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The
PHILIPPINE GEOGRAPHICAL JOURNAL

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Obituary

LEOPOLDO BANCAIN UICHANCO
(1894-1972)

The Philippine Geographical Society and the Philippine Geographical Journal expressed their heart-felt condolence over the demise of Dr. Leopoldo Bancain Uichanco. As active member of the PGS, he did his level best in shaping the destiny of the Society and helped attain its avowed objectives. His role as contributing editor of the PGJ was to provide constant constructive criticism in making the Journal a real vehicle for the dissemination of first hand information on scientific findings that are geared for the economic growth and development of the Philippines.

Dr. Uichanco, whose field of interest was on entomology, was a retired dean of the College of Agriculture, University of the Philippines at Los Baños. He was Director of Research, Cadang-Cadang Research Foundation and until his death was Consultant in Agricultural Research, National Science Development Board.

He was born in Calamba, Laguna on 23 April 1894. He obtained the degree of Bachelor of Science in Agriculture in 1915; Master of Science in 1918 at the College of Agriculture, University of the Philippines; M. S. Zoology, 1920 and Sc. D. 1922, Harvard University.

He had attended a special training of the FAO training program on fiscal policy and management of agricultural colleges and experiment stations, FAO, 1955.

Dr. Uichanco was Assistant Professor in Entomology, 1922-24 and later on became the head of the same department; Associate Professor of Entomology, 1929; Dean, College of Agriculture, University of the Philippines, 1939-59.

Dr. Uichanco was Editor of the Philippine Agriculturist; contributing editor, Philippine Journal of Science; President, Boy Scouts Organization (Local Chapter); Member of the Committee that made investigational trip to the Rice and Corn Production Administration in Mindanao, January 1950.

In 1950, he made trips to collect different species of insects in Mindanao.

He was a member of many scientific societies and organizations among which are: American Association for the Advancement of Science; Philippine Scientific Society; Entomological Society of America; Association of Economic Entomologists; Society for the Advancement of Research; Los Baños Biological Club; National Research Council of the Philippines; Philippine Association of Science (Honorary Member); Phi Kappa Phi; Phi Sigma; and Gamma Sigma Delta.

Dr. Uichanco had travelled widely in the Philippines and outside the country to attend such scientific conferences as the International Congress of Sugar Technologists, Java, 1929; Fourth Pacific Science Congress, Java, 1929; Seventh International Entomological Congress, Berlin, 1938; International Locust Conference, Belgium, 1938; Eighth Pacific Science Congress, Quezon City, 1953; Fifth Session of the Convention of the National Research Council of Italy, Milan, Italy, 1955; First Meeting of the Directors of National Research Centers, Milan, Italy, 1955; Ninth Pacific Science Congress, Bangkok, Thailand, 1957; Committee in Community Problems, FAO Group on Coconut and Coconut Products, Rome, Italy, 1957, and FAO Council Session, Rome, Italy, 1957.

He has published more than one hundred fifty scientific papers and a number of books on biological science which are being used as textbooks in high schools and colleges.

JOSE O. JAUG

Neither the *Society* nor the *Journal* assumes responsibility for the statements of fact or opinion by authors.

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RESEARCH EFFORTS ON THE USES OF COCONUTS[1]

by

J. R. VELASCO, O. N. GONZALES, and P. L. RUBIO[2]

THE PROBLEM OF THE COCONUT MARKET

As far as the islander in the Pacific is concerned, the copra market just happened; he did not bring it about. He noted that some foreign trader was willing to buy the coconut meat which is dried in the sun, so he dried more and more nuts in the sun. When he could not cope with the demand by sun-drying, he learned to dry the nuts in a smudge of smoke and fire.

Copra is a natural consequence of the requirements of the trader. In order to go into the channels of trade, the coconut meat has to be brought to a more or less stable condition. This is accomplished by reducing the moisture content in the meat and the least effort needed to do this, the better for the trader. The farmer need not attempt to make the product more elaborate otherwise, it would cost more and the trader may not be willing to pay the difference.

What we are trying to say is that the copra market is a trader-based activity, and is a buyer's market. The producer has not done much thinking about the matter in the way of greater participation in price determination or in decision-making, regarding certain aspects of the market.

For example, every now and then the price of copra goes down to rockbottom. This is hard to reconcile with the fact that coconut is one of the best vegetable oil for food uses, and it is in fact sought after as a replacement for butterfat in reconstituted milk. Added to this is the fact that our production has not been excessive so as to produce a glut. The reduction in price may lead to the suspicion that it is being manipulated. If the farmer is a businessman conscious of cost of production and returns on investment, he would have gone out of the coconut business. The low price he gets for his copra, coupled with the low-yield per hectare, should discourage him because the income is not even enough to pay for the rent of the land.

Because of this irreconcilable situation, some leaders in the coconut industry turned desperate at times and advocated complete severance from the copra market. They suggested that we should mill our produce so that we could export coconut oil and other finished products. This, however, has remained a latent desire. The parties who advocated

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[1] Read during the Symposium on Utilization of Coconut as Food, Sponsored by the Chemical Society of the Philippines, January 21, 1972 at the P. J. Garcia Memorial Hall, Manila.

[2] Of the National Institute of Science and Technology, National Science Development Board, Herran, Manila.

this move have not contended with the enormous capital outlay necessary; also, with the reactionary moves of the oil millers in the consuming countries. This is not to mention the likelihood that the local jobbers and copra exporters would sabotage the movement. For a goal, like industrializing the coconut, to be realized, there should be concerted action among the different interest groups both private and public.

The coconut is a God-sent product. It is nutritious and the coconut milk has been said to be used in India to supplement mother's milk for the sustenance of suckling children. Unhappily, in the course of processing coconut meat into copra, we degrade the product so that it becomes unfit for consumption. As a consequence, we have to go through an involved process to refine the oil so as to bring it up again to a level of refinement suited for human consumption. Incidentally the protein by-product is used only for animal feed. It appeals to reason that to avoid the losses in oil and protein we should improve the processing and keep the edible quality of the fresh coconut meat. Considering that a large part of our population suffer from *protein malnutrition*, as incidental source of protein, like the coconut, can go a long way towards promoting public health.

PREVIOUS EFFORTS

Patents. — One indication of efforts exerted to utilize the coconut is the number and kind of patents issued on the subject. Schuh (1963) listed 513 entries in the patent offices of Australia, Great Britain, Japan, Philippines, United States, France, Germany, Netherlands, India, Canada, Switzerland, Belgium, and Spain. They were classified under the heading of food products, preservation, oil recovery, oil purification, apparatus, husks, coconut shell, coconut water, detergents, detergent intermediate, lubricants, and miscellaneous.

Patents on the processing of coconut meat may be classified into the dry processes and the wet processes. In the dry process, the meat is dried while the cell contents are held intact, while the wet process, the cell is ruptured and the contents squeezed out then the constituents are dried or further elaborated. Among the dry processes are the (a) Hiller process (patent issued 1952), (b) Sodergreen process (1952), (c) Yenko process (1954), (d) Modified Hiller process (1955), and (e) NIST integrated process (1962). In the Hiller process the meat is sliced, dried, and expelled to get oil and meal. In the Sodergreen process, the meat is dehydrated in two stages and passed through an oil separator. In the Yenko process, the meat is comminuted, dried at 100°C and pressed. In the modified Hiller, coconut oil is added to the sliced meat, mixed, ground, and dried. In the NIST process, the meat is ground, comminuted, dried in the fluidized bed and pressed to get oil and meal. By solvent extraction of the meal, cocoaflour is produced. By water extraction of the flour, protein and cellulosic products are obtained. Most of the patents concern the drying of the coconut meat by the application of heat to the natural product which is essentially an emulsion of oil in water. The Carver-Greenfield process which was not mentioned by Schuh provides for the addition of oil to the comminuted mass-in effect

reversing the phases so that the emulsion is that of water in oil. The supposed advantage is that oil has a lower specific heat than water and that it is capable of being heated to a higher temperature. Also, the escaping tendency of water from oil is greater than of water from water. The Carver-Greenfield process further, takes advantage of evaporation from a falling film.

Patents involving the wet process were issued to Lava (1937), Gonzaga (1948), Robledaño-Luzuriaga (1948), Robledaño-Luzuriaga (modified process, 1948), Cruz-Bernardo (1949), Birosel (physico-mechanical, 1955), Kraus-Maffie CFTRI (1958), and Diokno (1960).

The "heart" of Dr. Lava's process consists of comminuting the coconut meat, expressing the *gata* with roller press, centrifuging in several stages to produce the cream and skimmed milk. The cream is centrifuged to produce the protein solid, waste water, and oil. The skimmed milk is spray dried to produce milk powder. The Gonzaga process fractionates the coconut milk in a settling tank to produce the "water" and cream. The latter is heated at 100°C to produce the coagulated solid and the oil. The Robledaño-Luzuriaga process expresses the milk with a roller press, it heats the milk at 50°C and allows it to fractionate in in a settling tank. The products are skimmed milk, cream and de-oilefied protein. The cream is frozen and thawed, then filtered to produce the skimmed milk and oil. The modified R. L. process provides for drying the meal and expressing it in the expeller to produce the oil and cake. The skimmed milk is subjected to the filter press to obtain the protein isolate. The Cruz-Bernardo process uses hot water for extracting the ground meat. The mass is pressed and the extract is heated to 70°C in a settling tank to produce the "water" and cream. The latter is frozen and pressed in a cloth bag to obtain the "water" and the cream. Oil is obtained from the frozen cream by evaporating the water. The physico-mechanical process of Dr. Birosel subjects the milk to a separator to get a crude cream. This is cooled to 5-10°C and churned to separate the solid fat. On heating, the solid fat separates into oil and protein. The Kraus-Maffie process uses the coagulator and separator to produce the coco "water", the protein, and the oil phase. The Diokno process subjects the comminuted coconut meat to alternate pressure and vacuum to "explode" the cell and release its constituents.

It can be seen that most of the patents concern the breaking of the emulsion, we call coconut milk and the means used are centrifugation, heat coagulation, freezing and thawing, filter pressing, churning and a coagulator-separator device. Only the Diokno process "explodes" the cell — a different concept than just comminuting the meat by the shearing process. There is another concept utilized by the Chayen impulse renderer. A vibrator sends "shock waves" through the comminuted mass to further disintegrate the cells.

The various areas where further studies could be productive will be dealt with in greater detail in a later section.

Non-patented studies. — There were other activities which did not result in patents — either because the studies were not patentable or because the workers were not patent conscious. Clemente and Villa-

corta (1933) made preliminary studies on the celloidal properties of coconut milk. The subject was pursued much later by Gutierrez. Dr. Vicente Lava, besides working on oil recovery, conducted studies on the factors which predispose copra to the growth of molds. Dr. Birosel studied the constituents and properties of coconut oil. He found a natural anti-oxidant which he tentatively identified as cephalin. He also explored the industrial utilization of coconut oil.

Professor Balce studied the industrial possibilities of the husk, shell and meat. He pointed out the prospect of coconut oil as butter substitute, detergent base and soap. By subjecting the oil to pyrolysis, he obtained several new products. Lately, he got involved in studies to increase recovery of protein and oil from the meat. Dr. Banzon was interested in pyrolysis then, he became busy with chlorination and ethanolysis. His students studied the factors affecting the storage of copra, the recovery of oil from the meal and other aspects of oil technology. Subramanyan worked on the factors affecting the drying of coconut meat and came out with a patent on a process for producing high quality copra. He adjusts the pH of the meat surface by treatment with a weak acid, alkali or salt solution so that the meat would be unfavorable to the growth of bacteria and molds.

The studies on the industrial utilization of coconut husk and shell are many and varied, but they are not closely related to the main theme of this paper.

RECENT EFFORT IN THE NIST

In the Agricultural Research Center, there are studies on the development of the coconut fruit, the nature of cadang-cadang of coconuts and the reduction of fiber in the *sapal* by microbial action. The first area of activity is intended to find the best uses of the fruit at each stage of development.

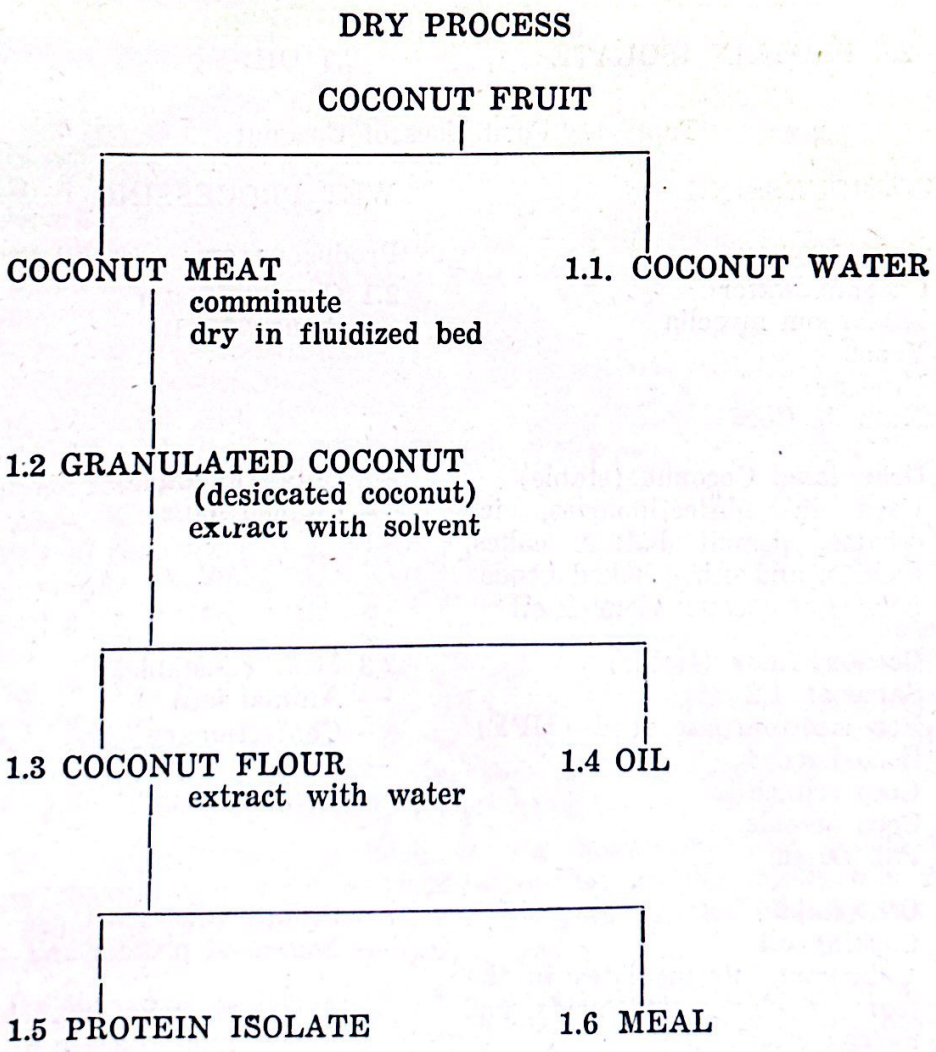
In the Biological Research Center, much activity is given to the utilization of coconut water as a medium for micro-organisms. Being pursued are the science and technology of yeast and mushroom production for food, alcohol and vinegar production, enzymes from micro-organisms, etc.

In the Food and Nutrition Research Center, emphasis is laid on the utilization of the coconut protein and the coconut flour. A high protein supplement of good biological value prepared from coconut flour, mungo flour and skimmed milk powder (CMM) was developed to replace the corn-soybean-skim milk formulation (CSM) donated by the U.S.A.I.D., now being distributed free in Mother Craft Center. Other acceptable products developed with coconut flour are the coco-crunchies, coco-noodles, and coco-cereals. Hopefully, these products would help stave-off malnutrition problems plaguing the country today. The industrial application of these products is worth considering. In the next section, we will take up the collaborative project between the FNRC and the Industrial Research Center on the semi-commercial production of canned *gata*.

The food uses of coconut, as prepared according to the dry and wet processes (scheme 1), are presented in Table 1.

In the Industrial Research Center, studies are undertaken on the fraction of the gata and the extraction of the protein. Oil is used as a starting material for sulfated glycerides and sulfonated fatty acids, which are notable for their detergent action and their bio-degradability. It has also been split with the use of methyl alcohol to produce glycerol and the methyl ester of the fatty acids. A pilot plant was assembled for this purpose. The coconut shell is made into activated carbon and the husk is decorticated to produce the coir fiber. Much attention is given to the economical disposal of the coir dust.

Scheme 1. Products from Coconut Meat



WET PROCESS

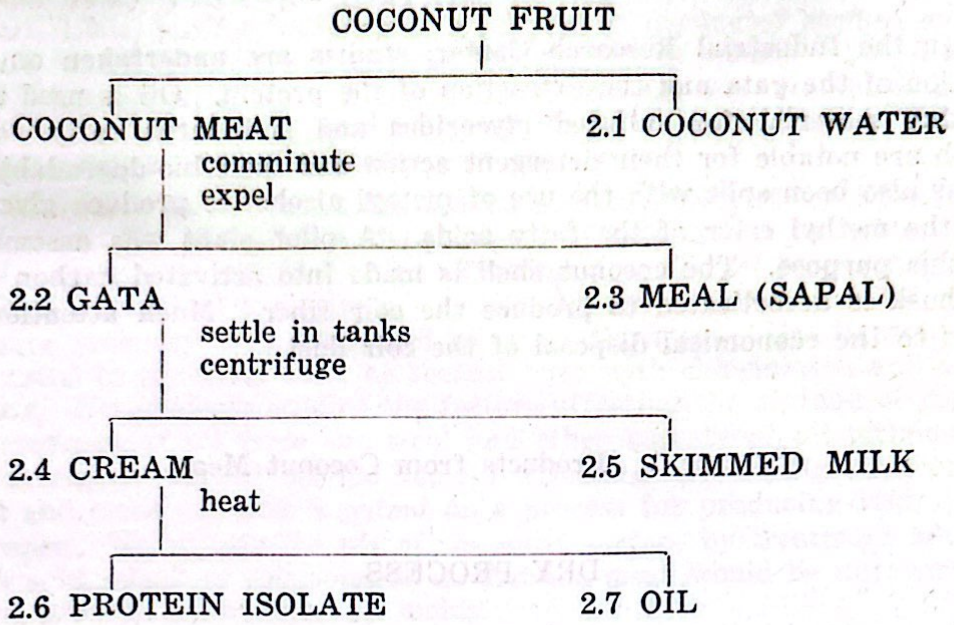


Table 1. Food Uses of Coconut

DRY PROCESSING	WET PROCESSING
Products from:	Products from:
1.1 Coconut water — Mushroom mycelia — Yeast — Vinegar — Nata de Coco	2.1 Coconut water — Same as 1.1
1.2 Granulated Coconut (stable) — Used in confectionaries, ice creams, peanut butter, cakes, cookies, and other baked goods — Source of coconut flour & oil	2.2 Gata (unstable) — Canned gata
1.3 Coconut flour (stable) Same as 1.2 — For multipurpose food (MPF) — Coco noodles — Coco crunchies — Coco cereals — Pan de sal	2.3 Meal (unstable) — Animal feed — Confectionary — Oil — Coconut flour
1.4 Oil (stable) — Cooking oil — Industrial intermediates in the form of free fatty acids and methyl esters — Detergent in the form of sulfated monoglycerides	2.4 Cream (unstable) — Source of protein and oil 2.5 Skimmed milk (unstable) — Fruit and chocolate flavored beverages — Coco honey (low-fat)

1.5 Protein isolates (unstable)
— Infant formula
— Meatless spread
— Canned vegetable loaf
— Condensed gata

1.6 Meal (stable)
— Animal feed
— Coco flour
— Protein isolate
— Instant drinks
— Sodium salt of coconut protein

2.7 Oil (stable)
— Same as 1.4

In the Tests and Standards Laboratories, Dr. Birosel was able to train a group which works on coconut milk and on coconut oil.

The other divisions of the NIST provide technical and management backstopping to the coconut project. For example, the Scientific Instrumentation Division helps in fabricating precision devices like pressure gauges and thermocouples, while the Techno-economic staff is responsible for market surveys and techno-economic evaluation.

PILOT SCALE PRODUCTION OF CANNED GATA

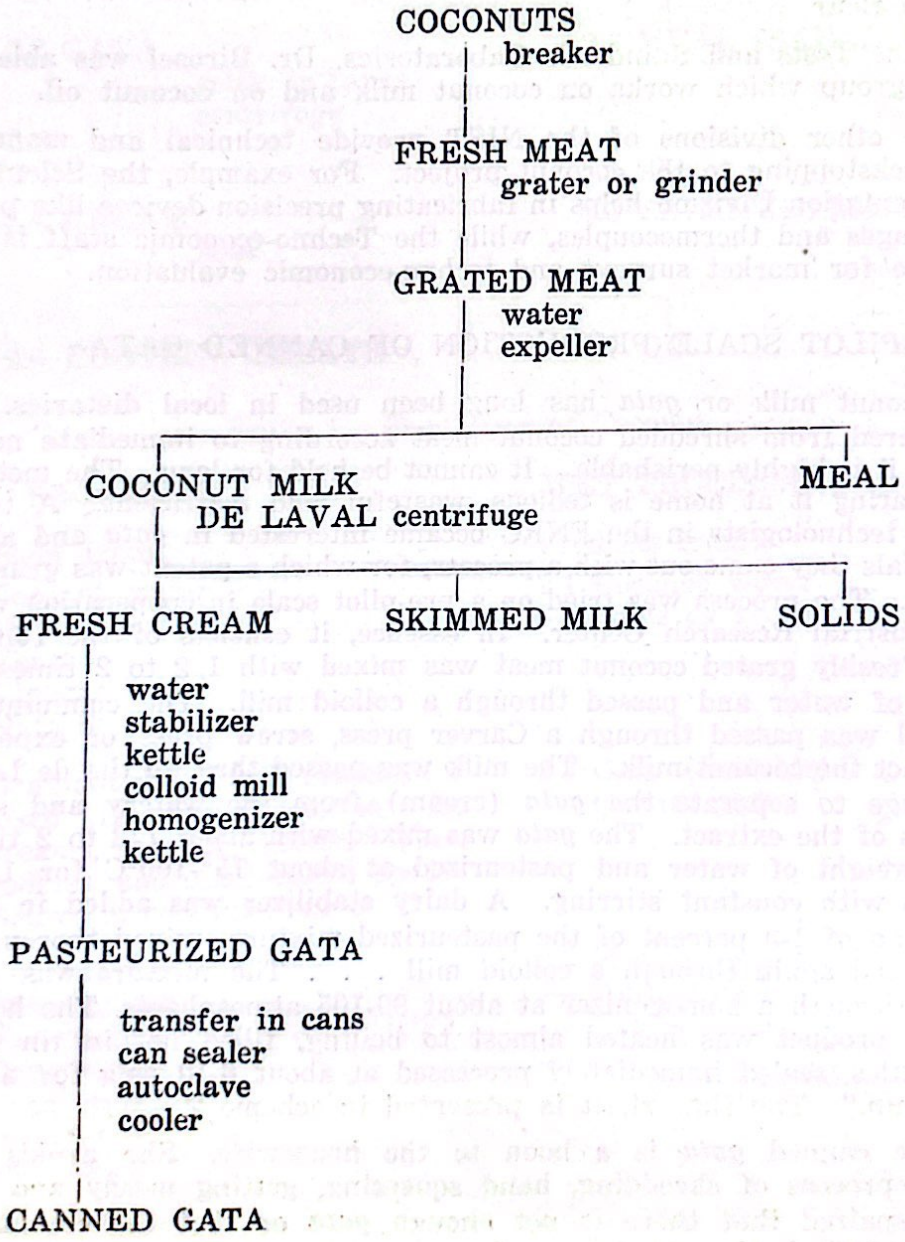
Coconut milk or *gata* has long been used in local dietaries. It is prepared from shredded coconut meat according to immediate needs because it is highly perishable. It cannot be held for long. The method of preparing it at home is tedious, wasteful, and inefficient. A team of food technologists in the FNRC became interested in *gata* and after some trials they came out with a process, for which a patent was granted to them. The process was tried on a pre-pilot scale in cooperation with the Industrial Research Center. In essence, it consists of the following: "Freshly grated coconut meat was mixed with 1/2 to 2 times its weight of water and passed through a colloid mill. The comminuted material was passed through a Carver press, screw press or expeller, to extract the coconut milk. The milk was passed through the de Laval centrifuge to separate the *gata* (cream) from the watery and solid portions of the extract. The *gata* was mixed with about 1/2 to 2 times of its weight of water and pasteurized at about 75°-100°C for 15-30 minutes with constant stirring. A dairy stabilizer was added in concentration of 1-3 percent of the pasteurized mixture, mixed thoroughly and passed again through a colloid mill . . . The mixture was then passed through a homogenizer at about 90-105 atmospheres. The homogenized product was heated almost to boiling, filled hot in tin cans and bottles, sealed immediately processed at about 6-10 psig for about 45-70 min." The flow sheet is presented in scheme 2.

The canned *gata* is a boon to the housewife. She avoids the tedious process of shredding, hand squeezing, getting meshy and getting dispaired that there is not enough *gata* or that the coconut is spoiled. All she has to do is open a can.

On the negative side, there were some misgivings that gata would not have enough local demand because the *gata* users generally have a tree near the house. However, with the fast trend in urbanization, the consumers of *gata* will no longer remain in the coconut producing

regions. Assuming that the local demand does not go up fast enough, there is a big latent demand for *gata* in other countries. Our people who migrate to other places hanker for things they "were used to" back home. Foreigners who had a stint in the coconut growing countries are attracted to articles they got familiar with. These people would buy the canned *gata*, provided that the price of the exported product is reasonable.

Scheme 2. Flow Sheet for Producing Canned Gata



Another problem to tackle in piloting the process is that it is not entirely a foreign-exchange conserving industry. Cans have to be imported and the cost of the can may make a little less than half of the price of the final product. The emulsifier is likewise imported.

A third item to consider is the need for a big capital outlay in terms of machinery. If all the equipment would be purchased from abroad, they would mean a big expenditure in foreign exchange. The need for a big capital outlay will rule out small entrepreneurs in the canned gata business. The big foreign exchange demand will mean that the process can not be adopted as a country-wide scheme of coconut processing.

In our desire to conserve foreign exchange, we attempted to fabricate some of the processing equipment. So far the IRC has reconditioned an old boiler including its major accessories such as feed pump and automatic burner; a water pump out of discarded pumps; rewound burned out electric motors that have long been condemned and pronounced unusable; and came out with its own insulator for steam lines — the cost of which is about 70 percent cheaper than the commercial types. It has also fabricated a grater-comminuter, an expeller, a fluidized bed; dryer, a kneader-mixer, a vibrating sieve, an autoclave-pasteurizer and an integrated conveying system. A brief description of these pieces of equipment follows:

LIST OF EQUIPMENT FABRICATED AT NIST

Grater-Comminuter — A machine with a set of rotating blades that cut the big chunks of coconut meat to uniform smaller sizes and feed to a screw conveyor that in turn feed them to a pair of rotating disks. The distance between the rotating disks which determine the finness of the output can be adjusted by a lever even while the machine is in operation.

Expeller — This is a positive type screw press, the thread of which is so designed as not to produce excessive heat while pressing. The pressing is done against a free moving cage bar.

Fluidized Bed Dryer — Composed of drying chamber and cyclone collector. The meal or *sapal* is fed into the drying chamber by means of a screw conveyor and dried by hot air with induced turbulence. A blower and heat exchanger provide the hot air that takes whatever material is dried to a cyclone collector where it is separated from the dried meal or *sapal.*

Kneader-Mixer — A semi-cylindrical open vessel with through shaft carrying a set of impellers that effect the breaking and mixing of any material placed in the vessel. This vessel can be tilted for convenience of discharge.

Autoclave-Pasteurizer — A cylindrical vessel lying horizontally with steam and water connections between perforated shelves that hold the cans that are being pasteurized.

Vibrating Sieve — A multi-layered screen of desired mesh vibrating by means of a cam.

Aluminum Conveyor — A system of three conveyors one on top of the other that conveys (1) the whole nut with shell, (2) the unshelled coconut meat, and (3) the coconut shells. All these are combined under one frame and driven only by one motor. Changes in direction of flow is effected by counter gears.

ORIENTED RESEARCH AROUND CANNED GATA

The process leaves much to be desired and the project on scaling up of the operation has many unsolved kinks. They call for further studies before the process could be adopted more widely. These may be categorized into (a) techno-economic, (b) processing, and (c) tooling studies.

Techno-economic studies are needed in costs of operations, surveys of the raw materials market, and the product market and systems analysis. A study of costs of operation will enable us to determine where economic could be effected. By adopting a *mathematical model,* we can project costs of operation at various scales or sizes and choose the optimum returns under a certain set of constraints. The raw materials market and the product market need to be kept in pace, if we are to prevent accumulation of inventories or avoid unutilized capacities. On the other hand, if error is to be committed on the side of small units, we can not take advantage of economies of scale. Again, it should be recognized that the operation is just a small part of a complex of socio-economic system represented by the community. It will interact with the system in terms of direct effects, multiplier effects, and backwash effects.

In the processing studies, much more needs to be done along more efficient recovery of the oil and protein from the coconut meat; breaking the natural emulsion which is the coconut milk; stabilization of the made-up emulsion which is the canned *gata,* evaporation of the unwanted water in the *sapal;* the skimmed milk and the protein isolate and methods of preservation and packaging.

Recovery of the cell contents in the coconut meat calls for disrupting the cell wall. The standard method is by cutting and shearing. Another method is by "exploding" the cell by abrupt changes in pressure. A third method is by sending "shock waves" through the cell. Each method can be effected by various means. The separation of the cell contents from the cell wall is usually effected through the application of pressure. Another method is by centrifugation. It may be worthwhile to explore the prospects of magnifying differences in physical properties (like density, solubility, and coagulability) between the cell wall and the cell contents by changing the dispersion medium or the temperature, etc.

The milk, which is a natural colloid, needs to be broken to separate the protein, oil, and water. With cow's milk, the method used are by the use of electrolyte, change in pH, shock or churning, and the use of enzymes. With coconut milk, we take advantage of the difference in density by allowing it to stand or by centrifuging it. It may be worthwhile to try the methods used with cow's milk and explore other methods like modifying the dispersion medium or attacking the natural emulsifier.

In the case of stabilizing the made-up emulsion, a more effective emulsifier than the dairy stabilizer has to be found. Methods of making a homogenous solution should be explored.

The coconut meat contains about 50 percent moisture. Most of this moisture has to be driven off in order to convert the meat into a

stable product. In the wet process, the problem with water disposal becomes aggravated because water has to be added to the comminuted mash to increase the recovery of the protein and oil. The *sapal* in the *gata* process is dried in a fluidized bed. However, a big problem is presented by the skimmed milk. Usually water is driven off by heating the thin emulsion in a pan. In the improved method like the spray drier, the evaporating surface is greatly increased by atomizing the liquid into tiny spherical droplets. There are certain technical difficulties in the case of thin emulsion because the solid to water ratio is very low also, because atomization calls for high pressure and maximum evaporation from the water surface calls for low pressure. Increasing the evaporating surface can also be effected by atomizing the air and allowing it to bubble through the liquid. It may be advantageous in a thin emulsion because there is less resistance to the bubble, hence, there is less coalescence of small bubbles to form bigger bubbles. The idea may be worth exploring. Atomization of the air may be used at the early stage when the emulsion is thin and spray drying may be adopted in the later stage of drying the skimmed milk when the emulsion is thicker.

It is essential that the process should be locally tooled because we have a problem with foreign exchange. Tooling is, however, not so easy because we do not have highly competent resident know-how. We should, therefore, be modest in our aspirations. Those that we can do without much effort should be made locally, and as our competence increases, we can attempt to fabricate more sophisticated equipment. Ancillary skills at metal forging and metal working should be developed to backstop our effort at local fabrication. For example, instead of laboriously machining a worm press from an iron chunk, we can cast the piece and minimize the labor. But casting technique must be developed so that pin-holes and internal defects could be avoided. Again, various exposures of moving parts like shearing, impact, and frictional heating call for various metals and alloys. We should be ready to assess the needs and make the necessary adjustments like alloying and heat treatment. In other words, research is needed to complement "pioneering" commercial operation to improve its competitiveness.

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ECONOMICS ON THE MARKETING OF HOGS AND PORK[1]

by

CELSO B. ROMERA[2]

The hog industry in the Philippines is characterized by a very erratic growth pattern. The factors influencing the pattern are the economics in production and marketing which either encourages or restricts growth. Since much has been said on the economics of production, this paper confines itself to a discussion of the economics of marketing hogs and pork.

AREAS ON HOG AND PORK BUSINESS

There are multifarious levels, both horizontal and vertical, in the hog or pork business. The business can be in production, processing, or marketing. Regardless of levels, hog and pork business is regarded by many as a profitable investment.

On the production side, there are different areas on which investor-producers specialize, namely: breeding to produce breeder hogs; breeding to produce weanlings for sale to growers of porkers; production of weanlings and fattening them for the market; mere fattening of hogs for the market; and maintaining boars for boar services. There are allied business to the production of hogs and which are directly dependent on it. These are production and trading of feed ingredients, like corn, rice bran, fish meal, and other concentrates. The business success of the people engaged in this feed production depends on the extent of utilization of their products by the livestock people. The livestock people in turn depends on the feed producer as a ready source of feed.

On the processors' side, we are familiar with investors who process pork only into ham, bacon, sausages, and others. We are also familiar with canners of pork. The same people are generally traders, or if big enough, they have their own marketing agents. Retailers in public markets also process their left-overs into *tusino* and native sausages.

On the marketing side, several people undertake the function of trading within the distribution chain. They are known in the trade (in their order within the distribution chain) as barrio buyers, municipal or city buyers, *viajeros* (shippers), Manila-based buyer, meat wholesaler and retailer. Each one, by the nature of his function, makes a trade margin.

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MARKETING CONSIDERATIONS

Before discussing the economics of hog marketing, let us discuss briefly the existing hog markets, the kinds of hogs marketed, channels of distribution, trading patterns, and other marketing considerations.

Existing Hog Markets. — The existing hog markets are the Nepomuceno area in Tondo which is presently considered a hog terminal market, followed by Vitas slaughterhouse of Manila, slaughterhouses of Pasay, Cebu, Quezon City, and other small livestock barkets as Luksuhin in Alfonso, Cavite, and to a minor extent, the markets of Tanauan, Lemery, Taal, San Jose, Padre Garcia and Lipa, in Batangas, and Urdaneta in Pangasinan. Other minor hog markets do exist, like the weanling market in Zapote, Las Piñas, Rizal.

Kinds of Hogs Marketed. — There are two distinct kinds of hogs that are marketed within the GMA. They are the natives, which are raised in backyards, and which practically are self-supporting, and the purebreds, which are purposely grown.

Of the hogs marketed in the GMA, approximately 70 percent are natives with the rest coming from piggeries. Native hogs are those which are generally native in look (long snout and lean type), small size, generally of black color with a non-uniform conformation. The purebreds (or breeding as known in the trade) are those with bloodlines, look, size, color and conformation resembling that of Landrace, Large-white, Duroc, Berkshire, Poland China, and the likes. These breeds are of foreign origin. They are grown purposely for their commercial value.

Channels of Distribution for Natives. — In terms of distribution flow, while there are ramifications which are distinctly inherent to each of the specific areas and traders, the general pattern for natives and small hog raisers is from farmer to first buyer who undertakes the canvassing function at the barrio producers' level; to second buyer, who undertakes the assembling and shipping functions oftentimes town- or city-based; to third buyer who is the financier and is Manila-based; to fourth buyer who is the meat wholesaler (he buys live hogs from the third buyer for slaughter) and who undertakes the responsibility of delivering and selling on deferred payment basis to the fifth buyer (retailer) who in turn sells to the ultimate end-users — the consumer.

The described distribution flow holds true for native hogs and small piggeries in the production centers of Mindanao, Visayas, Cagayan Valley, and Bicol. Variations, however, do occur where the chain may be shorter and this is due to the blending of functions of the assembler and shipper, depending on the practice in the area and the scope of operations.

Channels of Distribution for Purebreds. — The channel of distribution for purebreds is shorter than that of the native. The barrio buyer is skipped and sometimes the city-based agent is also skipped. Most piggery raisers within the immediately adjacent provinces to Manila sell direct to retailers or to institutional buyers who are the best buyers. Some have their own retail outlets.

There are ramifications in the simplified distribution channel presented above, and it is influenced by the various economic and social factors such as:

— the interpersonal relationships of people within the chain, members are oftentimes blood relatives or *compadres;*

— the economic relationship between buyer and seller where advances in big amounts are given on a trust system basis, formal documents are absent;

— the practically perfect knowledge of these people on hog marketing and handling;

— the geographic location of the hogs.

Other Marketing Considerations. — Some other marketing considerations which affect the marketing of hogs are methods and transport facilities, buying and selling practices, and delivery schedules.

Methods and Transport Facilities Employed to Effect Flow of Hogs. — The means of transporting hogs from the barrio to the municipality can range from the use of sleds pulled by a carabao to jeeps or trucks. On pre-arranged occasions, the hogs are brought to the roadside and picked up by big trucks (owned by city-based buyers) which ply the route quite regularly.

Buying and Selling Practices, Financial Relationships, and Mode of Payments Within Total Distribution Network. — The buying and selling practices within the total distribution network has been established to a point where each layer of middlemen relies on, and, protects each other.

The terms of payment are practically on a cash and carry basis up to the city-based buyer. The city-based buyer oftentimes a beneficiary of advances from the Manila-based buyer liquidates his advances by the hog shipment, after which a new fund is advanced to him.

From the Manila-based buyer to the meat wholesaler, it is on a cash and carry basis and from the meat wholesaler to the retailer, it is usually one day credit payment. Depending on the relationship, the payment may be on a deferred basis.

Delivery Schedules. — There is a regular shipping schedule from the city/municipal-based buyer to the Manila-based buyer. Some city-based buyer have a weekly schedule, others every other week. Delivery schedules are timed so that the arrival in Manila will ascertain continuous supply to the Manila-based buyer.

Handling Factors. — Handling of hogs from the farm to Manila market requires skill and knowledge. Any lack of skill or knowledge on the proper handling of hogs while in transit will cause an extremely high degree of loss in weight or possible death to the animals.

An individual convoy caring and feeding hogs can handle anywhere from 50 to 100 heads while on boat. A small shipment, therefore, has to carry the overhead cost of the convoy.

Problem of Free Flow of Hog Carcasses. — There is also the problem of free flow of hog carcasses arising from governing municipal ordinances in practically every town and city in the Greater Manila area

which require re-inspection. Re-inspection, more often than not, is used as a harassment tool by local officials to protect the "potential earnings of their municipality."

Network and Prices Dictated by Manila-based Buyer. — The network counts with a Manila financier/trader (organized formally with the others and meeting regularly) who "calls the shot" as to buying prices and volumes of purchases. This Manila-based buyers or traders will have an agent in, say, one of the major cities of Visayas and Mindanao, for instance in Cebu, Bacolod, Cagayan de Oro, Davao or Ozamis. The city-based agent in turn, will have his agents in the municipal level and the municipal agents will have their own agents at the barrio level.

To a great extent, the prices are dictated by the Manila-based buyer. The Manila-based buyer's prices are in turn dictated by competitors for live hogs. The numerous number of competitors in Manila serves as a self-correcting mechanism for the prices paid for the live hogs as the Manila-based buyer has to pay a better price (up to a certain level) if they want to remain in business.

Weight Deduction Upon Sales. — It has become a standard practice to deduct three kilograms at Nepomuceno market as allowance for feeds taken up by the animal whenever sales is consummated form *viajero* to the Manila-based buyer. The deduction is taken from the animals' weight prior to acceptance of the Manila-based buyer.

ECONOMICS OF MARKETING HOGS AND PORK

Because of the functions performed by traders, it is just natural for them to earn in the process. Otherwise, the chain will break down, causing more harm to the industry. For who shall undertake the assembling and shipping function for the small hog raisers?

The succeeding discussion illustrates the role played by those hog traders and the margin of profit they earn.

Flow of Hogs from Farmer to First Buyer or Barrio Agent. — The barrio agent buys from the grower at the dictated price of the municipal agent, less discounts and margins for his profits. This hog buyer at the barrio level is practically precise in estimating the liveweight of hogs. The barrio agent quotes a buying price to the producer. The producer, not knowing the weight of the animal and not being used to selling hogs and not being aware of current prices and basis of pricing, will invariably agree to selling at the dictated price. The barrio agent sells to the municipal agent, making money on the transaction by having a commission of either ₱5.00 per head or ₱0.02 to ₱0.03 per kilogram based on the liveweight. In addition to the commission, the barrio agent also may profit by the difference of the underprice and the buying price of the municipal agent and the price difference may go as high as ₱0.10 per kilogram. Generally, he does not have capital and transportation facilities of his own. Whenever he finds several hogs ready for purchase, he notifies the municipal agent who sends his small truck (3/4 ton size) to pick up the hogs. The truck carries a scale (espada), which is often tampered with. The *espada* is used for weighing and is the basis for final payment.

Flow of Hogs from Second Buyer (Municipal-based) to Third Buyer (Manila-based). — The next link in the chain is for the barrio-based buyer or agent to transfer to the municipal- or city-based buyer the hogs wherein he (barrio agent) gets paid. The municipal buyers buy the hogs from the barrio agent at a price dictated by the municipal buyer. The municipal agent gets his income either from commission if he is a member of the chain or gets a margin of profit which is the difference between his purchase price and the selling price. The usual commission or margin is about ₱10 per head.

The municipal agent has a small corral near his residence and he accumulates the hogs for some time before informing the city-based buyer that he already has some hogs for sale. He accumulates anywhere from 50 to 80 heads, which are good for one truckload. The city-based buyer, once notified, will send his truck together with a weighing scale (espada) to weigh the animals and make payment based on the previously agreed upon buying price.

Immediately upon loading the hogs on the boat, the city-based buyer wires his principal in Manila informing him of the number of heads and weights. Advances made by the Manila-based financier may be liquidated by the shipment. The pick-up time from the municipal level to the port is so calculated that from pick-up time at the municipal level, truck goes direct to the port for loading on the boat. This situation is deliberate to minimize losses while in transit.

Prior to shipment, however, various regulatory requirements have to be complied with, some of them necessary, some unnecessary.

Flow of Hogs from Third Buyer (Manila-based) to Fourth Buyer (Meat Wholesaler). — From the Manila-based buyer, say from Nepomuceno St., Tondo, Manila, the hogs are bought by the wholesaler who undertakes the function of having the hogs slaughtered and brought to his retailer clientele. Oftentimes, the meat wholesaler is one of the bigger (in volume) retailer at the retail markets. The Manila-based buyer makes about ₱10.00 per head and the meat wholesaler makes about ₱7.00 with the retailer making about ₱25.00 for the 50 kgs. dressed carcass.

To summarize, the earnings of the middlemen at the various levels in the channel of the native hogs are as follows:

Chain	*Earnings*
Barrio agent	₱ 5.00 per head or ₱0.02-0.03/kg. as trade margin
Municipal-based buyer	₱10.00 per head
Manila-based buyer	₱10.00 per head
Meat wholesaler	₱ 7.00 per head
Retailer	₱25.00 per head

Effects of Dressing Percentage. — Based on constant observation of the pork business, the following information have been gathered. The dressing percentage from a hog appears to be affected by the following:

— breed or bloodline of hog
— feed and nature of feeding
— manner of fasting the hog prior to slaughter

We have observed that the cross of two bacon type (Landrace, Large-white, Yorkshire) hogs with a lard type (Duroc or Hampshire) resulting into a triple cross produces a fast growing hog with a high dressing percentage.

More important than dressing percentage, however, are the percentage proportions of each specific cut of a hog carcass. There should be more of the prime parts covering from the rump and shoulder and less of head and feet. Ham and picnic are the more salable parts and also premium priced. The head and the feet (pata) are less salable and priced much less. What is desired by the market is a low percentage of head, feet and fats and more of the prime cuts. Comparatively, the percentage cuts are as follows:

Cut	*Weight*	*Percentage*
Ham and picnic	28.5	53.5
Belly	7.0	13.0
Pork Chop	6.4	12.0
Pork leg	4.0	7.4
Tenderloin	0.6	1.0
Head	5.2	9.4
Fat	1.8	3.3
Lost weight	1.0	
Total	54.5	99.6

Retailer's GROSS PROFIT — approximately 10%

The retailer's earning can be misleading as non-sale of heads and feet, which are relatively non-marketable when compared to other cuts, can cause losses to the retailer.

MARKET POTENTIAL FOR HOGS

The market potential for hogs or pork may be considered sizeable. This situation is apparent when one compares effective demand against nutritional demand. Furthermore, meat importations in the past years have indicated that local meat supply is inadequate in filling up domestic needs.

The effective demand in the Greater Manila area is about 4000 to 5000 heads of hogs daily. The consumption is at the higher level during weekends, paydays, and fiesta days.

Retailing this number of hogs is estimated to be handled by about 2000 retailers. The retailers in turn are supplied by about 100 meat wholesalers who get their supply from about 20 Greater Manila-based hog dealers.

A new market is being created by Greater Manila Terminal Food Market (GMTFM) for producers. GMTFM in its initial operations will be a market for hogs, moving towards serving as a marketing agent till a perfect market is developed.

RECOMMENDATIONS

Some of the problems earlier cited are part of our social and economic system and may not be easily changed. The market demand, however, can be attended to and met. It is recommended, therefore, that areas of research be undertaken with the following objectives:

1. Development of a breed which has a small head (less than 7 percent of total weight), small feet (less than 8 percent) of total weight with primal parts higher than 60 percent of total weight. This hog should be a fast grower and weight gainer, and should attain a weight of 80 kgs. in about 5.5 months instead of 6.5 months presently achieved by efficient piggeries. I would like to think this is possible as it was done on broiler chickens.. Ten years ago, to grow a kilo of broiler in 10 weeks was considered outstanding. Two years ago, the 10 weeks was reduced to 8 weeks. To date, it is not unusual to find at the commercial farm levels farmers growing 1.3 kgs. chickens in 6.5 weeks.
2. A feed formula be developed, utilizing available feed ingredients that will give the attractive reddish color of meat and at the same time have a better meat keeping quality under ordinary public market condition. I think the existing public markets will be with us for sometime. Presently, an exposed meat in the market will stay attractive and have the quality maintained for at most five hours.
3. A centralized livestock market and a centralized feed grain market should be developed for the purpose of having a perfect market possible.

   A centralized livestock market will encourage processors to expand production as they know of a ready raw material source. Export can be developed as a sizeable volume is available from one place and producers will know where to bring their livestock for sale.

   GMTFM is moving towards this objective but it needs the support of producers — which is happening.

ELECTRONIC QUAKE-WATCHING

by

JOHN LENIHAN[1]

A few years ago an elaborate monitoring system was established round the magnetic observatory at Eskdalemuir, a lonely spot in the south of Scotland. The equipment included a number of seismometer — earthquake recorders — linked with sensitive electronic processing units to interpret the signals. The apparatus worked well but one type of signal, which turned up fairly regularly, puzzled them greatly because it did not seem to match any known events, as judged from records of other observatories.

The mysterious signals always occurred on moonless nights — an important clue which, with a little local knowledge, led to the correct solution. The unexpected tracings were produced by small charges of explosive, detonated by poachers catching fish in Solway Firth, 20 miles (32 kilometers) away.

HOT IN THE MIDDLE

Though the development of seismology received a considerable fillip from the need to monitor nuclear weapon tests, the detection of earthquakes is a large, important and wholly peaceful activity. Earthquakes occur because the earth has never really recovered from the thermal stresses produced when the original molten mass solidified to form the globe that we live on. The core of the earth is, even now, a mass of liquid — and very hot; it may indeed still be warming up. The mantle, which reaches half way to the center of the earth, and the crust — really no more than the top layer, about 40 miles (64 kilometers) deep — are made of rocks which do not conduct heat at all well. Consequently, the expansion produced by heat from the core can only be taken up by buckling and cracking, often with disastrous results.

Red Indians, according to legend, could put their ears to the ground and detect a distant coach or train. Scientists interested in earthquakes use a more sophisticated version of the same technique, based on the detection of small earth movements. The seismometer depends on the property of inertia, by which a stationary object tends to remain at rest, even though the surroundings may be moving. The well-known party trick of whipping away a tablecloth without dislodging the crockery is a demonstration of inertia.

EARLY MODEL

An early seismometer, made towards the end of the 19th century, consisted of a heavy block of metal hanging above or alongside a slowly rotating cylinder and fitted with a pen or needle to record small move-

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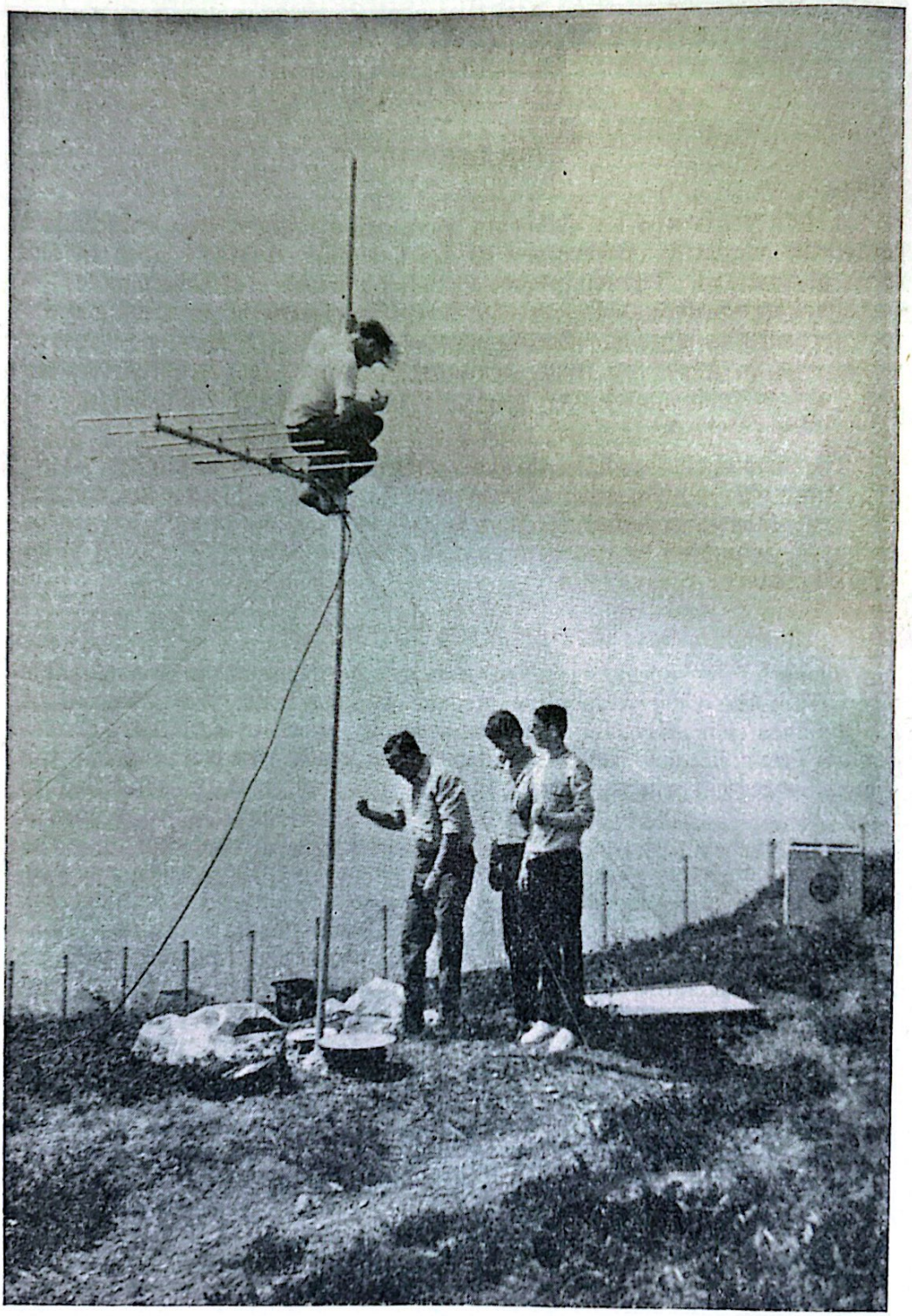


Erecting the aerial for transmitting signals from the seismometers back to base.

ments. In an earthquake, the heavy block stayed at rest while the surrounding rocks moved and the pen or needle traced the shock.

As the theory of the seismometer became more fully understood, it was seen that a large heavy mass was not really necessary; what was more important was that the mass should be suspended in such a way that its natural period of oscillation was rather long — up to several seconds. With this knowledge, it became possible to design sensitive seismometers of quite small size and weight. The instruments devised by Dr. P. L. Willmore of the Global Seismology Unit, Edinburg (part of the Institute of Geological Sciences) and now used all over the world, weigh only about 20 pounds (9 kilograms).

Dr. Willmore leads a team of scientists who have just begun an important earthquake research project in Iran, supported by a grant of about £35,000 from the Overseas Development Administration.

AMONG THE MOST DANGEROUS

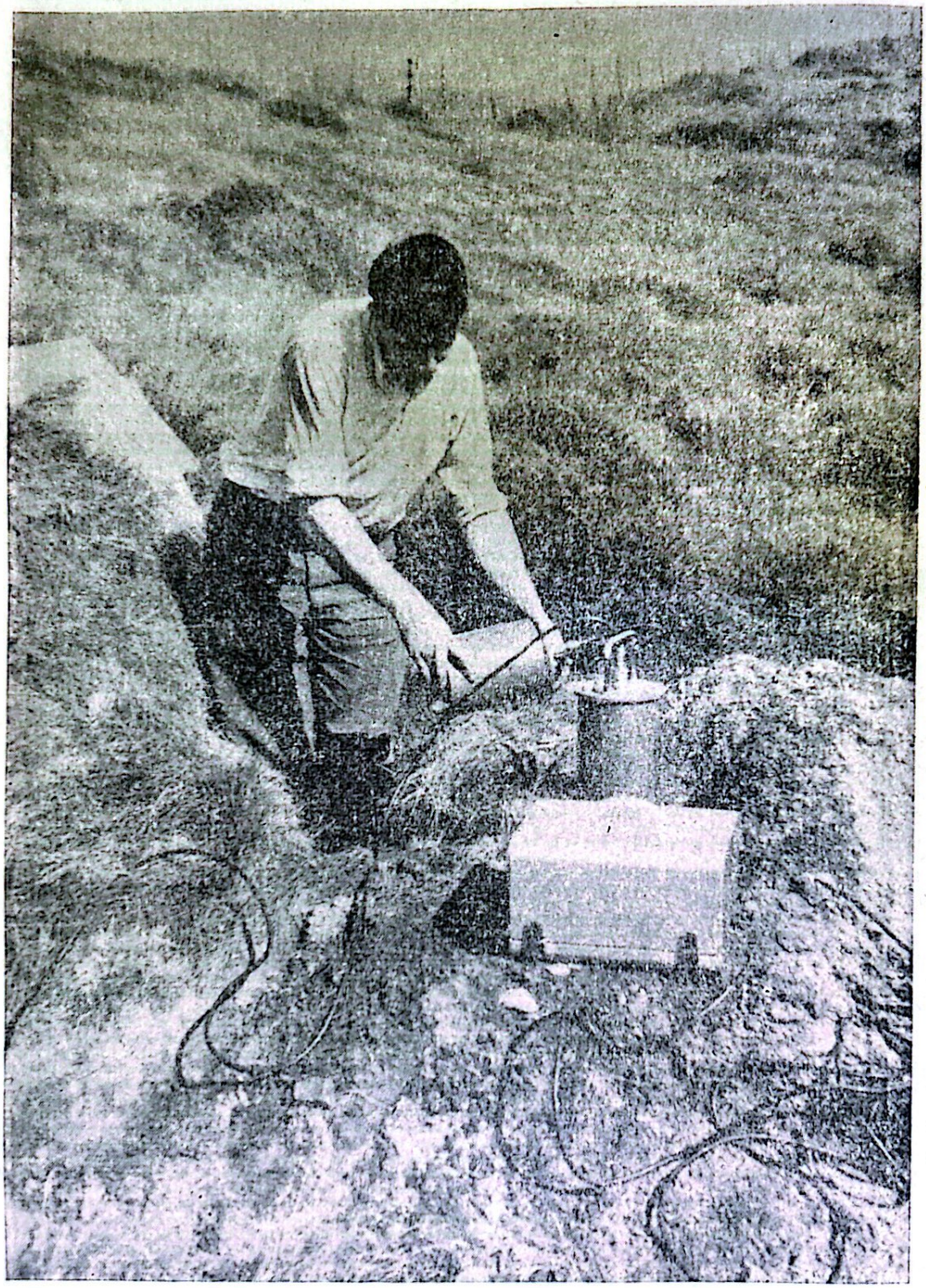
Iran lies in a belt of severe earthquake activity, stretching from Turkey to Pakistan. Deaths from earthquakes in Iran often amount to more than 10,000 in a year. Similar disturbances in Japan or California (other quake-prone regions) would produce fewer casualties; Iran is among the most dangerous countries in the world from this point of view, because so many of the houses, built with mud walls and heavy roofs, collapse when shaken by relatively light tremors.

Although Iran is a readily accessible country with a good level of scientific competence, earthquakes have had little study until now. Yet the problem is of considerable importance, since the accurate mapping of danger areas and the assessment of improved building techniques would contribute greatly to the saving of life and property. Better understanding of local earthquake activity is also a matter of concern to the oil and mining industries which are so significant in the economy of middle eastern countries.

IN OPEN MOORLAND

Until quite recently, seismometers were substantial permanent installations, usually associated with observatories or other large scientific establishments. The equipment used in Iran illustrates a new concept, developed by Dr. Willmore and his colleagues in Edinburg. A full-scale trial of the new system has been operating in Scotland since 1969. Six small seismometers are located at chosen sites within 100 kilometers (62 miles) of Edinburg; each instrument sits in a concrete pit, usually in open moorland. The tiny electrical signals generated in the seismometer by earthquake activity are amplified by electronic units built into the seismometer casing and then transmitted by radio to a central station at the Royal Observatory, Edinburg. The pocket-sized transmitter is a modified police radio.

The signals received in Edinburg are recorded on magnetic tape. A standard 1800-foot (550 meter) reel of one-inch (25.4 milimeter) tape records up to 24 tracks and runs for 48 hours. Six of the tracks



Horizontal and vertical Willmore Mark II seismometers being placed in position.

are used for signals from the out-stations, three are available for simultaneous recording of signals from three seismometers in the Edinburg observatory, and others are used for time marks.

ALL IN ONE LAND-ROVER

The basic design features of the Scottish system — the most advanced of its kind in the world — are now being used in the new project recently begun in Iran. The entire equipment for the project was driven from Edinburg in one Land-Rover in March 1871, accompanied by Dr. Stuart Crampin of the Global Seismology Unit. The recording equipment has been set up in a temporary field base at Lar, a town in the south of Iran which is in one of the most vulnerable areas for earthquakes. Seismometers are being distributed over an area up to 200 kilometers (124 miles) in diameter and, when once adjusted, will operate reliably for long periods; one set of batteries, for example, lasts for a year. Signals from the out-stations are being recorded on magnetic tape at the base and analyzed.

Though the initial effort is being provided by British staff and funds, it is expected that the Iranian contribution will increase rapidly. The first project, already under way at Lar, is being conducted in association with the University of Teheran, which is providing some staff. Other Iranian scientists and technicians will be trained by the Edinburg team.

FUTURE PATTERN

The pattern of activity foreseen for the future is that the British equipment, with a small staff from Edinburg, will be available to join in any project jointly agreed between the Institute of Geological Sciences and an Iranian university, company or other agency. Funds from the Overseas Development Administration will be used in the early stages of this collaboration.

The enterprise which has now begun will make Iran one of the best equipped countries in the world for seismological studies. Apart from the scientific benefits, research will, in the course of time, help significantly in reducing the earthquake death toll. The progress of the work will be closely watched, because the new British equipment and methods are likely to be in demand in many other parts of the world where earthquakes are a hazard to life and property.

AVERCH, HARVEY A., JOHN E. KOEHLER, AND FRANK H. DENTON, 1971. THE MATRIX OF POLICY IN THE PHILIPPINES. xvii — 234 pp. Princeton, New Jersey: Princeton University Press.

This is a Rand Corporation study written by two economists and a demographer and can best be characterized as an empirical analysis of several related areas of concern to policymakers. More specifically, the authors have attempted to apply the quantitative tools of modern behavioral science to the available data on politics, economics, crime and dissidence in the island nation. The data used have been available for some time and pre-date the reelection of President Marcos and the student riots of early 1970. Some of the conclusions coincide closely with those presented by analysts using more traditional methods, but a few of them contrast markedly with the generally accepted views on Philippine subjects.

The book is not a balanced, comprehensive treatment of the state of the nation, nor is it intended to be one. For example, it contains little geography, anthropology, or history. Parts of the treatment can be read and understood only by those individuals familiar with factor analysis. But, if the general reader will accept or ignore the methodology, and concern himself only with the introduction, the verbal aspects of the presentation and the conclusions, he can oftentimes acquire a good overview of the subject analyzed.

Filipino readers will be interested in some of the findings. (1) The political system appears to be stable and generally responsive to the desires of most of the people, the stability resting on a rural sector voting along traditional lines with politicians responding primarily to rural demands. (2) The economy appears to be performing better than commonly thought. (3) The periodic lurching of the economy and the balance-of-payments crises which attract the attention of foreign observers are deeply rooted in the behavior of the political system and should not be seen as manifestations of any "fundamental dis-equilibrium" in the usual economic sense. (4) Crime is not a nationwide problem; violence and fear of violence are concentrated in a few areas. (5) The HMB are not a serious threat to the government. The organization is more an application of terror and coercion than a real attempt (or demand) for social and economic reform.

In a somewhat different context, the authors conclude that: (1) The general image of the Philippines needs to be changed. And, (2) it is misleading to view the Philippines as an aggregate. The country is so diverse, with regions varying sharply in many dimensions, that its characteristics cannot be summed up in meaningful fashion with a few aggregate indicators or collective impressions. Philippine scholars, both national and foreign, certainly find nothing new in either of these generalizations.

There is an index and a sixteen-page bibliography, principally economic, and political titles.

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SPENCER, J. E. AND WILLIAM L. THOMAS. 1971. ASIA, EAST BY SOUTH: A CULTURAL GEOGRAPHY. Second edition. xv-669 pp. New York City: John Wiley & Sons. $16.50.

This is a lot of book. It is a systematic, regional study of Monsoon Asia, and it is cultural geography in its widest interpretation. It is more than a revision of the senior author's earlier volume with the same title. (Reviewed in PGJ Vol. III, 1955, p. 110.) It is a complete rewriting, and with complete reorganization of the most material, as well. It draws heavily upon the Asian experiences of both authors, some as recent as 1970. It attempts to give the reader a complete understanding of the Oriental culture world as defined by the authors, and in general succeeds in that attempt.

The division of the book into three parts is traditional, but the space and subject matter allocated to each part is less orthodox. Part I, Systematic Geography (280 pages), contains the usual chapters giving an overview of the entire region: landforms, climate, soils, natural vegetation, mineral resources, and agricultural systems. But, Part I also contains chapters entitled People, Languages, and Population; Religion, Law, and Social Order; Patterns of Historical contact; Settlements and Their Architectures; Geography of Health and Disease and other topics normally omitted or treated in the individual country analyses.

In the second section, The Regional Expression of Cultures (388 pages), the authors give a country by country description beginning with the Indian Sub-Continent, continuing through Southeast Asia to Indonesia and the Philippines, and concluding with East Asia (China, Korea, and Japan). There is little physical geography in these chapters. It is regional cultural geography with the emphasis on historical geography or regional cultural development. The chapter on modern China is outstanding and the few pages devoted to modern industrialization in Japan represent truly superior analysis and writing.

Part III contains 50 pages of reference material. It includes tables or populations, densities and mortality rates; agricultural crop acerages and animal populations; and selected social and economic indicators. There are seventeen pages of bibliographical references, arranged as chapter references, and both a subject and a place-name index.

The volume is illustrated with 160 maps, 26 of them new in this edition, and 23 pages of photographs, presented in 5 groups of 4 to 6 pages in each grouping. The maps are appropriate and well chosen, but photo reproduction is not as clear as desirable.

Without question, this is the most complete geographical treatment of Monsoon Asia, particularly with respect to the cultural emphasis. But, students will not find the writing as easy to read and comprehend as Cressy's now obsolete *Asia's Land and Peoples*. Nor will the organization conveniently fit the standard course outline used in most courses entitled Regional Geography of Asia (or parts of Asia).

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