been business manager of UPRP and the Office of Special Projects and held his latest position in a concurrent capacity.

Part of the structural changes were the conversion of the Legal, Management and Information Staffs into full-fledged departments and the creation of an Irrigators Assistance Department. In addition, the number of regional offices was increased to 11 with a sub-regional office established in Central Visayas. A Research and Irrigators' Assistance Division was likewise created under each regional office, bringing to six the number of divisions in each.

As of the end of 1978, the agency's work force had reached its highest level at 37,599 individuals consisting of 11,860 monthly and 25,739 daily workers. During the calendar year, its budget sharply rose to P1.743 billion, its surplus soared to P309.56 million and its assets grew to P5.797 billion.

By 1979, palay output had increased to 150.29 million cavans, almost twice the production of 76.85 million cavans in 1964 when NIA started operating.

CHAPTER VII

FULFILLMENT OF MANDATE

Dr. Estuar succeeds Juinio as administrator; the new NIA head institutionalizes corporate planning and introduces the use of computers in operations and management; by the early 1980s, NIA fulfills its charter mandate to bring about an "Irrigation Age"; the World Bank advises the Philippine government to scale down its irrigation investments program; Magat Dam inaugurated; Tech replaces Dr. Estuar as administrator; Tech continues the policies and programs of his predecessor: emphasizing the need to upgrade operation and maintenance, strengthening and institutional development, and introducing profit-sharing program.

NIA STEPPED on the threshold of the 1980s with vigor, confidence and justifiable pride. Even as it did so, however, it felt a strong need to reexamine the government policy towards agriculture, the critical rice problem having been licked. More specifically, the government was faced with the question of whether or not to maintain the investments in rice production or shift part of those investments to other areas of development. Since irrigation is a very vital input in rice production, any change in policy towards rice production would directly affect the irrigation development program.

Directions for the '80s

1. Maximizing Land Use. Due to population pressure it was expected that there would be strong competition in the use of land resources for human settlement, industrial expansion and agricultural uses. The area of land cultivated per inhabitant had decreased from 0.29 hectare in 1960 to 0.25 hectare in 1970, and was expected to decline further to 0.20 hectare by 1985. Any land that might be available for cultivation, therefore, had to be maximized so that food production would not lag behind food requirements. Irrigation is the major input

that could increase cropping intensity and promote higher yields.

2. Meeting Food Requirements. At the time, annual per capita consumption of rice ranged from 134 kilos in the Ilocos and Central Luzon regions to 44 kilos in the Central Visayas with a national average of 106 kilos. With a population growth rate of about three percent, rice production had to grow at the same rate to be able to keep pace with our needs. Rice production growth was highest in 1976 at 10 percent when the Philippines regained self-sufficiency in the cereal. It slid down to 6.8 percent in 1977 and five percent in 1979. Certain areas in the country like Palawan, Aurora, Masbate and Catanduanes, were not only insufficient in rice but were also isolated from supply centers by physical barriers. In those areas, providing irrigation facilities to increase crop production was considered one logical strategy in view of the prohibitive transport costs of commodities. Local production would not only lower costs for commodities but also increase employment opportunities.

3. Improving Farmers' Income. One of the primary objectives of the national government is to bring about wider social and economic improvement, and undeniably an effective approach is to mobilize the potentials of the rural areas and raise farm incomes. In a basically agricultural setting, enabling farmers to cultivate two to three crops a year through a year-round water supply, instead of the traditional one rainfed cropping cultivation, would greatly improve their incomes. Studies showed that farmers' income increased by 55 percent in Southern Mindanao and 47 percent in the Bicol region where irrigation water was available in the farms during the dry season, and 48 percent in Central Luzon, and 25 percent in Central Mindanao during the wet season.

4. Increasing Yields. Irrigation development is basically a rural program whose target beneficiaries are the farmers and, therefore, promotes better income distribution. And since irrigated agriculture is labor intensive, employment opportunities for the growing labor force are opened. Also, the average landholding becomes smaller due to the pressure of population growth and the Filipino tradition of dividing the inheritance, resulting in generally low net incomes in the fragmented farms. By providing irrigation, cropping intensity would increase and yield per crop would improve.

5. Countryside Development. Irrigation is a basic component in any countryside development program to attain balanced regional progress in an agricultural country. Among those where irrigation is an important feature are rural development, integrated area development, river basin and land settlement projects. In all these undertakings, a major thrust is almost always the improvement of the agricultural sector, hence the inevitable inclusion of irrigation. Because agriculture is the largest contributor to the country's export earnings, the largest absorber of the labor force and the largest contributor to the gross national product, it continues to play a crucial role in our economy even as the Philippines moves more and more towards industrialization.

6. Building Up Food Reserves. Sufficient stock of rice is necessary not only for the country's food reserves but also for other members of the Association of Southeast Asian Nations (ASEAN). Although the Philippines again enjoyed a five percent growth rate in food production in 1979, total world grain stocks dropped by seven percent for the first time since 1971. Since some international organizations concerned with food production had grimly predicted food shortages in the near future, particularly in Asia, a sustained build-up of food reserves is necessary to help ensure food stability and security in the region.

7. Keeping Satisfactory Income Levels. With the rising cost of oil and natural gas, it was foreseen that fertilizers and other chemical inputs such as insecticides, and other agro-chemicals would go beyond the reach of most farmers because of a similar rise in the cost of these commodities. Unless the cost of rice was commensurate to the actual cost of production so that net farm returns could reach satisfactory levels, farmers would tend to use less and less fertilizers and other chemicals or even revert to planting old rice varieties that did not require much of these inputs but yielded low harvest. A decline in the use of fertilizers and chemical inputs would naturally result in the overall decline in average crop yields.

The government could exert efforts to contain fertilizer prices in the form of subsidy and tax exemptions to encourage farmers to continue applying more fertilizers and still enable them to realize enough profit. But direct subsidy appeared a temporary solution as it constituted a heavy drain on the government coffers. In real economic terms, the subsidies would only have tended to disguise

the true difficulties. Between 1973 and 1977, the government spent P1.3 billion in subsidies.

8. Rising Investment Cost. The investment cost of irrigation per hectare had increased from P651.00 in 1955 to P4,213 in 1975 and about P12,000 in 1979. With the high rate of inflation, it is generally believed that it was better to invest then than later. This also holds true in other capital intensive projects such as paper mills, steel mills, smelter plants, power plants and fertilizer factories. The government realized too late that it should have constructed such projects years before when the investment costs were then relatively much lower. Therefore, even if the level of investment for irrigation development was maintained at the time, the area generated would have become increasingly smaller due to inflation.

9. Crop Diversification. There was a common misconception that irrigation development is designed only for rice. This misconception was born when, due to the efforts to attain self-sufficiency in the basic staple, the thrusts of various production programs were directed at the rice-growing areas. Now that self-sufficiency in the cereal had been achieved, irrigation development had to be expanded to serve other crops like sugar cane, bananas, mangoes and tobacco, which also grow well and yield more under irrigated conditions.

10. Production of Rice Surplus. Rice surplus not only saves foreign exchange due to non-importation but also earns substantial amounts for the country through exportation. In the preceding two crop years, about one percent of the total rice output was exported. Although it may not be the long-term policy to generate rice surplus specifically for export, the country may however export the commodity if substantial surpluses and world prices and conditions warrant. Rice could even be traded with a number of commodities from other countries.

11. Multipurpose Projects. The search for and development of indigenous sources of energy, which then occupied highest priority in the government infrastructure program, included the harnessing of water resources for hydroelectric projects and the complexity and high costs involved in their construction, these schemes could not always be economically viable if planned only for a singular function. Like the Pantabangan and Magat proj-

ects, their development with either irrigation or power alone as the main function could not be justified.

On the basis of these considerations, the agency's irrigation development program provided the key input to various government programs. It was important, therefore, to formulate, implement and maintain a proper balance between large, medium and small-scale projects in any type of irrigation development program. To promote local production in food deficit areas, small and medium-size schemes appeared suitable. In addition, short gestating small-scale projects were desirable to bring about a dramatic impact in the countryside. In areas where low irrigation intensities prevailed, the need was felt for more irrigated dry season crops to enhance a better economic condition among the farming populace. Storage projects were also deemed necessary. Further, to support the energy production and flood control programs, irrigation inevitably would become a major function to make the multipurpose project viable.

On February 29, 1980, Assistant Administrator Mercado went on terminal leave. Bagadion, assistant administrator for finance and management was designated officer-in-charge of the Office of the Assistant Administrator for Operations in a concurrent capacity effective March 1, 1980. During its 332nd regular meeting on March 10, 1980, the NIA board of directors passed Resolution No. 3540-80 commending Mercado:

RESOLVE... to commend Mr. Mercado for his exemplary performance and significant contribution to irrigation, having devoted his forty-two years in the government in this field;... resolve that this Body states categorically that it fully believes in his capacity, dedication, integrity and honesty;.... that a "Plaque of Appreciation" and the "Prinsang Ginto" Award be given to the Assistant Administrator in recognition of his proven competence and devotion to duty.

"It Takes Vision"

After steering NIA to its rapid and dynamic growth from a small entity to a corporate giant, Juinio decided to devote his full time as minister of Public Works, ending a sterling service spanning 13 years and three months as NIA head. As MPW minister, however, Juinio remained as chairman of the NIA board of directors.

His successor, Dr. Fiorello R. Estuar, is recognized here and abroad as a leading structural engineer with a

long string of outstanding achievements in the private sector. On formally assuming office on March 17, 1980, during the commemoration of the agency's 17th anniversary, the new administrator paid tribute to Juinio and the people at NIA:

The performance which made NIA one of the best irrigation agencies in the world, according to the World

Bank, was made possible only through the dedication and efforts of the NIA staff and its management, and in a very large measure to the vision and dedication of its administrator, Minister Alfredo L. Juinio, and to the continued support of President Ferdinand E. Marcos. It takes vision to bring an organization to a stage of development that NIA and our irrigation efforts are in now and that vision was certainly supplied by NIA top management and amply supported by concrete efforts of the NIA staff.

The economic horizon was beginning to darken when Dr. Estuar took over the helm from Juinio. Aware of the ominous situation, the new administrator was nevertheless hopeful when he said:

"I am confident that with the decisions we are making now and the courses of action we have started to take, a new beginning will lead us to brighter skies tomorrow".

Dr. Estuar, a 1976 TOYM ("Ten Outstanding Young Men") awardee, was 41 years old when he assumed office as NIA chief executive. He graduated from the UP in 1959 with a Bachelor of Science in Civil Engineering degree and obtained his Master's and Doctorate degrees in 1962 and 1965, respectively, both from Lehigh University in Pennsylvania, USA.

His paper on "The Experimental Investigation of Welded Built-Up Members", published in the **American Welding Society**, was awarded the prestigious A. F. Davis Medal. "Structural Design" which he co-authored in 1964, was



Fiorello R. Estuar

adopted as a textbook by more than 80 percent of American and Canadian civil engineering schools.

He worked at the Bethlehem Steel Corporation and later at Rust Engineering Co., both in Pittsburgh, Pennsylvania, USA, in 1965-1968. Shortly after he returned to the Philippines in 1968, he supervised the preparation of the structural designs and repair of several big buildings damaged by the killer earthquake of August 1968. The following year, he took charge of the preparation of the ADB building design, which introduced for the first time in the Philippines the use of computers for structural engineering design. The original ADB building located along Roxas Boulevard, Manila is an engineering accomplishment featuring two multi-story wings that overhang without posts at the ends to as much as 50 feet.

At the time Dr. Estuar assumed office, the agency was searching for new directions impelled by developments in its organizational milieu. The achievement of self-sufficiency in rice, the heightened economic pressure brought about by the energy crisis, the growing demands for balanced development—particularly in the rural areas—and the changing priorities of the national government required a review of what had been achieved, a definition of what still needed to be done, and under what conditions and costs. While the agency had to sustain its basic task of providing irrigation service to the greatest number of farmer-beneficiaries, management realized that basic changes in its program content and operating strategies were necessary for maximum impact on the country as a whole.

Dr. Estuar, therefore, launched a series of initiatives, one of which was a comprehensive and systematic revamp of NIA operations and policies to further expand irrigated areas and to provide corollary services in support of the national government's development programs. To achieve this, the agency systematized its operations with the introduction of computers and corporate planning. It also strengthened the user-oriented participatory approach as an integral part of irrigation development and management.

Increased Capitalization. On July 18, 1980, Marcos signed PD No. 1702, further amending the NIA charter by raising the agency's authorized capital stock from P2 billion to P10 billion. The decree also allowed the agency to impose, as administration and overhead charge, five

percent of the total cost of the projects undertaken by NIA, to become part of its capital.

As NIA girded to embark on its new directions, it defined four basic objectives as the guiding philosophy in the implementation of its program, namely: (1) to support the government policy of self-sufficiency in food production; (2) to maintain a satisfactory level of service; (3) to catalyze development in the rural areas; and (4) to operate the agency as a viable corporation and in a cost-effective manner, particularly in its investments for the prosecution of its capital construction program, operation of the systems and administration of the agency. For these purposes and in recognition of the aggravating costs of energy, studies were initiated to regionalize development plans, taking into account grouping of areas by provincial and/or island groups as affected by current and future supply and demand as well as transport linkages. To achieve cost-effectiveness, NIA instituted the following measures: judicious selection of projects, responsive project management and strategic retrenchment to maximize allocation of funds to productive project components.

Participatory Approach Implemented. During the year, NIA introduced the participatory approach in its communal project construction program. Communal projects are small irrigation facilities that NIA constructs and, upon completion, turns over to irrigators' associations for operation and maintenance. In the past, all activities involved in the first three phases of the entire cycle of a communal project were undertaken by NIA personnel. A project cycle has four phases: project identification, investigation, evaluation and selection; pre-construction; construction; and operation and maintenance. Later, an inventory of completed projects revealed that a large number were partially operational or non-operational and in some cases completely abandoned. The twin implications: NIA had spent millions of pesos to construct projects that turned out to be either partially useful or utterly useless.

After a series of evaluations and workshops in the field, the causes were pinpointed, among which were inaccurate survey data, wrong planning and defective designs, and the use of substandard construction materials. These defects were due partly to the inherent weaknesses of a bureaucratic system that operates in a compartmentalized manner and, more importantly, because the prospective farmer-beneficiaries were not consulted. The solution: adoption of the participatory approach whereby

prospective farmer-beneficiaries were consulted and involved in the first three phases of the project cycle.

The rationale behind this concept is that communal projects affect the lives of the prospective farmer-beneficiaries and the community. Mary Racelis Hollnsteiner, in her paper **People Power: Community Participation in the Planning and Implementation of Human Settlements**, enumerates three major reasons for people's participation in community projects: "results are more successful if the intended beneficiaries take part in design and implementation, it reeducates planners and project engineers by giving them new insights into the customs and traditions of the clientele, and it builds up self-ennobling character and the cooperative spirit of the community".

The participatory approach, first tested in Laur, Nueva Ecija, as previously mentioned, is being implemented through the agency's institution building program.

NIA Subsidiary

Since it began operating in 1964, NIA has gradually developed a pool of highly-trained engineers, economists, agriculturists and other specialists with wide ranging experiences in their respective fields. Recognizing their expertise and experience, international institutions started tapping this pool of technical specialists by engaging their services as consultants in various overseas projects in Indonesia, South Korea, Sri Lanka, Thailand and other Asian countries. Among these institutions were the World Bank, ADB, USAID and Ford Foundation. The consultancy services of these NIA specialists were likewise engaged in various local water resource undertakings.

This growing demand for the services of the agency's technical personnel led to the creation of NIACONSULT in 1980 as a subsidiary of NIA. This subsidiary offers consultancy services, management and specialty services in irrigation and other water resources development schemes.

Such services are rendered by competent specialists whose diversified expertise and solid experience assure the successful prosecution of any specialized contract work. The policy of NIACONSULT is to make continuing use of the engineering and other specialized skills and expertise built up over the years by the agency.

NIACONSULT offers the services of its staff in managing projects assisted by international financing institutions such as the World Bank, ADB, International Fund for Agricultural Development (IFAD), Overseas Economic Cooperation Fund of Japan (OECF), USAID, Organization of Petroleum Exporting Countries (OPEC) and bilat-



A NIACONSULT expert briefing foreign irrigation officials.

eral donor countries. Having been a longtime borrower of such institutions and a recipient of foreign assistance, NIA through NIACONSULT is adept at the utilization of loan and aid funds. Similarly, NIACONSULT personnel are particularly experienced in the management of limited development resources, a situation common to developing countries.

In its relatively short existence of nine years, NIACONSULT has generated a cumulative gross earning of P86.11 million from its local and overseas operations. While its foreign earnings are not really impressive by current standards, NIACONSULT helps pump into the country's coffers much-needed foreign exchange. More importantly, it helps promote the development of highly professional human resources in the Philippines through its various services.

The services of NIACONSULT are categorized into eight major areas: investigations, feasibility studies, engineering and design, construction management, operation and maintenance, water management, institutional and manpower development and specialty services.

Meanwhile, on August 5, 1980, Bagadion assumed office as assistant administrator for operations and was

succeeded by Ciriaco L. Camacho as assistant administrator for finance and management.

Camacho obtained the degree of Bachelor of Science in Commerce from the Far Eastern University in Manila in 1964. He was a cashier at the Emergency Employment Administration (EEA) before he transferred to the Metal Industry Research and Development Center (MIRDC) where he rose to managership of its Accounting and Finance Department. He was also accountant for several accounting firms.



Ciriaco L. Camacho

Fulltime Mechanism

Corporate planning as a management tool for the effective administration of NIA was institutionalized in 1981 through a series of strategic planning sessions involving top and middle management officials in the central and field offices. At the same time, interaction sessions with field officials were held to obtain deeper insights into the activities, capabilities and weaknesses of the agency and to encourage participation of field level implementors. To provide a fulltime mechanism for consolidating the wealth of information on the activities of the agency and the recommendation obtained from management interaction sessions, a corporate planning group was formally activated on October 1, 1981, as a staff unit directly under the Administrator. This group was mobilized with the initial task of consolidating the ten-year Corporate Plan (1981-1990), or Corplan, approved by the Board of Directors on September 14, 1981.

The Corplan spelled out the mission of the agency in relation to national development goals within the context of present and future operating environments. That mission is to provide adequate and timely water resources for irrigation and other corollary physical and technical services to the people in support of the development program of the national government. To achieve the objectives of

the Corplan (previously enumerated and constituting the guiding philosophy in program implementation), the NIA formulated a number of strategies in four areas, i.e., irrigation development, systems operation, agency management and administration and other areas.

About 1.01 million hectares of new areas are targetted for generation for 1981-1990, requiring a funding of P21.5 billion. Due primarily to financial constraints, however, the annual targets were not attained and adjustments in targets were subsequently made on the basis of funding availability and other considerations.

Compelling Reasons

In its report released in January 1983, titled **The Philippines: Irrigation Program Review**, the World Bank recommended to the Philippine government the scaling down of NIA's investment program for future irrigation projects. The Bank found out that huge rice surpluses were projected through the 1990s, placing under doubt the advisability of continuing with major investment programs in new irrigation facilities. The report concluded:

Unless the Philippines could establish itself in the rice export market on a regular basis (a possibility which should be studied urgently), generate domestic demand, or manage a large - scale conversion of land use from rice to more profitable crops, the current plans for irrigation development should be scaled down - but with the provision that the need for further investment in the late 1990s should be carefully monitored.

The findings of the Bank indicated that, to all intents and purposes, NIA had fulfilled in the early 1980s its charter mandate to bring about an "Irrigation Age" in the Philippines through its capability of maintaining self-sufficiency in rice and sustaining the production of surplus. Nevertheless, it seemed wise for the government to continue with the pace of its irrigation development program in line with the policy of optimizing rice production for four compelling reasons.

First, the slightest dip in rice production due to *force majeure* under certain conditions creates a supply-demand problem. Although the government may have enough reserves to fill any production shortfall, the artificial rice shortage triggered by widespread hoarding is virtually impossible to stop. This has happened time and again,

especially during protracted droughts or after a series of destructive typhoons.

Second, every time the country imports rice, in effect it subsidizes the farmers of the exporting countries. At the same time, importing deprives local producers of earnings that would go to them if the government buys from them instead. In addition, since rice trading in the Philippines is a big business, earnings from storage, trucking, handling and taxes would be lost. Furthermore, it is more expensive to import rice than to buy it locally.

Third, rice imports constitute a heavy drain on our precious foreign exchange reserves. A side effect of rice imports is the lowering of the country's credit standing and the weakening of her diplomatic leverage.

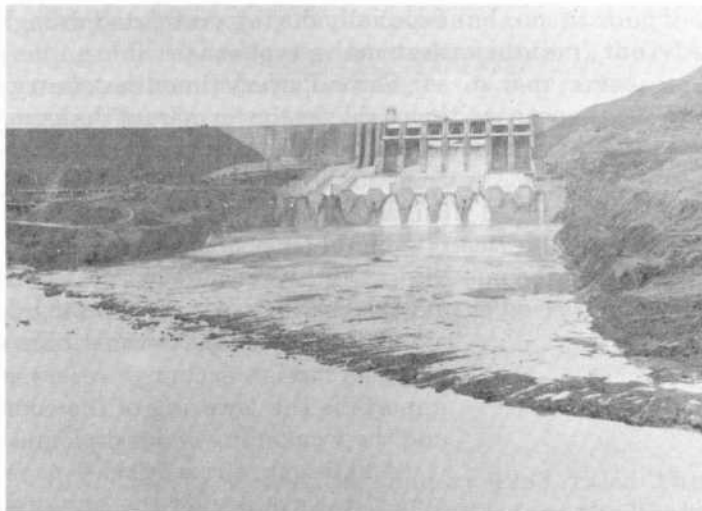
And fourth, a rice crisis — especially if protracted — almost always upsets the national economy, producing multiple effects that, if unchecked, eventually disrupt political stability. In a real sense, therefore, rice shortages increase the potential threat to national security.

Concrete Monolith

In line with the thrust of NIA to streamline the agency into a lean but strong service organization, the Farmers' Assistance Department was renamed Institutional Development Department consisting of a Farmers' Assistance Division and an Irrigators' Organization Division. Another was the placing of the Communal Irrigation Development Department under the Office of Special Projects, a newly-created agency branch.

The inauguration of the Magat Multipurpose Dam in Isabela on October 27, 1982, highlighted NIA's construction activities during the year. It is considered the biggest of its kind in Southeast Asia, and the statistics below show why:

Storage Capacity:	1.25 billion cubic meters
Length:	4,160 meters
Height:	114 meters
Base:	102 meters
Crest:	12 meters
Irrigable Area:	102,000 hectares
Type:	Earth-rockfill
Cost:	P3.3 billion



Magat Multipurpose Dam in Isabela

Sometime in February 1983, the President prevailed upon Dr. Estuar to help oversee the rehabilitation of the financially-distressed Construction Development Corporation of the Philippines (CDCP) as its executive vice-president. The government had taken over the big construction company after it was foreclosed due to its inability to service its huge loans from a number of government lending institutions. Cesar L. Tech, then assistant administrator for Project Development and Implementation, was appointed to succeed Dr. Estuar, assuming his new post on February 25, 1983.

Tech was the first NIA administrator who rose from the ranks. He joined the government service in 1949 as assistant civil engineer at BPW's Irrigation Division. He climbed the promotion ladder steadily, becoming supervising civil engineer in 1964 at the agency's Design Section. Twelve years after, in 1976, he became the head of the newly-created Office of Special Projects with the rank of assistant administrator. He was the first president of NI-ACONSULT when it was organized in 1980. Before he assumed office as administrator, Tech had at one time served as deputy executive director of NWRC, vice chairman of the NIA Board of Directors and member of the Boards of Directors of NWRC and FSDC, among others.

The new NIA head continued the policies and programs of his predecessor and, during the year, the agency continued implementing the following four major strategies:

1. **Improvement of Project Management.** This strategy was undertaken through better planning, monitoring and evaluation of project activities. Contingency plans were also prepared in the light of uncertainties in funding allocation and releases to allow the agency to respond faster in the event of delays in fund releases.

2. **Strengthening of Institutional Development.** Maximum participation of irrigators' associations is essential to effective operation and maintenance of irrigation systems. A strong institutional development program assures the attainment of this objective. Other activities initiated under the program were the adoption of the participatory approach in national projects under construction and the implementation of training programs to sustain the associations' capability to operate their systems efficiently, among others.

3. **Conversion of Marginal National Systems.** The Corplan provides for the gradual turnover of marginal national systems to irrigators' associations for operation as communal systems. The turnover of such systems is preceded by institutional activities.

4. **Provision of Agricultural Support.** This strategy was intended to assist farmer-irrigators in improving their productivity. The support services included the establishment of demonstration farms, research programs and farm mechanization facilities.

Other strategies included the firming up of service areas of national systems, strengthening of regional and field offices, streamlining of personnel complements, attainment of viability status by all field units, intensification of irrigation service fee collections and close coordination with other government agencies in the provision of agricultural support services to the farmers.



Jose B. del Rosario, Jr.

On March 28, 1983, Jose B. del Rosario, Jr., assumed office as assistant administrator for Project Development and Implementation, which had been vacated by Administrator Tech.

Del Rosario completed the course in civil engineering at the Mapua Institute of Technology (MIT) and placed 8th in the board examination for civil engineers in 1964. He joined NIA the same year as a civil engineer trainee. The new assistant administrator was only 41 years old at the time of his promotion, but he already had 18 solid years of experience in the investigation, planning and preparation of technical and feasibility studies on irrigation and multi-purpose water resources development projects. At the time, del Rosario was regarded as the agency's leading planning expert.

The appointment of Atty. Jose L. Juinio as assistant administrator for Administrative Services on May 9, 1983 completed the composition of the agency's top management. As business manager of the UPRP and the Office of Special Projects and concurrently OIC of the Office of the Assistant Administrator for Administrative Services and Vice-President for Operations of NIACONSULT, Inc., Atty. Juinio participated in several loan and contract negotiations and in international conferences.

The year 1983 was a difficult year for NIA due to fiscal constraints and economic pressures imposed by the national government to counter economic difficulties. From an original budgetary proposal of P950 million, the total equity contribution of the national government to irrigation development was reduced to only P760 million. Also, the country was hit by the worst drought in three decades, resulting in the sharp decrease in irrigated cropping intensity in national systems to 119.23 percent of the total service area, down by 18.97 percentage points from the previous year's high of 138.20 percent.

The reorganization which started in 1978 was finally implemented in 1984 during the start of Administrator Tech's term. Its salient features are as follows:

<i>Structure</i>	<i>Number</i>	
	<i>Before</i>	<i>After</i>
Assistant Administrator	4	4
Staff	4	4
Department	13	12
Division	37	35
Unit	1	2
Division in Regional Offices	6	6

To avoid too much centralization of authority that promoted bureaucratic red tape and caused delays in the execution and implementation of irrigation policies and projects, a reasonable degree of authority was delegated by top management to assistant administrators, department heads, regional irrigation managers, project managers, irrigation superintendents and provincial irrigation engineers. To the extent that these subordinate officials assumed functional control and authority delegated to them, the administrator was now able to concentrate on the implementation of major policies, as well as basic planning and supervision over the activities of the agency. Delegated authority by management included the approval of contracts, checks and vouchers up to a certain amount. Heads of regional offices were delegated authority to approve transactions of foreign-funded projects at a certain level, such as appointments, leaves of absence, vouchers, checks and contracts. The Board of Directors delegated authority to the administrator in specific areas of management responsibilities such as approval of certain appointments and contracts up to a certain amount and authority to undertake loan negotiations.

As a consequence of the drought, national palay production in 1983 declined to 154.61 million cavans, 7.82 million cavans less than the 1982 output. If the palay production situation was bad enough despite the irrigation of a total of 1.76 million hectares in 1983, one can just imagine the catastrophe that would have ensued had the rate of irrigation development slowed down in previous years. The country, after enjoying self-sufficiency in rice since 1976, was forced to resort again to imports to stave off famine in critically-hit areas and fill the shortage gap between supply and demand. The imported shipments totalling 191,240 metric tons valued at US\$41.1 million arrived in early 1984. During the seven-year period (1976 to 1982) that the country enjoyed self-sufficiency and produced huge surplus, it had exported a cumulative total of 544,027 metric tons of rice valued at US\$154.3 million.

Enhancing Corporate Viability

As a government corporation, NIA must be viable, that is, its earnings must exceed its expenses. Otherwise, it has no reason for existence since it will just be a liability instead of an asset to the government. For this reason, the agency set, as one of its major objectives, the attainment of

viability status so that it can acquire the capability to undertake its various programs, projects and activities to accomplish its vital mission. To this end, NIA took positive measures not only to increase its income but also to reduce its expenses.

Among the main sources of NIA's income are irrigation service fees (ISF) paid by beneficiaries of national systems and amortizations on construction cost of communal projects and equipment rentals. The agency has been implementing various strategies to generate more income from these sources addressed to both the beneficiaries and NIA fieldmen to encourage them to pay and collect more, respectively. These strategies include the granting of discounts for prompt payment, imposition of penalties on delinquents and filing of collection suits against delinquents, improvement of irrigation facilities and services and collection incentives for NIA fieldmen. These measures are supported by information campaigns featuring interpersonal dialogues.

Through these strategies, collections have improved to a certain extent — but not enough to reach satisfactory levels. The agency, therefore, has come up with a novel scheme to motivate field offices to strive harder to attain viability. These field offices consist of regional, provincial and national systems offices. Under the scheme, a field office that posts net earnings in a given calendar year is entitled to a "Viability Incentive Grant" or VIG equivalent to 10 percent of its net income. If the entire region of which the viable field office is a part also registers a net income, the VIG is increased to 20 percent. However, a ceiling of P4,000 is set for each VIG recipient. Non-viable field offices are not entitled to the VIG even if the region is viable.

NIA's VIG program is similar to the profit-sharing system in progressive private companies whereby workers who are productive are rewarded with bonuses or dividends. As far as is known, only NIA has such a profit-sharing program in the government sector.

The effect of the experimental program was encouraging. In 1982 there were only two regions, 24 provincial irrigation offices and 16 national systems, or a total of 42 field offices, that showed surpluses. But in 1983 three regional offices, 33 provincial irrigation offices and 34 national systems, or a total of 70 field offices, made it to the viability list with an aggregate net income of P3.8 million.

Buoyed up by the apparent success of the innovative approach, Administrator Tech issued Memorandum Circular No. 3 in February of the following year setting the

guidelines for and making the VIG program retroactive to calendar year 1983. The results confirmed the positive impact of the scheme when, at the end of 1984, the number of viable field offices increased to three regional offices, 32 provincial irrigation offices and 47 national systems. These 82 viable field offices turned in a combined net income of P4.1 million which was P342,000 more than the previous year's.

On May 1, 1985, Manuel R. Ticao assumed office as acting assistant administrator for operations replacing Bagadion, who retired. Before his designation as such, Ticao was regional irrigation manager of Region 6.

Ticao finished civil engineering at the National University in Manila in 1951 and passed the board examination the same year. He started government service in August that year as instrumentman at the Irrigation Division branch in Iloilo City. He progressed steadily and by 1974 had risen to regional head. Under his stewardship, Region 6 reached high levels of performance, attaining viability status for the first time in 1983 with a respectable surplus of P1.4 million.



Manuel R. Ticao

Under Ticao, the agency's irrigation service fee receipts in 1985 dramatically shot up to P143.285 million, up by P44.33 million or 44.8 percent over the 1984 collection of P98.95 million.

Against All Odds

Meanwhile, financial assistance from the national government continued to dwindle. In 1984, only P205 million out of the approved ceiling of P760 million was released as equity contribution. Also, the actual disbursements of P1.39 billion was almost 10 percent less than the amount programmed that year. The fiscal environment within which the agency operated kept deteriorating such

that the equity released to NIA that year dropped to its lowest at P99 million.

Since it was launched in 1980 as a regular program of NIA, the participatory approach to irrigation development has been given strong emphasis. Farmers' participation in irrigation activities contributed to improved operation and maintenance of irrigation systems as well as reduced the financial burden on NIA in the implementation of its various field activities. The agency also made it a policy to maximize the use of existing facilities by upgrading operation and maintenance procedures to make the systems and their personnel more efficient and effective in the delivery of services on one hand and in optimizing production on the other.

At the end of 1985, the 145 national, 5,539 communal and 17,031 pump irrigation systems had expanded irrigation coverage to 1.437 million hectares representing an irrigation development rate of 45.96 percent. On the other hand, national palay output that year was a hefty 164 million cavans, the highest ever. Of the total output, 109.63 million cavans or 66.8 percent were from irrigated areas which accounted for 55 percent of the total harvested area. Average yield per hectare in irrigated areas was 60.9 cavans, twice the 30.4-cavans output in unirrigated ricelands.

The personnel capability of the agency had been strengthened to meet the needs of its enlarged goals and targets. Its revised pay plan and staffing pattern made possible by PD No. 552 was designed to make NIA competitive in the recruitment of competent and capable personnel and at the same time retain its experienced and trained staff. However, with the sudden change in the economic trend, the pay plan had become outdated, resulting in the unsuppressed exodus of NIA technical and non-technical employees to more attractive employment opportunities here and abroad. To minimize the brain drain, top management officials sought the aid of higher authorities to extend more benefits to agency employees in the form of allowances. Since its early years, NIA had already embarked on a staff development program in the form of training, grants, advanced studies and technical staff development through various forms of scholarship here and abroad.

Against all odds, the agency did well in its financial operations in 1985. That year, it registered a net income of P123.63 million from revenue of P482.6 million and ex-

penses of P358.97 million. The VIG program, which had triggered intense competition, brought about dramatic results when the number of viable field offices rose to 114. These field units consisted of five regional offices, 46 provincial irrigation offices and 63 national systems with an aggregate surplus of P19.6 million, more than twice the total surpluses chalked up in the preceding two years and some 15.4 percent of the total net earnings that year. Also, NIA's assets increased by P1.144 million to P15.066 million from P13.922 million the previous year.

Meanwhile, the total service area had expanded to 1,436,880 hectares, bringing the rate of irrigation development to 45.96 percent at the end of 1985.

CHAPTER VIII

1986 AND BEYOND

Corazon C. Aquino installed as the seventh President of the postwar Republic; Alday appointed as new NIA administrator and Rogaciano Mercado becomes new chairman of the Board of Directors; irrigation development in 1972-1985 reviewed; implementation of the agricultural component of the national recovery program outlined; irrigation thrusts and strategies to support the recovery effort firmed up; highlights of 1986; NIA gets strong budgetary support in 1987, increases its targetted areas; Baligatan Hydroelectric Plant inaugurated; crop diversification project; accomplishments during the year summarized; proclamation of "Irrigation Week"; and importance of water underscored.

IN MID-MORNING of February 25, 1986, at the height of the bloodless revolution backed by "People Power", Corazon C. Aquino was installed as the seventh President of the postwar Philippine Republic. It was the climax of a dizzying series of socio-political events sparked by the assassination of former Senator Benigno S. Aquino, Jr. in 1983 and leading up to the controversial snap presidential



EDSA Revolution in 1986

election of February 7, 1986. It was the conduct of this election that directly triggered the historic four-day revolution that toppled the 20-year-old Marcos regime.



Federico N. Alday, Jr.

Like others in the government bureaucracy, top management officials of the agency tendered their courtesy resignations to the new head of state. President Aquino accepted the resignations and initially appointed Federico N. Alday, Jr., as administrator who assumed office on May 1, 1986.

At 39, Alday is the youngest NIA Administrator to assume office. He was valedictorian in elementary and high school and was a college scholar at the UP where he obtained his Bachelor of Laws degree in 1971. After passing the bar the same year, he engaged in private law practice and became a partner in a law office. He also served as director, corporate secretary or legal counsel of nine big firms with diverse business interests.

At the same time, Rogaciano Mercado became the new chairman of the Board of Directors by virtue of his appointment as MPWH minister.

On June 1, 1986, the new assistant administrators, who came mostly from the private sector, assumed office. They were Dr. Agustin N. Ramos, Jr., assistant administrator for Project Development and Implementation; Dr. Manuel M. Vergel, Jr., assistant administrator for Systems Operations and Equipment Management; Mario D. David, assistant administrator for Finance and Management; and Jose R. Hernandez, assistant administrator for Administrative Services. The following month, the position of deputy administrator was created and Domingo T. Bautista was appointed to the position.

Bautista finished B.S. Chemical Engineering at the National University in 1957 and passed the board examination the following year. Later, he earned two master's

degrees: one in Business Administration at the New York University, USA in 1965 and another in Economics at the Ateneo de Manila (now Ateneo University) in 1967. Before joining NIA, he was president of the New Rural Bank of Guimba in Nueva Ecija and was either entrepreneur or operator of a number of agribusiness ventures.



Domingo T. Bautista

Being all newcomers, Administrator Al-day and the other top management officials as well as their immediate staffs took sometime to get the feel of things, considering that NIA is a big and complex organization. They introduced some changes and in time, got the agency going with middle managers providing valuable support.

The nation faced an awesome challenge as it girded for the herculean task of national recovery. Aside from a nearly empty treasury, the previous regime had left the country with a staggering foreign debt whose annual interest payments alone were estimated equivalent to half of the country's yearly export earnings. In the new milieu, NIA had to readjust its program goals and feather its operations and construction activities since it had to rely to a great extent on its own financial resources during the critical interim when the national government was raising revenues to fund the various ongoing activities and eventually the overall program to be formulated to achieve national recovery. As a result of the effective implementation of the viability program under the Corplan which started in 1981, the agency had become financially sound based on its total accumulated reserves of more than P1 billion by the end of 1985. This financial capability enabled the agency to augment the funding needs of some of its projects in the absence of adequate releases by the national government.

Brief Review of Irrigation Development (1972-1985)

The implementation of the program to generate new areas for irrigation and rehabilitate existing systems was vigorously pursued in 1972-1985. This raised the service area of operating irrigation systems from about 742,447 hectares in 1972 to approximately 1,436,880 million hectares in 1985, representing a hefty 93.55 percent increase or an average annual growth rate of 7.19 percent. On the basis of the identified potential irrigable area of 3.16 million hectares in the country, the level of irrigation development in 1972 was only 23.75 percent, which almost doubled to 45.96 percent in 1985.

As previously mentioned, the accelerated irrigation development program launched by NIA in 1974 was the crucial factor that made possible the regaining of self-sufficiency in rice in 1976 and the production of huge surpluses starting 1977. However, the prolonged drought in 1982-1983 caused a depletion of government and private rice stocks. The government had to import 191,240 metric tons of the cereal valued at US\$41.1 million to insure the stability of rice supply and price. This contingency indicates the instability of the rice supply in the face of prolonged and widespread drought, destructive typhoons and other natural calamities.

The irrigation development program to facilitate economic recovery slowed down in the period 1983-1985 due to financial restraints imposed by the government. Cutbacks in the investment program resulted in considerable delay in the completion of almost all on-going projects.

The National Recovery Program

President Aquino's national recovery program places agriculture at the center. The implementation of the agricultural component of the program is based on the following strategies:

- Highest priority to be given to the development of agriculture not only to realize the goal of equitable distribution of benefits and opportunities but also to enable the 70 percent of the population who live in the countryside to maximize their contributions to the economy.

- Implementation of a genuine agrarian reform pro-

gram to be supported by a complete package of services that includes credit, marketing and technology.

— Priority to be accorded to and investments to be encouraged in labor-intensive, rural-based small and medium-scale agricultural enterprises, particularly those engaged in food production for domestic consumption.

This program is initially being undertaken through the **Short-Term Recovery Plan for the Rural Sector** of the Ministry of Agriculture and Food (MAF) anchored on three policy goals: (1) to free the economy from unnecessary and costly government institutional and policy interventions; (2) to provide the farmers access to land, technology, credit, infrastructure facilities and market information, and for landless wage-earners, greater employment opportunities; and (3) to increase the effectiveness of the various government agencies concerned in pursuing the new thrusts in agriculture and the rural sector. Decentralization is a key feature of this last policy goal to insure full participation of farmers and landless workers in the development process.

Thrusts and Strategies

To support the agricultural component of the national development program, NIA, for a start, undertook the construction of new communal irrigation projects and the rehabilitation of existing communal irrigation systems concomitant with the objective of generating employment opportunities under the Community Employment Development Program (CEDP). In 1986, the initial year of the program, NIA was able to complete 110 communal irrigation projects that generated 1,800 hectares of new areas and restored 7,476 hectares of existing areas for a total cost of P151 million.

Specifically, the programs were:

Completion of On-going Projects. The completion of on-going projects shall take precedence over any other undertaking. No new project shall be undertaken if it would mean additional delay in the completion of ongoing projects. Some components of ongoing projects may have to be cut down when necessary without prejudice to the economic and financial viability of such projects.

Development of Small and Medium-Scale Projects. The development of small and medium-scale

irrigation projects, particularly communal irrigation projects, shall be continued. The development works shall include generation of new areas with the participation of organized farmers.

Rehabilitation of Existing Systems. To minimize investment losses and maintain efficient irrigation service, the rehabilitation and improvement of existing irrigation systems shall be pursued. Rehabilitation works shall primarily involve the restoration of the systems into their designed functional capability.

Strengthening the Capability of National Systems. National systems account for almost half of the aggregate service area of all types of irrigation systems. The objective of this thrust, therefore, is to establish a sustainable framework for NIA's operation and maintenance activities at a sufficient level to stem further deterioration of these big irrigation systems and at the same time improve the generation of revenues. This strategy shall involve the infusion of additional funds, improvement and participation of irrigators' groups, provision for and optimal utilization of appropriate equipment, training for irrigation personnel and farmers, and restructuring of the systems' organization.

Limited High Priority Multipurpose Projects. Subject to the financial capability of the government and NIA, high priority multipurpose projects shall be implemented sequentially to enhance irrigation, power, flood control and other purposes. For irrigation purposes, the priorities shall be projects that would upgrade the performance of existing systems.

The physical targets for this six-year program (1987-1992) are the generation of 156,521 hectares of new areas, the rehabilitation and restoration of some 475,258 hectares and the reforestation of 7,906 hectares of watershed areas requiring an investment of P19 billion. Primarily due to the strong adverse influences exerted by internal and external environments, the program is intended to be flexible and may have to be adjusted from year to year.

Plan Up to Year 2000

The aggregate service area in 1986 expanded to 1.458 million hectares or a development level of 46.06 percent.

With the unification of the approach to water resources development, management and utilization through the creation of NWRC, major improvements can be foreseen and realized in the field of irrigation at the turn of the century.

The irrigation development program aims to further accelerate the generation of new irrigated areas and improve existing systems for the production of rice and other crops such as sugar cane, feed grains, bananas, vegetables and others. The objective is to sustain the country's self-sufficiency in the staple and generate reasonable quantities for the export market. Increased production via irrigation and related inputs is, in turn, envisioned as an investment to achieve the government's basic goals of raising farmers' income, improving standards of living and expanding opportunities in the rural areas.

The aggregate service area of 1,458 million hectares in 1986 is programmed to increase to 2.8 million hectares by the year 2000 with some 2.3 million hectares devoted to rice production and about 0.5 million hectares to other crops needing irrigation.

The irrigation program will be closely dovetailed with the agricultural development strategies in terms of the types of crops to be produced and their targets, location and timing of production. The strategy will seek to strike a balanced development of large-scale gravity-type projects which have a relatively long gestation period and are concentrated in a few places, on one hand, and smaller communal and pump projects which promise quicker results for a more widely-spread farmer population, on the other hand.

In line with the objective of developing water resources for multiple uses whenever feasible more impounding reservoirs, with special emphasis on small-scale ones, will be built not only to provide irrigation but also to generate power, mitigate floods and provide water for domestic and industrial uses as well as to recharge groundwater sources.

To optimize the benefits from irrigation, the integrated development approach will be adopted in coordination with other agencies involved in food production and rural development. Under this scheme, irrigation will be planned as an element of a multi-sectoral package of farm inputs and support services, and this will be complemented by the use of high-yielding varieties, farm-to-market roads, drainage facilities, extension services and modern farming practices.

Priority in the irrigation development program will be given to areas with high production capabilities, mainly

the major river basins as identified in the agricultural sector program. In depressed areas with potentials for increased yields and higher income, irrigation and related inputs will be given special attention.

Corollary to this, the Diversified Crops Irrigation Engineering Project (DCIEP) was implemented in 1987 with financial assistance from the Japan International Cooperation Agency (JICA). The primary objective of the project is to install training facilities in connection with the intensive research program on raising agricultural crops other than rice. The special features of the project include pipeline irrigation to convey water pumped through an engine run by solar energy.

Thus, the program until the year 2000 is balanced between the generation of new areas derived from both large and small projects and improvement of existing systems to maximize the effects of irrigation in agricultural production.

Flood Forecasting Center

The first significant event that took place after the change in the NIA management was the inauguration of the Flood Forecasting and Warning System for Dam Operations (FFWSDO) at the NIA compound on October 14, 1986, with President Aquino as guest of honor. In her message, the President said:

"We recall with deep sorrow the tragic loss of many human lives due to the disastrous flash flood of 1978 in the downstream plain areas of Angat Dam in Bulacan. This could have been avoided had the Flood Forecasting and Warning System for Dam Operation Project been completed earlier.

This project is a major accomplishment in our task of nation-building. The involvement of various government agencies contributed to the preservation of human life, as well as to the new government's objective of improving the quality of rural life. Definitely, the project will enable the major dams to make full use of their stored water for adequate domestic water supply, sustained irrigation services and maximum power generation".

FFWSDO, the first of its kind in the Philippines was born from death and destruction. After the disastrous flood that brought death and destruction downstream of the dam of the Angat RIS in Bulacan in 1978, the authori-



Pres. Aquino during the inauguration of the Flood Forecasting and Warning System for Dam Operations (FFWSDO) at the NIA Compound.

ties saw the need for a flood forecasting and warning system in major damsites. This led to the conception of FFWSD, to prevent the recurrence of similar disasters. The system is a two-stage scheme started in April 1983, a year following the signing of a memorandum of agreement between the Philippines and Japan. Under the agreement, the project fund was to be provided under the 10th Yen Loan Package of the Japan Overseas Economic Cooperation Fund (OECF).

Phase I of the project involved the establishment of a flood forecasting and warning system covering the Angat and Pantabangan areas and the upgrading and expansion of the existing Pampanga River Flood Forecasting and Warning System (FFWS), while the ongoing Phase II involves the establishment of an FFWS covering the Magat and Binga/Ambuklao dams and the PAGASA Data Information Center as well as the repair and rehabilitation of other existing FFWSs.

Directly involved in project implementation are NAPOCOR and NIA as dam authorities in their areas of jurisdiction, PAGASA as the National Flood Forecasting

Center and DPWH, Office of Civil Defense (OCD) and NWRC as monitoring agencies.

Completion of the project will result in the effective use of hydrological data and information in the efficient operation and management of reservoirs to ensure the optimum use of impounded water for power generation, irrigation, flood control and domestic water supply. It will also be useful in the mitigation of flood damages, particularly loss of human lives, through the prior issuance of warnings of impending releases of impounded water.

Highlights of the Year

In spite of tight funding constraints and the difficult period of transition, NIA was able to continue prosecuting most of its projects in 1986. The agency generated 24,642 hectares of new areas, rehabilitated 81,020 hectares in existing systems and reforested 3,885 hectares in the Pantabangan and Magat watersheds.

Locally-Funded Projects. Eight locally-funded national projects with a total cost of P181.03 million and covering an aggregate service area of 24,420 hectares were under construction during the year. Of these projects, two were substantially completed: the Lumintao River Irrigation Project with a service area of 2,200 hectares in Occidental Mindoro and the San Pablo-Cabagan River Irrigation Project covering 2,890 hectares in Isabela. Due to lack of funds, four of the projects had to be temporarily stopped. These were the Lower Agno River Irrigation Project in Pangasinan, San Antonio Extension Project in Nueva Ecija and Solana-Tuguegarao Extension Project in Cagayan. The locally-funded national projects generated 630 hectares of new areas and rehabilitated 100 hectares during the period.

On the other hand, the agency received P151.03 million for the communal irrigation program in 1986 compared to P71.1 million the previous year. However, the greater portion of the amount was released in the second half of the year. The relatively big amount allocated to communal irrigation projects was in line with the government's priority thrust to generate employment in the countryside under the Community Employment Development Program (CEDP). Despite the delayed releases of funds, 110 communal projects were completed, generating

1,800 hectares of new areas. In addition, 7,476 hectares were restored in existing systems. Furthermore, 18,361 hectares served by 260 communal systems damaged by typhoons were restored at a cost of P14.7 million.

Foreign-Funded Projects. The agency continued the implementation of 22 foreign-funded projects in 1986. Of these, eight were partly-financed by the World Bank, 10 by ADB, three by the OECF and one by USAID. The International Fund for Agricultural Development (IFAD) and the Organization of Petroleum Exporting Countries (OPEC) also provided assistance to some of these projects like the Bukidnon Irrigation Project and Second Laguna de Bay Irrigation Project. Loans funded by OPEC are administered by the ADB. Upon completion, 21 of these projects are expected to generate a total service area of 399,956 hectares. The Water Management and Erosion Control Project (WMECP), on the other hand, is designed to reforest a total of 35,296 hectares in the Pantabangan and Magat watersheds.

National Systems Operation. The 130 national systems operated and maintained by the agency irrigated a total cropped area of 818,629 hectares, of which 96 percent was planted to rice. However, six strong typhoons that hit the country during the year affected 34,339 hectares and inflicted damage estimated at about P38.06 million to irrigation facilities. The Mambusao RIS in Capiz was destroyed, but immediate repair works were undertaken.

Institutional Development. As in the last few years, the development of farmers' institutions through the organization of irrigators' associations (IAs) was a major thrust of the agency in 1986 in support of its program to attain financial stability and to improve the operation and maintenance of national systems. By involving the irrigation-users in the operation and maintenance of irrigation systems, the agency realized substantial savings in operating costs, increased irrigation service fee collections, reduced conflicts over water distribution and made water distribution more equitable. Above all, the institution-building efforts contributed to the capital build-up of the associations and helped establish better working relationships between NIA personnel and irrigation-users.

As of the end of 1986, a cumulative total of 1,078 IAs had been organized. Of this number, 854 were registered

with the Securities and Exchange Commission (SEC), qualifying them to enter into a contract with the agency in the operation and maintenance of portions of irrigation systems. As of the same period, 548 IAs cultivating a combined area of 172,000 hectares had assumed responsibility in the operation and maintenance of sections serviced by 1,950 kilometers of canals.

The development of IAs includes provision for several training courses on leadership, water management, crop production and financial management. Most training activities are conducted in close coordination with the MAF and Bayer Philippines, Inc., with which NIA has collaborated in crop protection and water management. So far, 3,085 farmer-irrigation users have benefitted under the NIA-Bayer tie-up. Before, institutional development efforts and resources were split between communal and national systems, resulting in their diffusion. In 1986, however, all farmer-organizing programs were integrated and centralized under the Institutional Development Department of the operations sector.

Top Management. Towards the end of the year, a protracted boycott was staged by a number of Central Office personnel led by the newly-organized NIA Employees' Association demanding the resolution of some grievances. This resulted in a sweeping revamp in the top management set-up of the agency. The four assistant administrators who had been in office for some eight months agreed to tender their voluntary resignations in order to put an end to the divisive conflict. Their positions were then filled up by the following career officials: Eduardo G. Fernandez as assistant administrator for Project Development and Implementation; Sebastian I. Julian as assistant administrator for Systems Operation and Equipment Management; Zenaida C. Sebastian as assistant administrator for Finance and Management and David T. Rojas as assistant administrator for Administrative Services.

Fernandez finished civil engineering at MIT in 1952 and was among the top ten placers in the board examination for the profession given that year. He joined the Irrigation Division in 1952 as project inspector, transferred to the Board of Technical Surveys in 1961 as supervising civil engineer, again moved to the Bureau of Coast and later to the Bureau of Coast and Geodetic Surveys in the same capacity in 1972. In 1975, Fernandez finally transferred to NIA. His varied expertise and expe-



Admr. Alday with the Assistant Administrators

rience in the field of water resources here and abroad stood him in good stead when opportunities for advancement beckoned.

Also a graduate of MIT, in 1957, Julian passed the board examination for civil engineers the same year. He started his government service as canal inspector at the Santo Tomas RIS in Pampanga in March 1952. After three years as irrigation superintendent of the Angat RIS in Bulacan, he was promoted as senior civil engineer at the Central Office in August 1966. In 1967 he took postgraduate studies on land drainage in the Netherlands. In 1978-1980, Julian was successively chief regional engineer II and chief regional operations engineer II of Region 3. He returned to the NIA Central Office in May 1980 as manager of the Systems Management Department. Julian has attended a number of seminars and conferences abroad.

Sebastian obtained the degree of Bachelor of Business Administration from the University of the East (UE) in 1964 and passed the examination for certified public accountants the following year. She entered the government service as accounting clerk I at the NIA Accounting Division in 1967. Ten years later, she had become chief corporate accountant, and by 1980 had taken over as manager of the Controllershship Department, the position she held before her appointment as assistant administrator for Finance and Management.

Rojas finished law at the Manuel L. Quezon University (MLQU) in 1960 and passed the bar examination given the same year. He began his career in the government as water

rights investigator in the Irrigation Division in 1961. When NIA was created and the Division was abolished in 1963, Rojas opted to be absorbed by the new agency. He rose to senior legal officer in 1968 and eventually became corporate legal counsel in 1972, a position he held up to his appointment as assistant administrator for Administrative Services. From 1961 up to December 1986, he was concurrently special attorney in the Office of the Solicitor General.

Financial Performance. Due primarily to the withdrawal of a substantial amount from corporate fund deposits to augment the funds for construction activities in the absence of equity releases from the national government as well as a sharp decline in returns from investments, the agency's interest earnings experienced a big drop, resulting in a deficit of P93.39 million in 1986. However, the five traditionally viable regions amassed an aggregate surplus of P20.26 million. By the end of the year, NIA's assets had risen from P15.03 billion in 1985 to P16.05 billion during the year.

In the middle of December, President Aquino appointed Vicente R. Jayme, then president of the Philippine National Bank (PNB), as MPWH minister in the first major cabinet reshuffle. As such, Jayme succeeded Mercado as chairman of the NIA Board of Directors.

Strong Budgetary Support

Through its irrigation development program, NIA serves as a catalyst in the agricultural growth of the country. And since the government had given top priority to rapid agricultural development, it continued to provide NIA strong budgetary support. In 1987, a budget of P1.7 billion was allocated to the agency.

This unusually huge budget enabled NIA to realign its construction and rehabilitation programs by targetting larger areas. Heretofore arid lands were considered for possible irrigation and, with the slack in the construction of new large-scale projects, the agency was able to concentrate on the rehabilitation of irrigation facilities in existing national systems and in the continuance of ongoing infrastructure projects.

On February 2, 1987, the people overwhelmingly approved the Freedom Constitution in a plebiscite. The

government thus reverted to the presidential form.

NIA chalked up another "first" with the inauguration on April 28, 1987, of the Baligatan Hydroelectric Plant (BHEP), a component of Magat Dam. Before the completion of this plant, NIA had to pay NAPOCOR for the power used by the three pumps of Magat Dam that irrigate 8,267 hectares located above the maximum elevation for gravity flow. The electricity generated by BHEP, which has a rated capacity of six megawatts, is fed into the NAPOCOR substation at Barangay Rizal, Santiago, Isabela. With the operation of this mini-hydroelectric plant, NIA now repays NAPOCOR in kind for the power used in those three pumping stations.

The Baligatan power plant was constructed by China Machinery and Equipment Import and Export Corporation (CMEIEC) of the People's Republic of China (PROC) at a cost of P28.2 million.

Salient Accomplishments

The initial release of funds for communal projects, however, was made only in the second quarter, the onset of the rainy season when construction activities are hampered by inclement weather. Moreover, the funds were released through the DA instead of through DPWH as was the practice in the past. Consequently, precious time was lost in establishing standard operating procedures, thus slowing down releases which, in turn, delayed construction activities. As a result, NIA's performance in its physical activities was adversely affected during the year.

In spite of this problem, the agency was able to generate 19,274 hectares of new areas and rehabilitate/improve 131,639 hectares in existing systems. The cumulative service area of all types of systems rose slightly to 1.487 million hectares or 47.07 percent of the total potential irrigable area of 3.16 million hectares. In addition, some 3,125 hectares were reforested in the Pantabangan and Magat watersheds during the year. Taken as a whole, specific physical accomplishments were below targets due to a combination of factors.

Other 1987 Highlights:

— The Management Audit Division was renamed Internal Audit Service. Operating under the Office of the Administrator, IAS brings to the attention of top management all findings and assessments on the financial and operating functions of the agency.

— Research studies were conducted in various fields. Two of these studies were particularly important: a joint irrigation water management study of the NIA Hydraulic Research Station and the Overseas Development Unit of the United Kingdom and an ADB-funded study on irrigation management for crop diversification. The latter study led to the establishment of the Diversified Crops Irrigation Engineering Project (DCIEP), a five-year joint undertaking of NIA and the Japan International Cooperation Agency (JICA). This project was conceived primarily "to investigate the most appropriate methods of irrigating diversified crops and designing facilities for crops other than rice".

— A cumulative total of 1,232 IAs had been organized, an increase of 154 over the previous year's number. Of this total, 990 IAs had been registered with the Securities and Exchange Commission (SEC). These associations were distributed as follows: 1,087 in communal systems and 145 in national systems.

— More activities were computerized and additional personnel were trained on computer operation. New microcomputers were acquired to augment existing units and the VAX 11/750 minicomputer. A total of 70 microcomputers had been installed in the Central Office as well as in the regional and project offices. Computerized billing of irrigation service fees (ISF) was adopted in selected national systems in Region 6, 11 and 12. Computerization minimizes the time and activities involved in the preparation of individual bills and is expected to contribute to the overall increase in ISF collections.

— Fifty units of transport vehicles, agricultural and communications equipment including spare parts valued at P14 million were procured to enhance personnel mobility, equipment dependability and fast communication. Equipment rentals amounted to P40 million, while P3 million was realized from the sale of unserviceable and excess equipment.

— Completion of feasibility studies of two irrigation projects for foreign assistance. These are the Balog-Balog

Multipurpose Project in Tarlac and the Irrigation Operation Support Project (IOSP) designed to improve the operation and maintenance of national systems.

— NIA entered into a memorandum of agreement with the Engineering Information Network (EINET) spearheaded by UP to strengthen management information, a basic tool in policy implementation. It is expected that the improved technical data base as a result of this tie-up shall help top management to improve policy formulation and decision-making.

— After being in the red by P93.39 million in 1986, NIA's financial position rebounded strongly in 1987 when a big surplus of P134.66 million was posted. The agency's assets likewise increased substantially to P18.079 billion, up by more than P2 billion over the previous year's.

On November 9, 1987, Juanito N. Ferrer assumed office as DPWH secretary, replacing Jayme whom the President tapped to head the Department of Finance. Ferrer automatically became chairman of the NIA Board of Directors.

The agency continued in 1988 the program thrusts it started to implement the previous year in consonance with the Medium-Term Philippine Development Plan (MTPDP) (1987-1992). These thrusts were the: (1) completion of ongoing projects, (2) continuing development of small-scale communal irrigation projects, (3) rehabilitation and upgrading of existing irrigation systems, and (4) strengthening of operation and maintenance capability of irrigation systems.

Under these thrusts, the agency has set four corporate priorities consistent with the overall policies and strategies of the MTPDP, as follows:

1. Rural-based, small and medium-sized, short-gestating and labor-based projects shall be given emphasis.

2. Priority shall be given to the maintenance of existing and soon-to-be completed infrastructure projects to prolong their useful lives, reduce costs to users and postpone huge investments for their major rehabilitation or replacements.

3. Rehabilitation and restoration, as well as improvement of existing facilities, shall take precedence over replacement of facilities and new construction as low-cost measures to provide acceptable levels of infrastructure fa-

cilities.

4. Special attention shall be given to the completion of ongoing projects. New infrastructure projects shall therefore be selectively undertaken.

To enable NIA to carry out its major thrusts, the national government approved a substantial budget for the agency in 1988, broken down as follows: P526.374 million for operating expenditures and P1.288 billion for capital investments.

The political and economic horizons appeared to brighten in the first five months of the year as a result of two major developments.

One was the diplomatic initiative started by President Aquino with her state visit to the People's Republic of China (PROC) in the middle of April. During that visit, PROC Chairman Deng Xiao Peng assured the President that China would not support the Communist Party of the Philippines/New People's Army (CCP/NPA). Chinese trade officials also agreed on a more equitable trade relations between China and the Philippines and explored areas where PROC could assist the latter. She was scheduled for a similar trip to Moscow during the year. Hopefully, she was able to obtain similar results there.

The other is a strong indication of a coming surge in economic activities. A reliable indicator was the huge increase in fuel consumption during the first quarter of the year. During the quarter, the country's oil import bill rose sharply by 18.8 percent compared to that of the same period the previous year, despite lower crude prices. Large industrial and commercial firms fueled the increase by consuming 14.2 percent more petroleum products over the corresponding period in 1987.

25th Anniversary

Since 1965, the agency had been observing its anniversary as a government corporation on March 17, the date its Board of Directors convened for the first time in 1964. To

Continuing Thrusts

place the occasion in its proper historical perspective, Administrator Alday issued Memorandum Circular No. 011 on February 11, 1988, resetting NIA's anniversary date to June 22, the date President Macapagal signed RA 3601 in 1963. On that date, NIA started to exist as a juridical personality.

To underscore the significance of the 25th anniversary of the agency on June 22, 1988, and so that the people will appreciate the vital importance of irrigation in national development, President Aquino issued Proclamation No. 256 on April 28 declaring the third week of June of every year as "Irrigation Week". At the same time, the Postal Services Office (PSO) issued a commemorative stamp to mark the event.

During the anniversary program, Macapagal, the guest of honor, said:

"Having expanded irrigation and boosted production phenomenally under three administrations, NIA has demonstrated the fundamental verity that nation-building does not pertain to one leader or administration alone but to all administrations cumulatively one after another".

He concluded: "You in NIA can invaluablely help in converting to reality President Aquino's vision of the Philippines becoming another economic miracle in this region by keeping up your great work and maintaining the reputation of NIA, in the words of Amnon Golan, as the finest irrigation agency in the whole of Asia and in any developing country in the world".

The agency presented the "Gawad-Patubig Award" to seven individuals in recognition of their outstanding contributions to the growth of irrigation in the country. They were Macapagal, former Congressman Baltao (posthumous), first NIA Board Chairman Abad (posthumous), former NIA Administrator Juinio, first NIA Assistant Administrator Mercado, former Congressman Leopoldo Diaz of Nueva Ecija and Assistant Secretary for Postal Services Tagumpay Jardiniano.

The "Gawad-Patubig Award" is the highest award given by NIA and will next be given to deserving recipients during its Golden Jubilee in the year 2013.

Twenty-one media practitioners were likewise honored with the "Pahayag Parangal Award" for their contribution to irrigation development through objective and timely reporting of irrigation policies, program and activities.

The agency also awarded plaques to five field officials for their exemplary performance as follows: Abundio V

Valdez, Jr., Regional Irrigation Manager, Region 11, "Regional Irrigation Manager of the Year"; Reynaldo C. Mencias, Project Manager, Allah River Irrigation Project II (ARIP II), "Project Manager of the Year"; Clemente N. Dinopol, "Irrigation Superintendent of the Year"; and Romulo I. Labarete, Provincial Irrigation Engineer of South Cotabato, "Provincial Irrigation Engineer of the Year".

Valdez was cited for his outstanding leadership and effective collection and cost-cutting strategies that netted Region 11 a whopping surplus of P13.38 million, 42 percent more than that of the previous year's. Mencias, on the other hand, was commended for cost-effective management and for his innovations. ARIP II was originally scheduled to be completed in 1991 at a cost of P700 million, but at the rate the project is progressing the undertaking will be completed two years ahead of schedule at half the original estimated cost. Dinopol and Labarete turned in sterling performances as heads of field units in the agency's vigorous viability drive.

Balog-Balog Project Started

In the middle of June 1988, the loan agreement for the foreign currency component amounting to US\$85 million



Groundbreaking ceremonies of Balog-Balog Multipurpose Project (BBMP) in Tarlac.

of the Balog-Balog Multipurpose Project (BBMP) in Tarlac was concluded in Rome. On June 27, 1988, groundbreaking ceremonies were held at the damsite of the biggest infrastructure project being implemented under the administration of President Aquino.

The project site is located at the eastern slope of the Zambales mountains in Central Luzon, some 28 kilometers from the provincial capital of Tarlac. It has a net irrigable area of some 50,000 hectares in eight towns of Tarlac and part of one town in the adjacent province of Pampanga. Aside from its principal objective of providing irrigation, the project will have the following features: a power plant capable of generating 33 megawatts of cheap hydroelectric power to augment the power supply in Central Luzon, a watershed management program, propagation of fish and other aquatic products in the reservoir and flood control facilities.

A few days later, on July 2, 1988, the Malatgao River Irrigation Project (MRIP) in Narra, Palawan was inaugurated. The new system has a service area of farmlands cultivated by around 5,000 farmers in the municipalities of Narra and Aborlan. Narra is a resettlement site set up by the defunct National Resettlement and Rehabilitation Administration (NARRA) during the term of Magsaysay as part of the strategy to solve the insurgency problem at the time. The project, which cost P232 million, is one of the seven irrigation projects packaged under the Philippine Medium-Scale Irrigation Project (PMSIP) being implemented by NIA with a loan assistance from the World Bank.

Later in the year on November 12, the Naga-Calabanga Irrigation Project in Camarines Sur which has an irrigable area of 11,896 hectares was inaugurated. The project which was started in 1980 and partly financed by a US\$50.80-million loan from the ADB cost a total of P599.18 million. Its completion was widely considered a giant step towards the goal of providing the necessary infrastructure support for agricultural development in the Bicol Region.

At the end of the year, overall physical accomplishment of NIA shows that a total of 25,761 hectares of new areas was generated and some 196,017 hectares in existing irrigation systems were rehabilitated or improved. The agency was also able to reforest 11,343 hectares in the

Pantabangan and Magat watershed areas. Status of irrigation development throughout the country based on actual generated area was 1,515,543 hectares or 48 percent of the total irrigable area of 3,169,594 hectares.

New Challenges

An auspicious event for NIA in 1989 was the inauguration in early January of the First Allah River Irrigation Project (ARIP-I). ARIP I which irrigates 18,479 hectares of prime lands in South Cotabato and Sultan Kudarat was a high priority project designed primarily to boost the productivity of the fertile Allah Valley in Mindanao. Its completion set the trend for irrigation development which picked up and proceeded at a faster pace throughout the year.

Accelerated Irrigation Program. Because of the importance of irrigation not only in agricultural crop production but also in countryside development, House Bill No. 21827 was filed in the House of Representatives in January 1989. The bill proposed a ten-year accelerated irrigation development program covering all the remaining 1.6 million hectares of irrigable areas in the country.

In support of the bill NIA formulated a ten-year irrigation program (1989-1998) that would speed up the development of the country's potential areas for irrigation. It lined up proposed national (multipurpose and single purpose) and communal irrigation projects for implementation in addition to those already under construction.

Full Blast Implementation. During the first quarter of the year, project development activities also intensified with the full blast implementation of several new projects. Among the new projects were: Irrigation Operation Support Projects (IOSP), Highland Agricultural Development Project-Irrigation Component (HADP-IC), Accelerated Agricultural Production Project (AAPP), and Diversified Crops Irrigation Engineering Project (DCIEP). Apart from these, NIA continued the implementation of 18 ongoing foreign-assisted national and 432 communal projects.

Early in April, the construction of the Diversified Crops Irrigation Engineering Center at the NIA Building Complex in Quezon City started. The Center, a five-

storey building with facilities for trainings, soil and water laboratory and other support services is a grant from the Japanese Government, through JICA. It will serve as a permanent facility for research, education and development programs geared towards strengthening NIA's operation and maintenance and water management capabilities in crops other than rice.

CARP - Irrigation Component. On June 1, NIA started implementing the irrigation component of the Comprehensive Agrarian Reform Program (CARP), a ten-year socio-economic development plan considered the centerpiece program of the Aquino Administration. Under the program, NIA is committed to construct new irrigation systems (mostly communal types) to generate 213,000 hectares of new irrigated areas and to rehabilitate or improve existing systems serving some 140,000 hectares. This component which has been programmed for ten years (1989-1998) has a total estimated funding requirement of P10.148 billion broken down as follows: P7.131 billion for new areas and P3.017 billion for rehabilitation.

CARP was formulated out of the provisions of RA No. 6657, the Comprehensive Agrarian Reform Law of 1988. It was envisioned to enhance agricultural productivity and rural industrialization and generate greater political stability. Programmed for implementation in three phases over a ten-year period, it is estimated to cost about P339 billion. It covers a program scope of 10.29 million hectares and will benefit about 3.9 million beneficiaries.

Change In Administratorship. On the morning of July 4, employees gathered at Central Office quadrangle to witness a formal turnover of administratorship. Engr. Jose B. del Rosario, Jr. took over stewardship of the agency from Atty. Federico N. Alday, Jr. who voluntarily stepped down. Atty. Alday who served as administrator of NIA from May 1986 to June 1989 resigned to go back to private law practice.

Del Rosario's appointment as new NIA administrator brought him back to active government service and to the agency he had served for over 20 years. In fact, he was with NIA from 1964 until his retirement in May 1986 after serving for three years as assistant administrator for Project Development and Implementation. Considered as one of the NIA's leading planning experts, he joined the Asian Development Bank as irrigation consultant shortly after his retirement. He later served as consultant/contract specialist for USAID projects under the



Administrator Jose B. del Rosario, Jr. receives NIA's symbolic flag from outgoing Admr. Federico N. Alday, Jr. during the turn-over ceremonies.

Economic Support Fund until his appointment by President Aquino as head of NIA.

Moves For Free Irrigation Service. During a congressional subcommittee deliberation in late November on House Bill No. 26572, NIA officials justified the collection of irrigation service fees in order to sustain the efficient operation and upkeep of irrigation facilities and to effect immediate repair of damaged structures after destructive floods and other calamities.

The bill which proposes a Magna Carta of Small Farmers and Small Fishermen makes it mandatory that "every farmer shall have free access to irrigation facilities". That "towards this end, NIA shall undertake the development and institutionalization of second crop irrigation facilities in support of multicrop farming". After considering NIA's situation, however, the House Subcommittee on Agricultural Support Services which was in charge of polishing the bill changed the provision to read instead: "that small farmers be encouraged to join or form irrigators' associations to maximize the availment of the incentives given by NIA which turn over parts of or entire national irrigation systems to irrigators' associations".

Earlier in the year, the agency also presented to the House of Representatives a position paper opposing House Bill No. 6289. This resulted in the filing of House Bill No.

23372, a compromise bill that provides for an annual government subsidy to the agency in the operation and maintenance of systems.

At the end of 1989, House Bill Nos. 26572 and 23372 were still in the House of Representatives pending further deliberations.

Physical Accomplishments In 1989. Throughout the year, NIA made determined efforts to pursue its project implementation program and sought to improve its financial position through sound management and fiscal measures. At the end of the year, it was able to generate a total of 25,373 hectares of new areas and rehabilitate or improve about 20,283 hectares in existing irrigation systems. In the Pantabangan and Magat watersheds, 34,044 hectares were developed under the Watershed Management and Erosion Control Project (WMECP).

Despite some constraints that included delays in fund releases, shortage of cement and peace and order problems in some project sites, substantial progress was attained in the implementation of projects. Before the end of the year, two more national irrigation projects and a watershed management scheme were completed. These were: Agusan II Irrigation Project (6,200 hectares) in Agusan del Norte and Sur, Bukidnon Irrigation Project (8,457 hectares) in Bukidnon and the Watershed Management and Erosion Control Project (34,044 hectares) in Nueva Ecija and Isabela. In addition, 318 communal irrigation projects covering a total of 20,263 hectares were completed.

As of December 31, 1989, the status of irrigation development in the Philippines stands at 1,538,144 hectares or 49 percent of the country's total irrigable area of 3,169,594 hectares. This shows that a total of about 1,631,450 hectares was still without irrigation at the end of the year.

For 1990, the agency's target is to generate 40,177 hectares of new areas and rehabilitate or improve 349,443 hectares covered by existing systems. These will require an estimated total funding requirement of P3.48 billion made up of P779.30 million from equity, P2.13 billion from proceeds of loan availments from foreign sources, P65.00 million from NIA corporate earnings and P503.68 million from regular government subsidy for communal projects.

Under the CARP-IC alone the agency is committed to generate 6,540 hectares of new areas and rehabilitate 10,920 hectares in existing systems. This undertaking which shall require an additional cost of P555 million will

further bolster the agency's role in rural development and in the national effort to alleviate poverty, especially in the less developed regions of the country.

Fountainhead of Life

An article entitled "Water is Life" in *Philippines Today*, May 1977 issue, stresses the importance of water to human beings, thus:

"Not only does the human individual start life's journey in the embryonic sac of fluid but the body cannot survive without water more than a few days. Alluding to the bloodfilled mammalian body consisting of nine-tenths of water, a biologist has whimsically pictured human beings as "walking bags of water". These "bags" must be replenished with intakes of water throughout our lives to maintain the body's fluid balance. Two of man's most important life-sustaining activities - agriculture and industry - are dependent on water".

In the middle of the 1970s, it was estimated that the earth held a total of 1,400 million cubic kilometers of water, of which less than three percent was freshwater. Of this volume of freshwater, 77 percent was stored in icecaps and glaciers while 22 percent was in the form of groundwater and soil moisture. Two-thirds of the world's groundwater, however, was located deeper than 2,000 feet below the surface. Only one percent of freshwater on earth, therefore, was available for human use at the time.

The Philippines is blessed with abundant water resources that have given it one of the most fertile lands on earth. The country has 421 principal rivers ranging in area from 40 to 25,469 square kilometers, 59 natural lakes and innumerable streams and creeks. In addition, there are four large groundwater reservoirs which, together with several smaller ones, cover an estimated aggregate of 50,000 square kilometers. Furthermore, the country has a relatively long rainy season, during which runoff in rivers and streams is replenished. Taken as a whole, these water resources make the Philippines water-rich. NWRC which was renamed recently as National Water Resources Board (NWRB) projects that it will be able to meet increasing water resources demands up to year 2000.

Like fossilized fuel, however, water is not inexhaustible — and unless the government takes immediate and decisive action in halting forest degradation, our water re-



Parched land illustrates the seriousness of threat posed by drought to agriculture.

sources will be depleted in a few decades. At the same time, corollary measures should be taken to prevent the further pollution of these resources. These twin problems must be dealt with not next month or next year but now. Otherwise, all the gains in irrigation development through the last two decades will have been in vain.

The scenario of increasing demand for water and dwindling supply of this precious resource, coupled with the growing rate of pollution, conjures a specter of desolation and hunger that would haunt our future generations.

No less than our survival is at stake in this vital struggle, for water is the fountainhead of life.

ANNEX 1

THE MAKING OF IRRIGATION PROJECTS

THERE ARE two ways to obtain water for irrigation: gravity and pump. Gravity irrigation is based on a principle in physics which says that water seeks its own level. Its source, therefore, is invariably located at a level higher than the fields to be irrigated. The main sources of this type of irrigation system are rivers, streams and creeks. In some cases, standing water in elevated areas is tapped for gravity irrigation with the use of a tunnel. Pump irrigation, on the other hand, uses suction to draw water from a source lower than the fields to be irrigated.

In both gravity and pump irrigation, a canal system distributes the water to the farms, and the larger the area to be irrigated, the more extensive the canal systems. Ordinarily, the process of water distribution is by gravity. In some big systems serving elevated portions, however, pumps are used to transfer water to a canal located at a higher elevation. A canal system consists of one or more main canals, branches or laterals and small canals or farmditches that deliver the water to individual farms.

A system of regulating devices ensures that each canal of a gravity irrigation system receives the proper volume of water. The main regulating structures of an irrigation system receives the proper volume of water. The main regulating structures of an irrigation system consisting of dam sluices, spillways and regulators are manipulated to keep the height of the water at a desired level when there is an oversupply of water or during heavy rains. Regulators also control the water supply of laterals and farmditches. Such an irrigation system depends on the water supply of the river source at a given time and is called "run-of-the-river" irrigation system.

In areas where the demand for water exceeds the minimum river discharge, it is necessary to store water at the time it is abundant for utilization during periods of low water level at the river source. This is done by building a high dam across the river, thus creating a storage reservoir. Sluices and spillways likewise control the water level of the reservoir.

Irrigation water contains mineral solutions that tend to accumulate in the soil. Some of these mineral solutions, such as sodium chloride (common salt) and bicarbonate are harmful to crops and must be eliminated. The process of eliminating mineral solutions from the soil is called

"drainage". Irrigated farms are usually drained of water by ditches or tile drains that discharge into collecting structures located below irrigation canals.

In some countries with highly-developed agriculture, irrigation technology is quite advanced. Many irrigation systems in Taiwan, for instance, use pipes with measuring devices to optimize water use. And in barren lands, the scarcity of water for irrigation has pushed human ingenuity to higher levels. The Israelis are an outstanding example. They have not only converted sea water into freshwater through the expensive, highly sophisticated process of desalination but have also developed a system of computerized irrigation consisting of a network of underground pipes that automatically discharge water in the right amounts at the right time.

The Philippines has adopted the standard modern irrigation technology and practices due to its relatively rich water resources. Before the last decade, irrigation systems in the country were simple run-of-the-river or pump systems designed for only one purpose — irrigation. As a result of the pressing need to irrigate more lands and to raise production yields, NIA started UPRP in 1969, the first of several undertakings with multiple purposes.

Project Cycle

The various types of irrigation projects vary in gestation period, scope, type of structures, funding and mode of operation and maintenance, known as "project cycle".

A project cycle has four phases: (1) project identification, investigation, evaluation and selection; (2) pre-construction; (3) construction; and (4) operation and maintenance. The number of activities — time span, requirements and procedures of each phase — however, differ depending on the type and magnitude of the project.

For a good idea of the entire process, let us trace the project cycle of a communal irrigation project (CIP), which has common major and minor structures with bigger national irrigation projects.

Phase One. This initial phase covers several activities over a three-year period. During the first year, the following activities are undertaken: identification, investigation and gathering of climatic data. Climatic data consist of information on the agro-economic conditions of the area, measurements of the discharge at the water source and rainfall, soil survey, percolation and evaporation. Second year activities include topographic survey, preparation of data report and hiring and training of a profile writer. The last year covers project profile preparation,

reproduction of materials, project selection and submission of a firm-up list of the project.

Phase Two. This involves pre-construction activities and covers one year. Initial activities are detailed survey, paddy mapping, regional and provincial orientation and integration of the irrigation community organizer (ICO) with the project community and irrigator's association (IA). Plans and estimates are then prepared, after which the project scheme is presented to IA. Simultaneously, the farmers are mobilized, planning sessions are held and working committees formed. Subsequent activities consist of preparation of the necessary documents (including application for water permit) and recruitment of farmer-members. The last activity in the preconstruction phase is the completion of legal requirements and approval of the program of work.

Phase Three. Construction starts with a "first pre-construction" conference and right-of-way negotiations. A crucial aspect of the initial part of this is the inventory of manpower and material resources which includes canvassing, bidding and procurement of construction materials with the participation of the association, farmers' counterpart and individual presentation and finalization of the construction schedule. After the memorandum of agreement between NIA and IA had been signed, funds for construction activities are released, and a one-week orientation of NIA-skilled workers is undertaken. From the start of Phase One up to this point, there is regular monitoring of activities, evaluation, regular meetings, dialogues and reflection sessions. With the completion of preparatory activities, construction materials are procured and manpower and equipment are deployed in the project area. Actual construction starts after construction materials have been delivered per terms and conditions of the memorandum of agreement, which should especially include the important monthly cost reconciliation. Following the completion of the project, physical and financial accomplishments are reconciled; the amortization scheme is approved; then the project is ready for turnover to IA for operation and maintenance. The basic procedures in project commissioning are pre-completion inventory, final project inventory, post-project inventory, follow-up project evaluation and project turnover.

Phase Four. This is the final phase, which is operation and maintenance. National irrigation projects are bigger undertakings and have longer project cycle than communal projects. Before the Corplan was implemented in 1981, institutional activities were not included in the

first three phases of their project cycle. Even in the operation and maintenance phase, the organization of farmer irrigators' groups (FIGs) was slow and, where they were organized, they were generally ineffective or inactive in most regions owing to budgetary and manpower constraints that precluded sustained follow-up by the agency's institutional workers. Now, however, institutional activities are an integral part of the cycle of national projects.

In foreign-financed undertakings especially multi-purpose types, the project cycle is very much longer for several reasons: (1) they involve negotiations with foreign lending institutions and complicated financial and legal arrangements; (2) feasibility studies and project review are more detailed and comprehensive; (3) some construction components and materials, mostly heavy equipment and service vehicles, together with other requirements have to be obtained.

Irrigation systems can be efficient only if their structures and facilities are well-maintained. A structure is a designed device used in an irrigation system to retain, regulate or control the flow of water. Many structures have four major parts—earth embankment, inlet, conduit and outlet. Irrigation-users should actively participate in the proper protection, care and maintenance of irrigation system. They should be familiar with the irrigation system serving them and know how each structure functions to deliver the water to meet their irrigation needs.

The major structures and appurtenances in national and communal systems are: diversion dam, intake, sluiceway, headworks and main and lateral canals. Structures are also constructed at different sections of the main canal and laterals to convey water, regulate its flow, protect other structures and facilities and measure the volume of water that enters the different parts of the canals.

Diversion Dam. This is a structure built across a river or stream for diverting the streamflow into a canal. It has a headgate for regulating the entry of water into the intake. Permanent dams are usually made of concrete while temporary dams generally consist of boulders, stones and brush. During floods, the headgate is closed to prevent overlapping of canals and entry of debris which clogs structures or cause siltation of the conveyance network. The sluiceway is also opened to prevent the accumulation of debris in front of the headgate. The headgate is cleaned and oiled periodically to make sure that it is always operable.

Intake Structure. An intake is a concrete structure usually built along the bank of a river or stream, which

draws water to be channeled into the irrigation system.

Control and Regulating Structures. These structures are built in certain sections of an irrigation system's canal network to control or regulate the flow of water into or out of the farms. These include checks, lateral headgates, turnouts, paddy drains and drainage culverts.

For efficient maintenance, these structures are regularly cleared of silt, debris and other waste materials. The gates are also cleaned and oiled periodically, and timely repair on any damaged structure is undertaken to ensure uninterrupted service.

Conveyance Structures. These structures are used to efficiently convey irrigation water from the source to the farmditches which directly serve individual farms. These structures include siphons and flumes.

1. Conveyance Structures
 - a. Siphon - To convey canal water under natural channels
 - b. Road Crossing - To carry water under roadways
 - c. Flumes - To conduct water along a steep hillside or to convey canal water over other waterways
 - d. Drop or Chute - To convey the canal water down a hillside
2. Regulating Structures
 - Canal Headwork Structures - Adjacent to a diversion dam on a stream or river
3. Water Measurement Structures
 - a. Parshall Flume and weir - To measure flows where the required head is available
 - b. Weirs
 - c. Weir Boxes
 - d. Open Flow Meters
 - e. Constant head Orifice
4. Protective Structures
 - a. Cross Drainage - Used to direct storm runoff flows under the canal through the culvert by drain inlet
 - b. Tunnels - Used where it is more economical to convey water through a ridge or hill
 - c. Turnouts - Used to divert water from a supply channel to a smaller channel

- d. Bridge - For roadway traffic over a canal, generally used for canals of much greater capacity than 100 ft/3 sec.
- e. Constant Head Orifice - regulate and measure the flow of water
- f. Thresher Crossing - as bridge to cross the canal
- g. Division Structure - used to divide the flow from a supply pipe or channel among two or more channels or pipes
- h. Check Structure - used to raise the canal water surface when the canal is flowing at partial capacity.

Major Irrigation Structures and Appurtenances

1. Pump
 - a. Intake Structure
 - b. Pump Sump
 - c. Pumping House
 - d. Pipe Line
 - e. Canals and Laterals
2. Communal Diversion Dam
3. National
 - a. Diversion Dam
 - b. Sluiceway
 - c. Headworks
 - d. Main canal and laterals
 - e. Intake Structure
4. Multipurpose
 - a. Earthfill Dam
 - b. Diversion Tunnel
 - c. Spillway Outlet Works
 - d. Hydroelectric Plant
 - e. Turbine Intake
 - f. Afterbay Diversion Dam

ANNEX 2

FOREST DEGRADATION AND WATER POLLUTION

IRRIGATION SYSTEMS will be useful if they deliver to the farms the right amount of water of acceptable quality during the various stages of plant growth. This can only be possible if the water supply from sources is adequate.

River and groundwater sources derive virtually all their water supply from watersheds. Webster's dictionary defines watershed as "a region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water" or "the catchment area or drainage basin from which the waters of a stream or stream system are drawn". Watersheds are thickly forested areas. The roots of trees and numerous forms of vegetation in a watershed give the surrounding soil a spongy texture, enabling it to absorb, retain and discharge water. The rate of water discharge and the rise and fall of the water level of a river, as well as water purity, depend on the condition of the forest and vegetative cover of the river's watershed. The reduction of this cover reduces the sponginess of the soil and its ability to absorb, retain and discharge water. Since forests are the bases of our ecological system, watersheds are vital to animal and plant life—so vital, in fact, that the term "watershed" is used as a metaphor to describe a critical or significant event, or a turning point in history and human life.

New Imperative

Watershed management in the Philippines has now become a new imperative as a result of the rapid degradation of its watersheds caused by uncontrolled logging, construction of substandard logging roads, slash-and-burn (*kaingin*) farming in logged over areas, poorly managed pastures resulting in overgrazing, indiscriminate cutting of trees for fuel and forest fires. These malpractices and forest fires accelerate soil erosion and conversion of once-forested lands to grasslands which repress the regeneration of trees and aggravate fire hazards. The ultimate effects are reduction of rate of water discharge from watersheds, a major change in climate, pollution of the atmosphere due to increase in its carbon dioxide content and corresponding decrease in its oxygen component, loss of

pearance of wildlife. Of the more than 12 million hectares of forest lands in the country, approximately one-half has been denuded, 1.4 million of which are located in watersheds.

Most diversion types of irrigation systems are constructed in areas with two distinct seasons — dry and wet — so the irrigated area is very much reduced during the former season due to the absence of rain. Good watershed management thus achieves two objectives: enhancement of the water storage capability of watersheds and increased cropping intensity through the availability of more water during the dry season.

Until the completion of the Pantabangan project in 1975, irrigation systems in the Philippines were simple diversion types, heavily dependent on the streamflow of river sources. For this reason, their capacities were subject to seasonal variations. Most of these systems are located at the lower stretches of rivers, and not much importance was placed on the conservation and development of their watersheds. With the completion of the Pantabangan Dam, NIA began including watershed rehabilitation and conservation as a component of big irrigation projects.

In 1976, NIA conducted a study of the Pantabangan and Magat watersheds where the two biggest dams in the country are now located. The study sought to formulate a watershed management and erosion control project for both areas. The World Bank approved in August 1980 a \$38-million loan for the Philippine government to partly finance NIA's Watershed Management and Erosion Control Project (WMECP). This project is the first World Bank-assisted undertaking addressed to the watershed management problems of the country.

WMECP is basically a reforestation undertaking to rehabilitate the watersheds of the Pantabangan and Magat dams. It also aims to establish plantations of agro-forestry and timber crops, generate employment opportunities for the residents, reduce erosion to a tolerable limit through vegetative protection and awaken the concern of the people in protecting, conserving and rehabilitating forest resources. Designed to be self-sustaining after the initial years, the project involves planting of trees, harvesting, processing and marketing of forest products from the plantations. It is envisioned that the project would be able to sustain its growth and maintain its profitability through the revenues to be generated.

Specifically, WMECP has already undertaken most of the following activities in the rehabilitation of the Panta-

angan and Magat watersheds:

- Reforestation of about 24,522 hectares in Pantabangan and 7,550 hectares in the pilot program area in Magat;
- Construction and operation of forest nurseries;
- Construction and maintenance of some 391 kilometers of forest roads in Pantabangan and 123 kilometers of similar roads in Magat;
- Construction and operation of charcoal ovens;
- Construction of other project facilities such as field storage sheds, plantation bunkhouses, lookout towers and guardhouses;
- Procurement of equipment and vehicles for forest protection and fire prevention;
- Hiring of consulting services to assist project management in the establishment of monitoring systems on project activities and costs, marketing and research plans, revenue and profit-sharing procedures and solution of technical and soil problems relevant to the success of the reforestation effort.

The 32,504 hectares of open lands in Pantabangan and Magat watersheds will be planted with a mix of forest and agro-forest species to provide financial returns from products such as leafmeal, charcoal, fruits and nuts and long-term returns from timber.

Through nursery operations, plantation establishment and development, forest protection, fire prevention and other activities, the project has employed several thousand workers in the Pantabangan and Magat plantation sites, respectively. Additional labor will be required as harvesting and processing activities, production of leafmeal, charcoal, mango and cashew pick up and as project plantation expands. At full development, the project will produce an annual average of about 3,090 tons of leafmeal, 15,751 tons of charcoal, 21,300 tons of mango fruits, 9,822 tons of cashew nuts, 27,000 tons of short-fiber pulpwood and about 24,000 tons of long-fiber pulpwood. In addition, the project will produce some 20,000 cubic meters of timber annually from yemane and pine and after 40 years the hardwood species of narra and mahogany will yield some two million cubic meters of timber. Leafmeal, charcoal and fruits will be produced within the first six years of the project, while other products will be produced in later stages on a long term but sustained basis starting the 10th-12th year.

Furthermore, the project has provided income and profit-sharing for the residents within the watershed areas

in the form of community facilities such as domestic water supply, school buildings, barangay halls, playgrounds and road improvements.

It is hoped that the pioneering watershed management project in Pantabangan and Magat would pave the way for a national effort to reverse the degradation of watersheds as well as other forest areas in the country. What is paradoxical about the present forest condition in the Philippines is that while other countries — notably Israel — are spending fortunes to make deserts bloom, deserts in our country are practically created out of its lush forests.

Most Precious Resource

As important to irrigation systems as adequate water supply is the acceptable level of water quality. Irrigation water, no matter how plentiful, would be harmful instead of beneficial to crops if it is polluted, especially by chemical poisons. Today, unfortunately, at least seven river sources of irrigation systems are polluted as a result of mining and manufacturing operations.

On September 18-25, 1972, the United Nations' ECAFE, now ESCAP, held a regional conference on water resources development in Manila. Among the papers read during the occasion was one titled Water Pollution in the Philippines and the Administrative and Technical Measures for its Abatement and Control submitted by the Philippine National Water and Air Pollution Control Commission (NWAPCC). According to the paper, there were some 15 active mines which produced about 126,000 tons of tailings daily discharged into nearby rivers. The main pollutants, the report said, were silt and chemicals like cyanide, acids, alkalis and salts used in the extraction of ores. The report went on that seven river systems were polluted by tailings at the time.

The paper particularly cited the situation at the Agno River System:

The Agno River System drains the southern slopes of Mt. Data which is approximately 70 kilometers northeast of Baguio City. It flows in a generally southerly direction for a distance of approximately 110 kilometers towards San Miguel, Pangasinan, and then follows a complete semi-circular route to the west for about 154 kilometers before it empties into the Lingayen Gulf drainage area down and south of the canyon...is approximately 1,238 kilometers.

At the upstream are located four active mines. The total tailings produced by these four mines run to about 24,000 tons daily (in 1971).

About 110 kilometers downstream of the mines, the intake of the Agno River Irrigation System is located. This system irrigates about 16,000 hectares. The potential area that can be irrigated is estimated to be 25,000 hectares. This system is served by a network of canals measuring about 234 kilometers.

In describing the effect of mine tailings on the irrigation systems, the Bureau of Mines stated in a report that in the areas covered, silt and fine sand were observed deposited along canals and rice paddies. The thickness varied inversely to the distance from the source. The paper details the degree of water pollution thus:

"From an analysis of mine tailings, the suspended solids content ranged from 32,422 ppm (parts per million) to 85,792 ppm, and the cyanide content ranged from less than 1 ppm to as high as 29.9 ppm. Downstream in the river after the junction of the Twin River (tributary) and the Agno River, the suspended solids and cyanide contents were found to be 3,440 ppm and 1.9 ppm, respectively. Downstream, at the intake the total suspended solids and cyanide contents were found to be 252-494 ppm and less than 1 ppm, respectively. In the distribution system, the figures vary from 63 to 294 ppm (suspended solids) and less than 1 ppm (cyanide)".

This technical description of the degree and extent of water pollution at the Agno River Irrigation System may bewilder the layman, but he will get a good but shocking idea of the problem from the fact that, *as early as 1967, or 21 years ago*, it was estimated that *71 percent* of the total sediments reaching the system during the dry season came from mine tailings.

Bad as the problem already is, water pollution is not confined to the service areas of the Agno and other affected irrigation systems. In her much-awarded bestseller **Silent Spring**, written in the early 1960s, Rachel Carson paints a vivid picture of the water pollution problem, thus:

"Of all our natural resources, water has become the most precious. By far, the greater part of the earth's surface is covered by its enveloping seas, yet in the midst of this plenty, we are in want. By a strange paradox, most of the earth's abundant water is not usable for agriculture, industry or human consumption because of its heavy load of sea salts and so most of the world's population is either experiencing or is

threatened with critical shortages. In an age when man has forgotten his origins and is blind even to his most essential needs for survival, water with other resources has become the victim of his indifference".

She then summarizes the danger of water pollution, to wit:

"In the entire water-pollution problem, there is probably none more disturbing than the threat of widespread contamination of groundwater. It is not possible to add pesticides to water anywhere without threatening the purity of water *everywhere*. Seldom if it ever does. Nature operates in closed and separate compartments: she had not done so in distributing the earth's water supply. Rain, falling on the land, settles down through pores and cracks in soil and rock, penetrating deeper and deeper until eventually it reaches a zone where all the pores of the rock are filled with water, a dark, sub-surface sea, rising under hills, sinking beneath valleys. This groundwater is always on the move, sometimes at a pace so slow that it travels no more than 50 feet a year, sometimes rapidly, by comparison, so that it moves nearly a tenth of a mile a day. It travels by unseen waterways until here and there it comes to the surface as a spring, or perhaps it is tapped to feed a well. But mostly it contributes to streams and so to rivers. Except for what enters streams directly as rain or surface runoff, all running water on the earth's surface was at one time groundwater. And so, in a very real and frightening sense, *pollution of groundwater is pollution of water everywhere*".

ANNEX 3

FARMERS' PARTICIPATION IN IRRIGATION DEVELOPMENT

A condensation of two papers written by Benjamin U. Bagadion entitled People's Participation: A Learning Process and Farmers' Participation in Irrigation Management-The Philippine Experience.

PD NO. 552 gave a new dimension to government assistance to communal irrigation systems. Under the decree, farmer-beneficiaries were now required to pay back the government the cost of construction or rehabilitation of their communal systems. The implication of this was obvious: unless a communal association consisting of a viable group is capable of managing the system, resolving conflicts and collecting fees from its members to amortize its cost, it would be impossible for NIA to implement the new policy.

Majority of communal associations at the time did not have the capability to operate and maintain their systems because they were weak. To solve this problem, NIA signed in 1975 a memorandum of agreement with the Farm Systems Development Corporation (FSDC) which stipulated that FSDC would undertake the organization of communal associations and other institutional activities while NIA would be responsible for the technical aspect, like engineering and construction.

FSDC was created under PD No. 681 dated April 4, 1974. The corporation's main objective was to accelerate rural development by promoting the organization of cooperatives and other rural-based associations and to extend assistance to these associations. PD No. 1592, dated June 11, 1978, expanded FSDC's coverage to include farming, irrigation, fishing, resource management, marketing, drainage, rural waterworks and land reclamation for agricultural production. FSDC set up the Barangay Integrated Service Association (BISA) as the major instrument to attain its objectives.

It was expected that the agreement with FSDC would fulfill NIA's need for the formation of strong and viable farmers' associations in communal systems. However, coordination problems soon cropped up — a natural consequence in a situation wherein two independent agencies with different functions undertake a common task for the first time. Where there was conflict in the utilization of

time, manpower, funds and other resources, it was inevitable that each agency would give priority to its own activities.

Faced with time-consuming coordination problems and uncertainty about the effectiveness of the arrangements with FSDC, NIA top management decided to start a program integrating both its technical and institutional aspects. Furthermore, it was felt by some that institutional development was of such strategic importance to NIA that it was unwise for the agency to depend on another entity to undertake this activity on a long-term basis.

For this purpose, NIA set up in 1976 two pilot projects — or more accurately learning laboratories — in Laur, Nueva Ecija, with support from Ford Foundation. One was planned to serve some 600 hectares and the other, 1,600 hectares. In this integrated approach, the capability of the irrigators' associations would be developed by actively involving them in planning and construction activities like participation in surveys, obtaining rights-of-way, acquisition of water permit and construction of physical facilities.

“Bottom-Up” Approach

Needless to say, putting into action the new concept of people's participation, especially in construction activities, was no easy task. Experts in rural organizations have time and again stressed that “citizen participation does not mean the illusion of participation, the semblance of involvement, the opportunity to speak without being heard, the receipt of token benefits, or the enjoyment of stop-gap measures. Participation means participation in every dimension of life”.

The “top-down” strategy in which development was perceived as being done for the people, not by them or even with them, was replaced with the “bottom-up” approach. In such approach, the farmer-members themselves became deeply involved in both institutional and technical activities.

Community Integration

The over-all success of the participative process in a communal irrigation project depends a great deal on the close cooperation among the irrigation community organ-

izer (ICO), the technical staff and the farmer's association. But first and foremost, a strong, active association must be organized and maintained. To be able to do this, the ICO must be integrated with the community. This means that the ICO should live in the community and take part in the social life of the people in the area. This kind of integration is hardly possible if he lives outside the community.

More specifically, the ICO experiences for himself the needs, desires and problems of the farmers, technically and institutionally. He assesses the mobilizable force of the community for possible utilization in some aspects of the project. He makes his assessment in several ways, like house-to-house visits, joining planting and harvesting activities and attending church functions and social gatherings. In the process, the ICO gets initial acceptance as a working partner in the community. However, integration is a long process that becomes complete only after the ICO has worked continuously with the farmers over a period of time.

Improving the Process

NIA's experiment in Laur to develop processes for maximizing farmers' participation and learn about its effects attracted the interest of a number of institutions associated with NIA in other activities. These were the Institute of Philippine Culture (IPC) of Ateneo University in Diliman, Quezon City, Asian Institute of Management (AIM) and IRRI.

IPC had been conducting social research on indigenous Philippine irrigation system for NIA and had a continuing interest in improving irrigation associations. AIM was at the time developing a course on the management of rural development and saw the importance of farmers' participation. For a number of years, IRRI had been working with NIA on irrigation research and was deeply interested in developing irrigation associations for better water management.

In 1979, the NIA administrator formed the Communal Irrigation Committee (CIC) to assist NIA in the improvement of the communal irrigation program based on the farmers' participation approach. CIC was initially composed of NIA, Ford Foundation, IPC, AIM and IRRI. Later, four institutions were invited as additional members. These were FSDC, UP Los Baños, Economic Development Foundation (EDF) and Central Luzon State University

(CLSU). CIC was able to draw from its members expertise in engineering, agriculture, sociology, economics, anthropology, institutional management and training.

While the Laur pilot projects attained the general objective of learning about the participation process, NIA noted that the process still had some weaknesses that need to be strengthened. To improve the process, NIA established in April 1979 two additional pilot projects in Camarines Sur: the Taisan and Aslong Communal Irrigation Systems. In these two new learning laboratories, NIA lay down the firm policy of "No strong organization, no construction". The "bottom-up" approach was likewise utilized there.

Officers of both the Taisan and Aslong associations at first encountered difficulties over some procedures and legalities. This was where the ICO's vital role came in. The ICO guided the association on basic requirements like obtaining a water permit, registration with the Securities and Exchange Commission (SEC), obtaining rights-of-way, conducting banking transactions for the association and preparing for construction.

However, even in these preliminary activities, the ICO needed the assistance and cooperation of the technical staff. There had to be a system of close coordination between them. To give concrete examples of the need for this kind of cooperation, the following problems and situations were reported:

"In Taisan, the owner of a private dam refused to give right of way. How is this problem likely to be solved? In Aslong, some farmers don't want to join the association since they say it will only mean they'll have to pay for the construction costs. Also in Taisan, there are five small dams above the proposed damsite. Is there going to be any future conflict with the private dam owners?"

Farmer Consultation

There are many constraints that go against the concept of people's participation, like uncertainties of fund releases and delivery of materials or difficulties in managing free labor which keeps shifting every so often. In Camarines Sur, there have been a few incidents the lessons from which may be useful for future reference. Foremost among these is the importance of consultation on certain decisions. In Taisan, for example, farmers waited for hours for the surveyor to discuss the proposed location of a structure. However, he failed to show up because he had changed his schedule without informing

the association. This might seem trivial, but to farmers who had to walk long distances to keep an appointment, it was an irritating experience.

Coordination and Monitoring

In the Camarines Sur pilot systems, regular coordination meetings were held between the ICO and the technical staff to discuss problem areas, plans and schedules so that they could apprise each other of what is going on. Through these meetings, they were able to develop the kind of coordination to carry out the program effectively. ICO-technical staff coordination is likewise necessary to anticipate difficulties in implementing the project, to assess accomplishments and to maximize each other's efforts for the smooth and continuous flow of the process. After the initial organization activities and other preliminary procedures, the role of the technical staff becomes all the more important. From the preparation of the layout of the system to monitoring the use of equipment, from surveys to canvassing of construction materials, the ICO needs the guidance and cooperation of the technical staff.

In all these technical activities, the "bottom-up" participative approach is fully utilized. Farmer-members contribute labor daily, such as hauling gravel, sand, boulders and other construction materials and excavating portions of the main canal and laterals. They also undertake activities that serve to protect the interests of the association as well as reduce construction expenses. The farmers conduct a canvass of construction materials independent of the canvass made by NIA. Whenever the price of the materials canvassed by the farmers appears more reasonable, the award is given to the supplier who quotes that price. Also, the association president first notes purchase orders before actual purchases can be made by the NIA. They also check the quantity and quality of materials delivered. If there are materials found to be inferior or below specifications, these are returned to the supplier or NIA for replacement with materials of the right specifications.

Another activity the farmer-members undertake is monitoring the use of oil and heavy equipment at the project site. Before the start of each working day, the association president checks the fuel gauge of the bulldozer. At the end of the day, he again checks the gauge to determine how much fuel had been used based on con-

Through these activities and the direct involvement of the farmers in all aspects of the project, the association is generally aware of the status of the project at any given time. The status of the project is summarized periodically during planning and reflection sessions. These sessions, which are attended by the ICO as an observer, are an extremely important part of the association's activities throughout its existence — particularly as it keeps track of labor counterpart, payment of fees, expenses, water distribution rules and other decisions made by the association.

The Camarines Sur experience has shown that the design of the system is best drawn up after several meetings and consultations between the technical staff and the farmers. Such is made possible through frequent field inspections which allow the farmers to maximize their inputs in the design of the system. A compromise is usually agreed upon by the technical staff and the association before the final design is drafted.

A pre-construction conference and contract signing are the final arrangements preparatory to construction. A temporary loan agreement is signed by representatives of NIA and the association to signify the commitment of each party to the project. For this purpose, a simple ceremony is usually held to manifest this commitment.

Program Expansion

Experience has shown that most often the difficulty in involving farmers in development projects is due not so much to the so-called "backwardness" of these people as to the difficulty of government machineries to introduce radical changes in their procedures to make people's participation possible.

The NIA-Ford Foundation learning laboratories in Taisan and Aslong, however, have achieved a breakthrough in the participatory approach program in communal irrigation projects. As a result of this initial breakthrough, NIA decided to expand the program to improve the process further. In 1980, a pilot project was set up in each of the twelve regions in the country as a learning laboratory through which regional staff capability for using the participatory approach would be developed.

To implement the expanded program, NIA hired 30 ICOs after a rigid screening process. The ICOs then went through a three-week training on the basics of irrigation and the new NIA organizing process. With IPC assistance, the project selection method used in Camarines Sur was

developed into a socio-technical profile writing process for communal irrigation projects. At the same time, NIA personnel were trained in data-gathering and in the writing of socio-technical profiles for candidate regional pilot projects. Using the lessons and experience in the pilot projects and with AIM assistance, engineers were given orientation on planning and construction policies and procedures that promote farmers' participation.

Workshops participated in by engineers and ICOs were held during which candidate project profiles were discussed and analyzed. Members of CIC and engineers and ICOs with experience in the Nueva Ecija and Camarines Sur projects served as resource persons and provided guidance to the workshop participants. The workshop outputs consisted of work schedule for each pilot project that integrated the engineering and institutional activities. The first group of ICOs in the program became the regional supervisors and trainers of the ICOs in the pilot projects. Additional socio-technical profile writers were trained in each region and a program was started for preparing the socio-technical profile of future projects.

Other staff members at various levels were also trained on how to properly support the program. The IRRI representative to CIC helped in improving training methodology and materials for irrigation system management and crop production. He also helped in training engineers in farm-level facilities design and paddy elevation mapping for improving water management.

The satisfactory results of the participatory approach in communal systems encouraged NIA to try the scheme in national systems. In December 1980, ICOs were fielded in the first national pilot system, the Buhi-Lalo Irrigation Project in Camarines Sur which would be improved and expanded from 1,000 hectares to 3,000 hectares. Later, the program was implemented gradually in portions of some national systems in different parts of the country. A number of small marginal systems were fully covered by the program.

As of the end of calendar year 1987, a total of 1,232 irrigators' associations had been organized in NIA's national and communal systems, an increase of 154 over the previous year's total of 1,078 associations. Out of the total 1,232 associations, 990 had been registered with the SEC. Among the organized IAs, 1,087 were in communal systems and were amortizing the direct cost of those systems. Of this number, 510 associations were organized in 1987 in communal irrigation projects under construction in 1987. At present, 219 associations are being organized in pre-construction projects.

The methods developed by NIA in its participatory approach program have been successfully employed with some modifications in Sri Lanka and Indonesia. Irrigation and rural development experts of other countries have shown interest in this innovative scheme and plan to adopt it in their respective countries.

ANNEX 4

FOREIGN ASSISTANCE AND COOPERATION

IN ITS 26 years of corporate existence, NIA has played a vital role in the country's socio-economic growth. The agency's accelerated irrigation development program, particularly, was the crucial factor that brought about self-sufficiency in rice for the first time in 1968 and the dramatic turnaround in the state of the country's rice economy in 1977 from perennial deficits to surpluses. In addition to providing support to food production, irrigation development has also made significant contributions to some of the major programs of the government.

These major and diverse achievements of the agency were made possible only because foreign governments, financial institutions and foundations as well as organizations under the United Nations assisted and cooperated with the Philippines in the formulation and implementation of some of its projects and activities through loans, technical services, commodity aid and training grants. Below are brief descriptions of the various foreign organizations, financial institutions and foundations that have assisted the Philippines in the implementation of its irrigation development program in the spirit of international cooperation.

Asian Development Bank

The Asian Development Bank (ADB) was conceived by the Economic and Social Commission for Asia and the Pacific (ESCAP), then known as the United Nations Economic Commission for Asia and the Far East (ECAFE), and was formally established in December 1966 with headquarters in Manila. It had an original membership of 15 countries, all in Asia and the Far East. In the course of time, the Bank admitted several countries outside the Asian region as members. Currently, ADB has 45 members — 31 from Asia and the Far East, including the South Pacific, and 14 from outside the region. ADB is an international development finance institution whose main purpose is to foster economic growth and cooperation in the Asian and Pacific regions and to contribute to the individual and collective economic growth of the developing member countries.

It undertakes two major activities to accomplish its purposes: financing and technical assistance. Its financ

ing activities consist of ordinary and special operations. The former are those financed from the ordinary capital resources of the Bank, while the latter are those funded from the Asian Development Fund (ADF). ADB extends technical assistance to upgrade the technical know-how and expertise of its less developed and smaller member countries. This type of assistance covers four broad categories, namely; project preparation, project implementation, advisory services and technical services for regional activities.

World Bank Group

The World Bank Group extends financial and technical assistance for the development of poor countries. The present strategy of the Group places greater emphasis on investments that can directly affect the well-being of poor people in developing countries by making them more productive and by integrating them as active partners in the development process.

1. International Bank for Reconstruction and Development

The International Bank for Reconstruction and Development (IBRD), or World Bank as it is more popularly known, was founded at a UN Monetary and Financial Conference of 44 governments in New Hampshire, USA in 1944 and started operations the following year. The Bank was set up for the purpose of helping "raise standards of living in developing countries by channeling financial resources from developed to developing countries". Loans by the Bank are therefore directed towards developing countries at more advanced stages of economic and social growth. Its charter specifies certain basic rules to a government with economic considerations as bases for the decision to lend. Also, a loan must be for a productive purpose and must stimulate economic growth in the recipient developing country. The Bank is owned and controlled by its member governments, which now number 142, with the USA as the biggest contributor.

2. International Development Association

The International Development Association (IDA) was established in 1960 on the initiative of the United States and endorsed by other members of the World Bank and the UN General Assembly. It is meant to help meet the need to lend to poor countries on much easier terms than the World Bank could give, which had become apparent in the 1950's. Membership in the

IDA is open to all members of the World Bank. The clientele of the Association is concentrated in countries too poor to borrow from the World Bank. Loans are extended to governments only and on terms that would bear less heavily on their balance of payments than World Bank loans.

3. **International Finance Corporation.** The second affiliate of the World Bank, the International Finance Corporation (IFC) was established in 1956 to assist in the economic development of less developed countries by promoting growth in the private sector. In addition to providing and helping raise loan and equity capital, the IFC works to strengthen the confidence of investors and promote investment opportunities in the developing world. Membership in the World Bank is a prerequisite to membership in the IFC which now has 122 members.

International Fund for Agricultural Development

The International Fund for Agricultural Development (IFAD) is a UN specialized agency which came into existence in 1977. Its objective is to mobilize additional resources to be made available on concessional terms for financing projects specifically designed to improve food production systems, the nutritional level of the poorest populations in developing countries and the conditions of their lives. Membership is open to any state-member of specialized agencies of the UN. The Fund's resources come from contributions of members, special contributions from non-member states and other sources and funds derived from operations. Loans are made on such terms as the Fund deems appropriate only to developing states that are members of IFAD or of inter-governmental organizations in which such organizations participate. The Fund extends technical assistance grants for project preparation and agricultural research. There are now 139 members, of which 107 are developing countries.

United States Agency for International Aid

The United States Agency for International Aid (USAID) has been providing various types of economic assistance to the Philippines since the end of World War II through dollar grants, loan and "Food for Peace" commodities. Its

projects in the 1960's were concentrated on the expansion of physical facilities in the rural areas and the strengthening of local government institutions to improve the management of development activities. In later years, the USAID gave emphasis on rural development, population, nutrition and agriculture.

The priorities of USAID are policy reform, institution-building, promotion of small and medium-scale private enterprises and technology transfer. The agency supports three complementary types of programs: development assistance concerned with increasing the income and well-being of the rural poor, Economic Support Fund as economic assistance to the Philippines in line with the Military Bases Agreement and "Food for Peace Program" which provides supplemental food assistance.

International Rice Research Institute

The International Rice Research Institute (IRRI) was set up in 1960 in Manila by the Rockefeller and Ford Foundations. It was the realization of a plan conceived in the immediate postwar years to conduct research necessary to develop improved agricultural technology in developing countries themselves instead of transferring existing technologies on rice to poor nations. In 1961, the IRRI transferred to a 40-hectare tract of land in Los Baños, Laguna where it set up its permanent office, research facilities and experimental farms. However, it maintained an extension office in Manila.

The research institute concentrated on the development of rice varieties that are short, stiff-strawed, fertilizer-responsive, early maturing and resistant to, or at least tolerant of, attack of all major insects and diseases. On November 28, 1966, the IRRI publicly announced the development of its first high-yielding rice variety, IR-8. This new variety and the other strains it subsequently developed were initially distributed in the Philippines and in selected countries in Asia. The seed distribution program later included other rice-producing countries. The adoption of these varieties over wide areas of ricelands as a result of accelerated irrigation development starting 1966 made possible the attainment in 1968 of self-sufficiency in rice in the Philippines. As a consequence of the widespread use of high-yielding rice varieties developed by IRRI, a "Green Revolution" swept through Asia.

Food and Agriculture Organization

In 1943 the UN Conference on Food and Agriculture held in Hot Springs, Virginia, USA recommended the creation of a Food and Agriculture Organization (FAO). It was formally established in October 1945 during a meeting in Quebec, Canada of delegates from 44 countries. The headquarters of the new international organization was first set up in Washington, D.C. but was transferred to Rome in 1951. The FAO is a leading international organization for the development of agriculture, fisheries and forestry or rural development in general. Its work falls into four basic categories:

- Collection, analysis and dissemination of information.
- Advising governments on policy and planning.
- Promoting consultations and cooperation among member-countries.
- Providing technical advice and assistance.

The main emphasis in the allocation of its resources is the elimination of the twin evils of hunger and poverty. Over three-fourths of its funded programs is dedicated to agriculture, particularly in increasing food production. FAO, likewise, has a series of special action programs that range from the provision of fertilizers to the introduction of forestry for community development.

FAO also promotes investment in agricultural development by helping Third World countries to identify and formulate investment projects. For this purpose, it works closely with all the major multinational financing institutions that lend to agriculture. In addition, it provides investment support to national development banks.

Information, which FAO collects on food, agriculture, forestry and fisheries from all over the world, is made available to member countries for the use of government planners and the general public. FAO keeps special watch on food situations of countries where food shortages are still a problem and governments are kept informed on areas where famine situations threaten to develop.

Overseas Economic Cooperation Fund

At the start of the 1960's which the UN declared as the "Decade of Development", the necessity for international economic cooperation became more pressing. By that time,

Japan had enhanced her economic strength and developed a positive posture towards economic cooperation. It was against this background that the Overseas Economic Cooperation Fund (OECF) of Japan came into existence in 1961. This organization is Japan's governmental financing institution in charge of foreign aid.

Initially, OECF's operations were confined to the provision of loans to, and investment type appropriations for, Japanese firms undertaking development projects in other countries. However, it began to lend development funds directly to foreign governments in 1966. The OECF finances projects in agriculture, forestry, fisheries and mining (limited to prospecting), pre-investment studies and experimental projects conducive to the economic development of the recipient-countries.

Japan International Cooperation Agency

The Japan International Cooperation Agency (JICA) was organized on August 1, 1974.

Originally, it provided five major services:

- Extension of technical cooperation to developing countries on a government-to-government basis.
- Undertaking of work necessary for the promotion of activities carried out by the Japan Overseas Cooperation Volunteers.
- Provision of funds necessary for the improvement of facilities related to social development and advancement of agriculture, forestry, mining and manufacturing. This service is complemented with technology transfer.
- Provision of services for the smooth immigration of Japanese nationals.
- Training and recruitment of qualified personnel for technical cooperation.

In 1978, new services were provided for the implementation of Japan's Capital Grant Assistance to developing countries.

Ford Foundation

Incorporated in 1936 in Michigan, USA, the Ford Foundation seeks to advance public welfare by trying to identify and contribute to the solution of problems of national and international importance. The Foundation extends grants primarily to institutions for experimental,

demonstration and developmental efforts that are likely to produce significant advances within the Foundation's fields of interest. These fields of interest are varied and include alternative approaches to management and policy formulation, training of administrators, resource management and ecology, job training and manpower research, assistance to the severely disadvantaged, assistance to developing nations in agriculture, education and development planning and economic and social research.

Rockefeller Foundation

The Rockefeller Foundation was established in 1913 in New York to promote the well-being of mankind throughout the world. It extends assistance under seven program areas, namely: conquest of hunger, population, health, international relations, education for development, equal opportunity and arts, humanities and contemporary values. The Foundation operates primarily through grants to universities, research institutions and other qualified agencies and, in agriculture, through staff research and direct operations.

Organization of Petroleum Exporting Countries

The Organization of Petroleum Exporting Countries (OPEC) was founded in 1960 at Baghdad, Iraq to advance its members' interests in trade, development and relations with other oil-producing nations. The OPEC founders were Iraq, Iran, Kuwait, Saudi Arabia and Venezuela. They were later joined by Algeria, Ecuador, Gabon, Libya, Indonesia, Nigeria, Qatar and the United Arab Emirates. The organization decided later to funnel part of their enormous common fund to assist the development of non-member countries, especially those in the Third World.

APPENDIX 1

REPUBLIC ACT. NO. 3601

An Act Creating the National Irrigation Administration

Be it enacted by the Senate and House of Representatives of the Philippines in Congress assembled:

ARTICLE 1

- Establishment and Objectives

SECTION 1. Name and Domicile. - A body corporate is hereby created which shall be known as the National Irrigation Administration, hereinafter called the NIA for short, which shall be organized immediately after the approval of this Act. It shall have its principal seat of business in the City of Manila and shall have representatives in all provinces for the proper conduct of its business.

SEC. 2. Powers and Objectives. - The NIA shall have the following powers and objectives:

(a) To investigate, study, improve, construct and administer all national irrigation systems in the Philippines;

(b) To investigate all available and possible water resources in the country for the purpose of utilizing the same for irrigation, and to plan, design and construct the necessary projects to make the ten to twenty-year period following the approval of this Act as the Irrigation Age of the Republic of the Philippines;

(c) To collect from the users of each irrigation system constructed by it such fees as may be necessary to finance the continuous operation of the system and reimburse within a certain period not less than twenty-five years the cost of construction thereof; and

(d) To do all such other things and to transact all such businesses as are directly or indirectly necessary, incidental or conducive to the attainment of the above objectives.

ARTICLE II

- Capitalization

SEC. 3. Working Capital. - The working capital of the NIA shall be three hundred million pesos, to be subscribed and paid entirely by the Government of the Republic of the

Bank, which shall deliver annually to the NIA the sum of thirty million pesos until its whole capital stock is fully paid.

The President of the Philippines is authorized to issue, preferably in the Philippines or abroad, if necessary, in the name and behalf of the Republic of the Philippines, bonds in such amounts as may be needed to cover the annual subscription of the Government to the capital stock of the NIA.

The Secretary of Finance, in consultation with the Monetary Board, shall prescribe the form, the rate of interest, the denomination, maturity, negotiability, convertibility, call and redemption features and all other terms and conditions of issuance, placement, sale, servicing, redemption and payment of all bonds issued under the authority of this Act.

The bonds issued under the authority of this section may be made payable, both as to principal and interests, in Philippine currency or any readily convertible foreign currency.

Nothing in this section shall be interpreted to mean that the Secretary of Finance, in the redemption of securities, is prevented from applying the lottery principle by which bonds, drawn by lot, may be redeemed before maturity either at their face value or above.

The bonds to be issued under this Act shall be exempted from taxation by the Government of the Republic of the Philippines or by any political subdivision thereof, which fact shall be stated on their face in accordance with this Act under which the said bonds are issued; and shall likewise be exempt from attachment, execution or seizure.

All amounts delivered to the NIA by the Central Bank as herein provided shall, beginning with the sixth year after their actual delivery, be returned by the NIA to the Central Bank in fifty equal yearly installments.

All amounts collected by the NIA as irrigation fees shall be added to its operating capital.

For the purpose of implementing the powers of the NIA, it is hereby authorized to obtain loans for and in behalf of the Republic of the Philippines, out of the proceeds of the sale of imported surplus agricultural commodities, under the terms and conditions set forth in Title IV of the United States Public Law numbered four hundred and eighty.

A sinking fund shall be established in such manner that the total annual contributions thereto, accrued at such rate of interest as may be determined by the Secretary of Finance in consultation with the Monetary Board, shall be sufficient to redeem at maturity the bonds issued

under this Act. Said fund shall be under the custody of the Central Bank of the Philippines which shall invest the same in such manner as the Monetary Board may approve; shall charge all expenses of such investment to said sinking fund, and shall credit the same with the interest on investments and other income belonging to it.

A standing annual appropriation is hereby made, out of any funds in the National Treasury not otherwise appropriated, of such sum which, added to the yearly installments returned by the NIA to the Central Bank as herein provided, shall be sufficient to provide for the sinking fund herein created and for the interests on bonds issued by virtue of this Act. Such sum as may be necessary is hereby further appropriated, out of any funds in the National Treasury not otherwise appropriated to cover the expenses of the issue and sale of the bonds authorized by this Act.

ARTICLE III - Governing Body

SEC. 4. Board of Directors - The powers and functions of the NIA shall be exercised by a Board of Directors composed of seven members, to wit: the Secretary of Public Works and Communications who shall be the Chairman, the Secretary of Agriculture and Natural Resources, the Chairman of the Board of Directors of the National Power Corporation, the Director of Plant Industry, the Director of Agricultural Extension, and two other members who shall be appointed by the President of the Philippines, one on recommendation of any national rice and corn organization of good standing, and the second on the recommendation of the minority party through its duly authorized officers, and with the consent of the Commission on Appointments, and who shall serve for a term of six years, with the exception of the two first appointees, one of whom shall serve only for two years, and the other for four years. Any person appointed to fill a vacancy in the Board shall serve only for the unexpired term of the appointive member whom he succeeds.

For actual attendance at meetings, each member of the Board shall receive a per diem of twenty-five pesos, but the total amount of per diems that a member may receive in a month shall in no case exceed one hundred pesos.

SEC. 5. Powers and Duties of the Board of Directors. The Board of Directors shall have the following powers and duties:

of the President of the Philippines, rules and regulations governing the manner in which the general business of the NIA may be conducted, including provisions for the formation of such committee or committees as the Board may deem necessary to facilitate its business;

(b) With the approval of the President, to appoint and fix the compensation of an Irrigation Administrator, an Assistant Irrigation Administrator from a list of names submitted by the Irrigation Administrator, a secretary and treasurer, and, by a majority vote of all members, to suspend and/or remove the said officials for cause, with the approval of the President; and

(c) To approve, subject to the final action of the President, the annual and/or supplemental budgets of the NIA which may be submitted to the Board by the Irrigation Administrator from time to time.

SEC. 6. Prohibition for Board Members. - The Chairman and other members of the Board of Directors shall not at the same time serve in the NIA in any other capacity, unless so authorized by the President.

ARTICLE IV - Management

SEC. 7. Managing Head. The management of the NIA shall be vested in the Irrigation Administrator.

SEC. 8. Powers and Duties of the Irrigation Administrator. - The Irrigation Administrator shall have the following powers and duties:

(a) To direct and manage the affairs and business of the NIA, on behalf of the Board of Directors and subject to its control and supervision;

(b) To sit in all meetings of the Board and participate in its deliberations, but without the right to vote;

(c) To submit within sixty days after the close of each fiscal year an annual report, through the Board of Directors, to the President of the Philippines;

(d) With the approval of the Board, to appoint and fix the number of such subordinate personnel as may be necessary for the proper discharge with approval of the Board, to remove, suspend, or otherwise discipline, for cause, any subordinate employee of the NIA, and

(e) To perform such other duties as may be assigned to him by the Board from time to time.

ARTICLE V

- Appointments and Promotions

SEC. 10. Auditor and Personnel under Him. - The Auditor General shall appoint a representative who shall be the Auditor of the NIA, and the necessary personnel to assist said representative in the performance of his duties. The number and salaries of the Auditor of the NIA and the personnel under him shall be determined by the Auditor General, subject to appropriation by the Board of Directors. In case of disagreement, the matter shall be submitted to the President of the Philippines, whose decision shall be final. Said salaries and all other expenses maintaining the Auditor's Office shall be paid by the NIA.

SEC. 11. Report. - The financial transactions of the NIA shall be audited in accordance with law, administrative regulations and the principles and procedures applicable to corporate transactions. A report of audit for each fiscal year shall be submitted, within sixty days after the close of the fiscal year, by the representative of the Auditor General, through the latter, to the Board of Directors, and copies thereof shall be furnished the President of the Philippines and the presiding officers of the two Houses of Congress. The report shall also show specifically any program, expenditures, or other financial transaction or undertaking observed in the course of audit which, in the opinion of the auditor, has been carried on or made without authority of law.

ARTICLE VI

- Miscellaneous Provisions

SEC. 12. Abolition of the Irrigation Division of the Bureau of Public Works. - The Irrigation Division of the Bureau of Public Works is hereby abolished, and all its personnel, unexpended appropriations, functions, duties, equipment, records, assets and liabilities are transferred and assigned to the NIA.

SEC. 14. Implementation. - The President of the Philippines shall by executive order issue such rules and regulations as may be necessary to implement this Act.

SEC. 15. Repealing Clause. - All laws, acts, executive orders, administrative orders, rules and regulations, or parts thereof inconsistent herewith are repealed or modified accordingly.

SEC. 16. Effectivity. - This Act takes effect upon its approval.

APPENDIX 2

MALACAÑANG

Manila

PRESIDENTIAL DECREE NO. 552

AMENDING CERTAIN SECTIONS OF REPUBLIC ACT NUMBERED THIRTY SIX HUNDRED AND ONE, ENTITLED, "AN ACT CREATING THE NATIONAL IRRIGATION ADMINISTRATION".

WHEREAS, the enunciated policy for a comprehensive development, utilization and conservation of water resources of the Philippines, and in pursuit of this policy, one of the primary objectives of the National Irrigation Administration is to effectuate an economic means of achieving the optimal and diversified utilization and control of water by undertaking integrated irrigation projects;

WHEREAS, the National Irrigation Administration assumes as its primary responsibility, the implementation of the irrigation integrated program of the government and the attainment of the "Irrigation Age", as envisioned under Republic Act No. 3601;

WHEREAS, an effective means of implementing multiple-purpose projects in line with program-oriented and comprehensive water resources development necessitates broader power and authority of the NIA to undertake concomitant projects such as flood control, drainage, land reclamation, hydraulic power development, domestic water supply, road or highway construction, reforestation and projects to maintain ecological balance, in coordination with the agencies concerned;

WHEREAS, the construction of multiple-purpose water resources projects involve substantial investments of government funds to increase agricultural production for the financial upliftment of the people for them to be able to assure and comply with their obligations and responsibilities to the government;

NOW, THEREFORE, I, FERDINAND E. MARCOS, President of the Philippines, by virtue of the powers vested in me by the Constitution do hereby amend certain sections or provisions of Republic Act Numbered Thirty-Six Hundred and One, "An Act Creating the National Irrigation Administration" to wit:

SECTION 1. Section 2, Republic Act Numbered Thirty-Six Hundred and One, is hereby amended to read as follows:

"Section 2: Powers and Objectives - The NIA shall have the following powers and objectives:

- (a) To investigate and study all available and possible water resources in the Philippines, primarily for irrigation purposes; to plan, design, construct and/or improve all types of irrigation projects and appurtenant structures, all national irrigation systems; the authority to supervise the operation, maintenance and repair, or otherwise *administer temporarily all communal and pump irrigation systems constructed, improved and/or repaired wholly or partially with government funds*; and to delegate the partial or full management of national irrigation systems to duly-organized cooperatives or associations, under such terms and conditions which the NIA Board of Directors may impose;
- (b) To charge and collect from the beneficiaries of the water from all irrigation systems constructed by or under its administration, such fees or administration charges as may be necessary to cover the costs of operation, maintenance, and to recover the costs of construction within a reasonable period of time to the extent consistent with government policy; to recover funds or portions thereof expended for the construction and/or rehabilitation of communal irrigation systems which funds shall accrue to a special fund for irrigation development under Section 2 hereof. Unpaid irrigation fees or administration charges shall be preferred liens, first, upon the land benefitted, and then on the crops raised thereon, which liens shall have preference over all other liens except for taxes on the land, and such preferred liens shall not be removed until all fees or administration charges are paid or the property is levied upon and sold by the National Irrigation Administration for the satisfaction thereof. Judicial actions for the collection of unpaid irrigation fees or charges, drainage fees or other charges which the National Irrigation Administration is authorized to impose and collect, shall henceforth be governed by the provisions of other laws to the contrary notwithstanding;
- (c) To construct multiple-purpose water resources projects designed primarily for irrigation, and secondarily for hydraulic power development and/or other uses such as flood control, drainage, land

reclamation, domestic water supply, roads and highway construction and reforestation, among others, provided, that the plans, designs and the construction thereof, shall be undertaken in coordination with the agencies concerned;

- (d) To investigate, in coordination with the Bureau of Public Works, areas which are unproductive or less productive due to permanent or occasional submergence, and to plan, design and construct drainage facilities and protective works for agricultural purposes to increase or maximize their productive yield, to collect drainage fees from landowners of areas benefitted by the drainage facilities and protective works to recover the cost of operation and maintenance as well as a reasonable portion of the cost of the construction thereof consistent with government policy;
- (e) To acquire, by any mode of acquisition, real and personal properties, and all appurtenant rights, easements, concessions and privileges, whether the same are already devoted to private or public use in connection with the development of projects by the NIA;

The National Irrigation Administration is empowered to exercise the right of eminent domain in the manner provided by law for the institution of expropriation proceedings. In the prosecution of its projects, the National Irrigation Administration is hereby given the right of way to construct and maintain such works and hydraulic structures over and throughout lands of the public domain, and in those owned by any branch of the government, political subdivision, and instrumentality. In case of private property, compensation for the use and occupancy thereof shall be paid and determined as follows:

- (1) In case of the establishment of easement of aqueduct, abutment of dams, right-of-way for access roads and other similar works pertaining to irrigation projects and for facilities and works pertaining to multipurpose projects, the owners of the property shall be entitled to not more than ten percent (10%) of the market value of the property, based on the current tax declaration at the time of actual entry or the filing of the complaint for eminent domain, whichever is earlier.
- (2) In case the property is acquired by purchase, the fair market value of the area actually occupied shall be paid, based on the current tax

declaration at the time of actual entry or the filing of the complaint for eminent domain, whichever is earlier.

- (3) In both instances under (1) and (2), the owners of the property shall be compensated for damages to improvements based on the valuation thereof appearing in the current tax declaration at the time of actual destruction or the filing of the complaint for eminent domain, whichever is earlier, provided, further, that if the improvements could be removed without substantial destruction and impairment of their use, the compensation shall be fifty per cent (50%) of the current value therefor; Provided, finally that if the crops are harvested before actual destruction thereof, no compensation therefor shall be paid notwithstanding the filing of the complaint for eminent domain.

All actions for the recovery of compensation and damages against the National Irrigation Administration under paragraphs (1), (2) and (3) hereof, shall be filed with a competent court within five (5) years from the date of entry of the land or destruction of the improvements or crops, after which period, the right of possession and /or ownership of the National Irrigation Administration shall be considered vested and absolute. All other actions for the recovery of compensation and damages to private property and improvements occasioned by the construction, operation and maintenance of irrigation facilities and other hydraulic structures under the administration of the National Irrigation Administration, which have accrued ten (10) or more years prior to the approval of this decree are deemed to have prescribed and are barred forever.

(f) To establish/create such services and facilities and other means of social and economic assistance to the community which might be adversely and directly affected by the construction of National Irrigation Administration projects, and to do all such other things, and to transact such business, as are directly or indirectly necessary, incidental or conducive to the attainment of the above powers and objectives, including the power to establish and maintain subsidiaries, and in general, to exercise all the powers of the corporation under the Corporation Law, insofar

as they are not inconsistent with the provisions of this act.

SECTION 2. Section 3, Republic Act Numbered Thirty-Six Hundred and One is hereby repealed, except paragraphs one and eight thereof which are amended and a new paragraph which is added to read as follows:

"Section 3. (a) Capitalization - The capitalization of the National Irrigation Administration shall be two billion pesos, to be subscribed and paid entirely by the Government of the Republic of the Philippines which shall deliver annually to the NIA the sum of two hundred million pesos until its whole capitalization is fully paid.

(b) Operating Capital - "All amounts collected by NIA as irrigation fees, administration charges, drainage fees, equipment rentals, proceeds from the sale of unserviceable equipment and materials, sale of all reparation goods allocated to the defunct Irrigation Service Unit and the National Irrigation Administration, and all other incomes shall be added to its operating capital.

(c) Funds for general administration, current operating expenses, and operation, maintenance and administration expenses of irrigation systems, shall be included in the annual general appropriations decree/act. Over and above the requirements of operation, maintenance and administration expenses of irrigation systems of the National Irrigation Administration and of its central office and regional and provincial offices, there shall be included in the annual appropriations act an amount not less than six million pesos a year to finance feasibility studies, investigations, surveys, and plans in preparation for projects".

SECTION 3: Authority to incur foreign loans. The National Irrigation Administration is authorized to contract loans, credits, in any convertible foreign currency or capital goods, and to incur indebtedness from time to time with foreign governments, or any international financing institutions or fund sources, the total outstanding amount of which, excluding interests, shall not exceed five hundred million United States dollars or the equivalent thereof in other currencies, on such terms and conditions as it shall deem appropriate for the accomplishment of its objectives, the provisions of existing laws to the contrary notwithstanding; and to enter into and execute contracts and other documents specifying such terms and conditions.

The President of the Philippines, by himself, or through his duly authorized representative, is hereby authorized

to negotiate and contract with foreign governments or any international financial institution or fund sources in the name and on behalf of the National Irrigation Administration, one or several loans, for the purpose of promoting the irrigation program and the construction of multiple-purpose water resources projects.

The President of the Philippines, by himself, or through his duly authorized representative, is hereby further authorized to guarantee, absolutely and unconditionally, as primary obligor and not as mere surety, in the name and on behalf of the Republic of the Philippines, the payments of the loans, credits and indebtedness up to the amount herein authorized, over and above the amounts which the President of the Philippines is authorized to guarantee under existing laws, as well as the performance of all or any of the obligations undertaken by the National Irrigation Administration in the territory of the Republic of the Philippines pursuant to loan agreements entered into with foreign governments or any international financing institution or fund sources.

The loans, credits and indebtedness contracted under this section and the payments of the principal, interests and other charges thereon, as well as the importation of machinery, equipment, materials, supplies and services, by the National Irrigation Administration, paid from the proceeds of any loan, credit, indebtedness incurred under this Act, shall be exempted from all direct and indirect taxes, fees, imports, other charges and restrictions previously and presently imposed, and to be imposed by the Republic of the Philippines or any of its agencies and political subdivisions.

SECTION 4: Section 4, Republic Act Numbered Thirty-Six Hundred and One, is hereby amended to read as follows:

"Section 4. Board of Directors - The powers and functions of the National Irrigation Administration shall be exercised by a Board of Directors composed of six members, to wit: The Secretary of Public Works, Transportation and Communications who shall be the Chairman; the Administrator of the National Irrigation Administration, who shall be the Vice-Chairman; the Director-General of the National Economic and Development Authority, the Secretary of Agriculture; the General Manager of the National Power Corporation; and one member who shall be appointed by the President of the Philippines on recommendation of any national rice and corn organization of good standing and who shall serve for a term of four years

unless sooner removed.

In the case of failure of a member to attend meetings of the Board due to physical incapacity or any temporary disability, the Undersecretary or the Assistant Head of the office or agency to which the member concerned belongs, shall attend the meetings of the board, with the power to vote.

For actual attendance at regular meetings, each member of the Board or his representative as authorized in the preceeding paragraph, shall receive a per diem of three hundred pesos, and one hundred pesos for special meetings, but the total amount of per diem in no case exceed one thousand five hundred pesos. The Board shall fix the amount of representation and transportation allowance that the members may receive".

SECTION 5. Section 6, Republic Act Numbered Thirty-Six Hundred and One, is hereby amended to read as follows:

"Section 6. Prohibition for Board Members. The Chairman and other members of the Board of Directors, except the Irrigation Administrator, shall not at the same time serve in the NIA in any other capacity unless so authorized by the President".

SECTION 7. Section 7, Article IV, Republic Act Numbered Thirty-Six Hundred and One, is hereby amended to read as follows:

"Section 7. Managing Head. - The management of the NIA shall be vested in the Irrigation Administrator who shall be appointed by the President of the Philippines".

SECTION 8. Section 8 (d), Article IV, Republic Act Numbered Thirty-Six Hundred and One, is hereby amended to read as follows:

"(d) With the approval of the Board, to determine the staffing pattern and the number of personnel of the National Irrigation Administration, to fix their salaries including emoluments, and to define their powers and duties. For this purpose, the Irrigation Administrator shall recommend to the Board a staffing pattern and salary pay plans similar to those in other government corporations of the same category as the National Irrigation Administration, the provisions of existing and position classifications notwithstanding, especially with respect to technical and professional positions".

With the approval of the Board, to appoint and

remove, suspend, or otherwise discipline for cause, any subordinate employee of the National Irrigation Administration.

SECTION 9. Separability Clause. - The provisions of this Decree are hereby declared to be separable and if any clause, sentence, provision or section of this Decree or its application thereof to any person or circumstance should, for any reason, be held invalid or unconstitutional, such invalidity or unconstitutionality shall not affect the other provisions or application of this Decree which can be given force and effect.

SECTION 10. Repealing clause. All laws, decrees, charters, executive orders, administrative orders, proclamations, rules and regulations, or parts thereof insofar as they are inconsistent with the provisions of this Decree are hereby repealed or modified accordingly.

SECTION 11. Effectivity. This Decree shall take effect upon its approval.

Done in the City of Manila, this 11th day of September in the year of our Lord, Nineteen hundred and Seventy-Four.

(SGD.) FERDINAND E. MARCOS
BY THE PRESIDENT:

(SGD.) ALEJANDRO MELCHOR
Executive Secretary

APPENDIX 3 MALACAÑANG Manila

PRESIDENTIAL DECREE NO. 1702

AMENDING SECTION 3 OF REPUBLIC ACT NO. 3601,
AS AMENDED BY PRESIDENTIAL DECREE NO. 552

WHEREAS, under Republic Act No. 3601 as amended by Presidential Decree No. 552, the National Irrigation Administration is charged with the responsibility of constructing, improving, rehabilitating and administering all national irrigation systems in the Philippines, including all communal and pump irrigation projects.

WHEREAS, the implementation of the irrigation integrated program of the government and the attainment of the "Irrigation Age" as envisioned under Republic Act No. 3601, is the primary responsibility and goal of the National Irrigation Administration; and

WHEREAS, the increased pace of irrigation development together with the increased cost of irrigation systems require an increase in capitalization of the National Irrigation Administration and the strengthening of its powers and resources to assure long-term capacity for meeting its responsibilities and attaining its goals;

NOW, THEREFORE, I, FERDINAND E. MARCOS, President of the Philippines, by virtue of the powers vested in me by the Constitution, do hereby amend certain sections or provisions of Republic Act Number Thirty Six Hundred and One, as amended by Presidential Decree No. 552, to wit:

SECTION 1. - Section 3 of Republic Act No. 3601, as amended to read as follows:

"Section 3. (a) - Capitalization. The authorized capital stock of the National Irrigation Administration shall be ten billion pesos, which shall be subscribed and paid entirely by the Government of the Republic of the Philippines. The amount is hereby appropriated for the purpose out of any funds in the Treasury not otherwise appropriated: *Provided*, that only such amounts as are actually necessary for the implementation of projects of the Administration shall be released as payments on capital subscriptions, subject to approval of the President as provided by pertinent budget laws".

(b) Operating Capital - All amounts collected by the National Irrigation Administration as irrigation fees, equipment rentals, proceeds from the sale of unserviceable equipment and materials, sale of all separation goods allocated to the defunct Irrigation Service Unit and the National Irrigation Administration, and all other income shall be added to its operating capital.

The National Irrigation Administration is hereby authorized to impose as an administration and engineering overhead charge, 5% of the total cost of projects undertaken by it, which shall likewise form part of its operating capital”.

SECTION 2. - Separability Clause. - The provisions of this Decree are hereby declared separable and if any clause, sentence, provision or section of this Decree or its application thereby to any person or circumstance should, for any reason be held invalid or unconstitutional, such invalidity or unconstitutionality shall not affect the other provisions or application of this Decree which can be given force and effect.

SECTION 3. - Repealing Clause. - All laws, decrees, charters, executive orders, administrative orders, proclamations, rules and regulations, or parts thereof insofar as they are inconsistent with the provisions of this Decree are hereby repealed, amended or modified accordingly.

SECTION 4. - Effectivity. - This Decree shall take effect immediately.

(SGD.) FERDINAND E. MARCOS
President of the Philippines

By the President

(SGD.) JOAQUIN T. VENUS, JR.
Presidential Assistant

LIST OF ACRONYMS

ACA	Agricultural Credit Administration
ACCFA	Agricultural Credit and Cooperatives Financing Administration
ADB	Asian Development Bank
ADF	Agricultural Development Fund
AIM	Asian Institute of Management
AMEC	Agricultural Machinery and Equipment Corporation
APC	Agricultural Productivity Commission
BAEx	Bureau of Agricultural Extension
BFAR	Bureau of Fisheries and Aquatic Resources
BHEP	Baligatan Hydroelectric Plant
BISA	Barangay Integrated Service Association
BPW	Bureau of Public Works
CB	Central Bank
CDCP	Construction Development Corporation of the Philippines
CEDP	Community Employment Development Program
CIC	Communal Irrigation Committee
CIP	Communal Irrigation Project
CIS	Communal Irrigation System
CLSU	Central Luzon State University
CPP/NPA	Communist Party of the Philippines/New People's Army
DA	Department of Agriculture
DANR	Department of Agriculture and Natural Resources
DCIEC	Diversified Crops Irrigation Engineering Center
DCIEP	Diversified Crops Irrigation Engineering Project
DPWC	Department of Public Works and Communications
DPWH	Department of Public Works and Highways
DPWTC	Department of Public Works, Transportation and Communication
ECAFE	Economic Commission for Asia and the Far East
EDF	Economic Development Fund
EEA	Emergency Employment Administration
EINET	Engineering Information Network
EO	Executive Order
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization
FSDC	Farm Systems Development Corporation
FFWSDO	Flood Forecasting and Warning System for Dam Operations
HRCC	Hydro-Resources Contractors Corporation
HYV	High Yielding Variety
IA	Irrigators' Association
IBRD	International Bank for Reconstruction and Development
ICO	Irrigation Community Organizer
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IOSP	Irrigation Operation Support Project
IPC	Institute of Philippine Culture

IRPA	Irrigation Pump Administration
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
MAF	Ministry of Agriculture and Food
MED	Machinery and Equipment Department
MSA	Mutual Security Agency
MTPDP	Medium-Term Philippine Development Plan
MWSS	Metropolitan Waterworks and Sewerage System
NARRA	National Resettlement and Rehabilitation Administration
NAPOCOR	National Power Corporation
NAWASA	National Waterworks and Sewerage Authority
NDC	National Development Company
NEC	National Economic Council
NEDA	National Economic and Development Authority
NFAC	National Food and Agriculture Council
NIA	National Irrigation Administration
NLSA	National Land Settlement Administration
NWAPCC	National Water and Air Pollution Control Commission
NWRB	National Water Resources Board
NWRC	National Water Resources Council
OCD	Office of Civil Defense
OECF	Overseas Economic Cooperation Fund
OPEC	Organization of Petroleum Exporting Countries
PACD	Presidential Arm on Community Development
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration
PD	Presidential Decree
PES	Presidential Economic Staff
PHILCUSA	Philippine Council for US Aid
PMSIP	Philippine Medium-Scale Irrigation Project
PNB	Philippine National Bank
PROC	People's Republic of China
PSO	Postal Services Office
RA	Republic Act
RCPA	Rice and Corn Production Administration
RCPCC	Rice and Corn Production Coordinating Committee
RIP	River Irrigation Project
RIS	River Irrigation System
SEC	Securities and Exchange Commission
UNDP	United Nations Development Program
UPRIIS	Upper Pampanga River Integrated Irrigation System
UPRP	Upper Pampanga River Project
USAID	United States Agency for International Development
USBR	United States Bureau of Reclamation
VIG	Viability Incentive Grant
WB	World Bank
WMECP	Watershed Management and Erosion Control Project

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