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SOME PROBLEMS OF IMPROVING AGRICULTURAL PRODUCTIVITY

S. C. HSIEH

(In November 1966, when I was a Visiting Professor of Agricultural Economics under the Ford Foundation-sponsored UP-Cornell Graduate Education Program, at the U.P. College of Agriculture in Los Baños, Laguna, Philippines, I was invited by the U. S. AID Office in Manila to speak at a Thursday breakfast meeting participated by the Senior Policy Staff of various agricultural and rural development agencies of the Philippine Government. The subject for discussion concerned the problems of improving agricultural productivity with special reference to the Philippine situation. Upon the request of the participants, the speech was later written in a paper which was produced by AID for distribution. Since we are now quite concerned with the problems of agricultural development in the Asian region, I would like to circulate this paper among our staff for further criticism and deliberation.)

Introduction

It seems to me that we have sufficient knowledge and understanding concerning the factors that significantly affect agricultural development. These factors range from physical and technical inputs to capital and credit sources and uses, from agricultural extension techniques, institutions and organizations to socio-economic incentives and markets. In the past ten to fifteen years, numerous books, articles, and scientific papers have been written by scholars, professors and technicians, and as many workshops, seminars, discussion meetings, training courses have been held dealing with the factors affecting agricultural development in many countries. In addition, many econometricians and statisticians have developed a number of highly sophisticated and complex econometric models which attempt to explain the process and behavior of economic and agricultural growth in the developing countries. Yet, in spite of all these factors, agricultural production in many developing

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countries remains stagnant. I wonder to what extent these academic exercises have contributed to actual production increases at the farm level and to improving the level of per capita output in agriculture of the less developed countries.

I believe we know a great deal about the generalities for improving agricultural productivity but still lack the specific and precise knowledge on how productivity increases in a given country starts and how a meaningful agricultural development program is effectively sustained. I have observed in several Asian countries that discussion on land reform, improvement of agricultural extension and credit, irrigation systems, improved varieties of seeds or new crops have been continuing for more than ten to fifteen years. Still unit yields of major crops and over-all agricultural productivity remained unchanged even after many of these programs were implemented. We have to ask ourselves why this situation persists and what can be done to remedy it in the most decisive and permanent way possible.

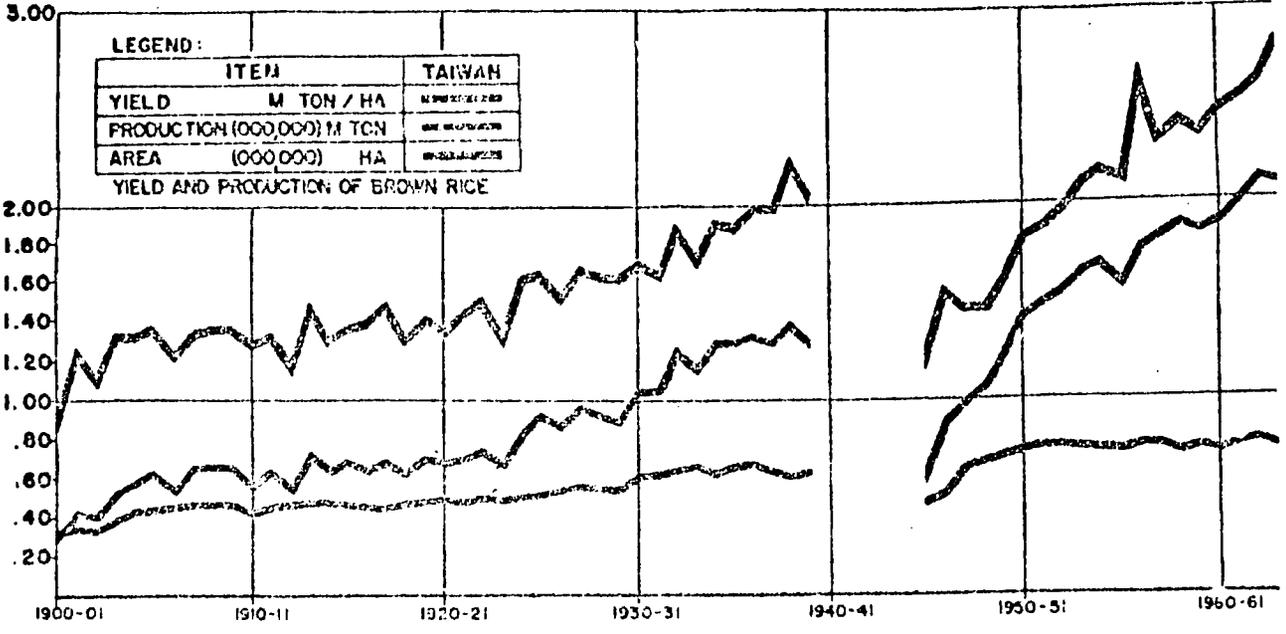
Let us take a familiar example from the Philippine agricultural situation. I visited the Philippines in June 1956 to attend a United States Foreign Operations Administration (FOA, as you know, was one of the predecessors of AID) sponsored conference on agricultural credit. At that time both the Philippine Government and FOA were implementing a large-scale agricultural credit program through the ACCFA and the FaCoMas. Many people then thought that agricultural credit was the key to the problem of low agricultural productivity and that by providing credit at reasonable rates of interest to the farmers they would improve agricultural production. After ten years we realize that the farm credit program has failed to solve the problem of low agricultural productivity.

A few years ago, many people thought that new land reform legislation would be the answer to increasing agricultural output. The Land Reform Code (R.A. 3844) was enacted by Congress on August 8, 1963 and the National Land Reform Council was established to satisfy the needs of agricultural development in land reform declared districts. Evidence and experience gained from pilot land reform areas indicate that the problems of increasing agricultural productivity are not so simple and that Land Reform alone does not guarantee any improvement of productivity at the farm level. People have also talked about improved seed varieties and fertilizers for many decades, but again experience has shown that these factors of themselves have not produced any significant impact or real breakthrough on agricultural productivity or increased unit yields of major crops in the country as a whole.

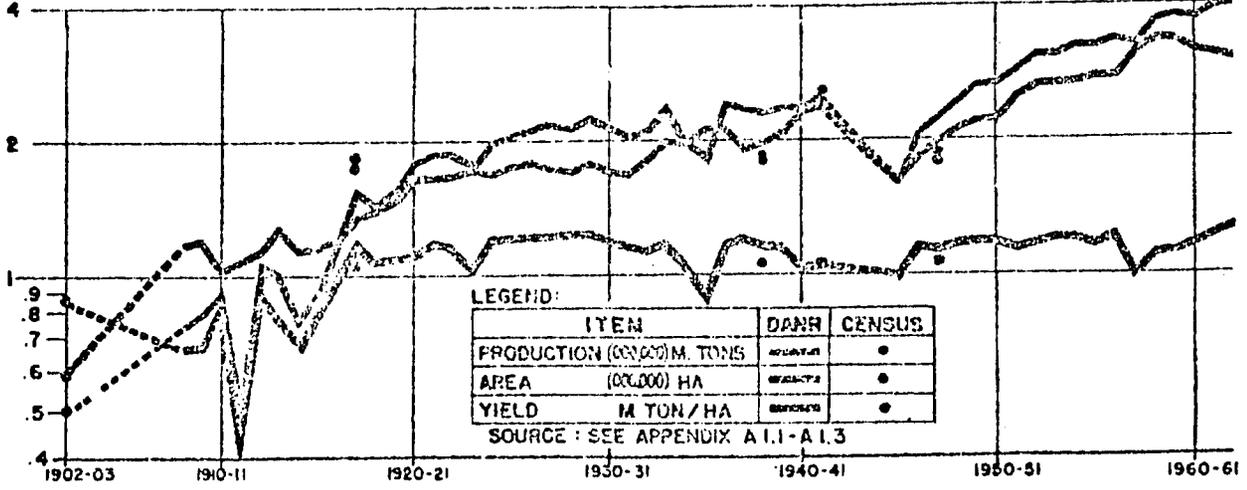
#### I. Rice Production Trends of Three Asian Countries Compared

Let me present some rice production figures over a fifty to sixty year period of three Asian countries - Taiwan, the Philippines and Thailand - to show you the similarities and contrasts in the productive performance of these countries in relation to area expansion. You will note from Chart No. 1 that in Taiwan, while the cultivated rice area between 1900 to 1960 increased only slightly (from about one-fourth to about three-fourths of one million hectare on the average), yet rice production and yields per land unit made dramatic increases from about .80 metric tons to over 2.80 metric tons per hectare. Meanwhile, in the Philippines, whereas the cultivated rice area had been extended from about 0.6 million to over 3 million hectares on the average over the same sixty-year period, still rice production per land unit had not grown appreciably (from about .90 metric tons to around 1.2 metric tons per hectare on the average). Similarly, Thailand had expanded considerably its cultivated

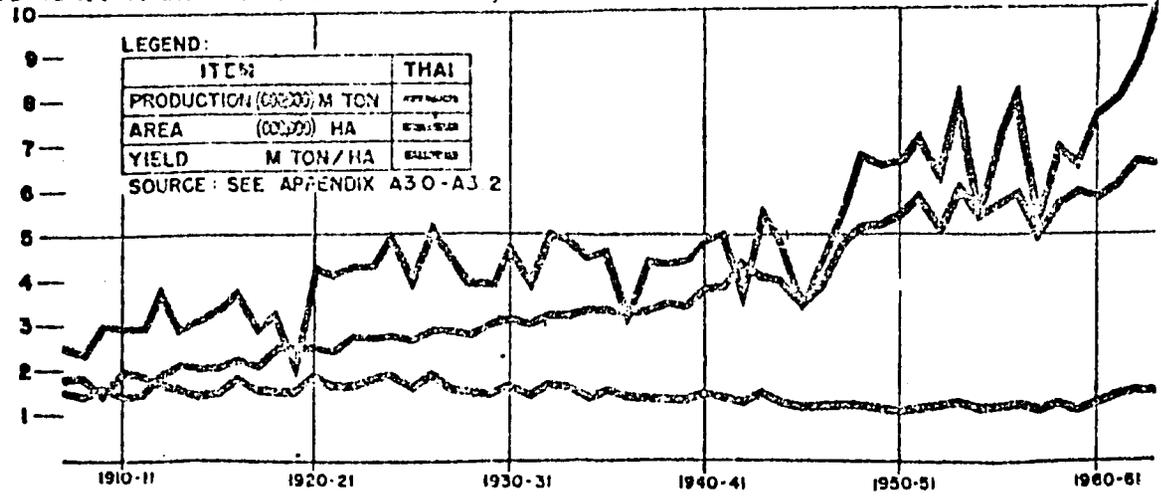
**LONG TERM TREND OF RICE PRODUCTION, AREA AND YIELD IN TAIWAN (1900-1963)**



**LONG TERM TREND OF RICE PRODUCTION, AREA AND YIELD IN THE PHILIPPINES (1902/03 TO 1962/63)**



**LONG TERM TREND OF RICE PRODUCTION, AREA AND YIELD IN THAILAND (1907/08 TO 1965/66)**



rice area from 1.5 million hectares to over 6.5 million hectares during the fifty year period, 1910 to 1960, but its rice yields over that period decreased from about 1.90 to 1.5 metric tons per hectare.

From Chart No. 11 it will be seen that Japan, South Korea, and Taiwan have had impressive per hectare yields of rice without expanding significantly their cultivated farm areas, whereas Burma, Pakistan, Thailand, India and the Philippines have not succeeded in improving to an appreciable degree their per hectare yield in proportion with the expansion of per farm cultivated area.

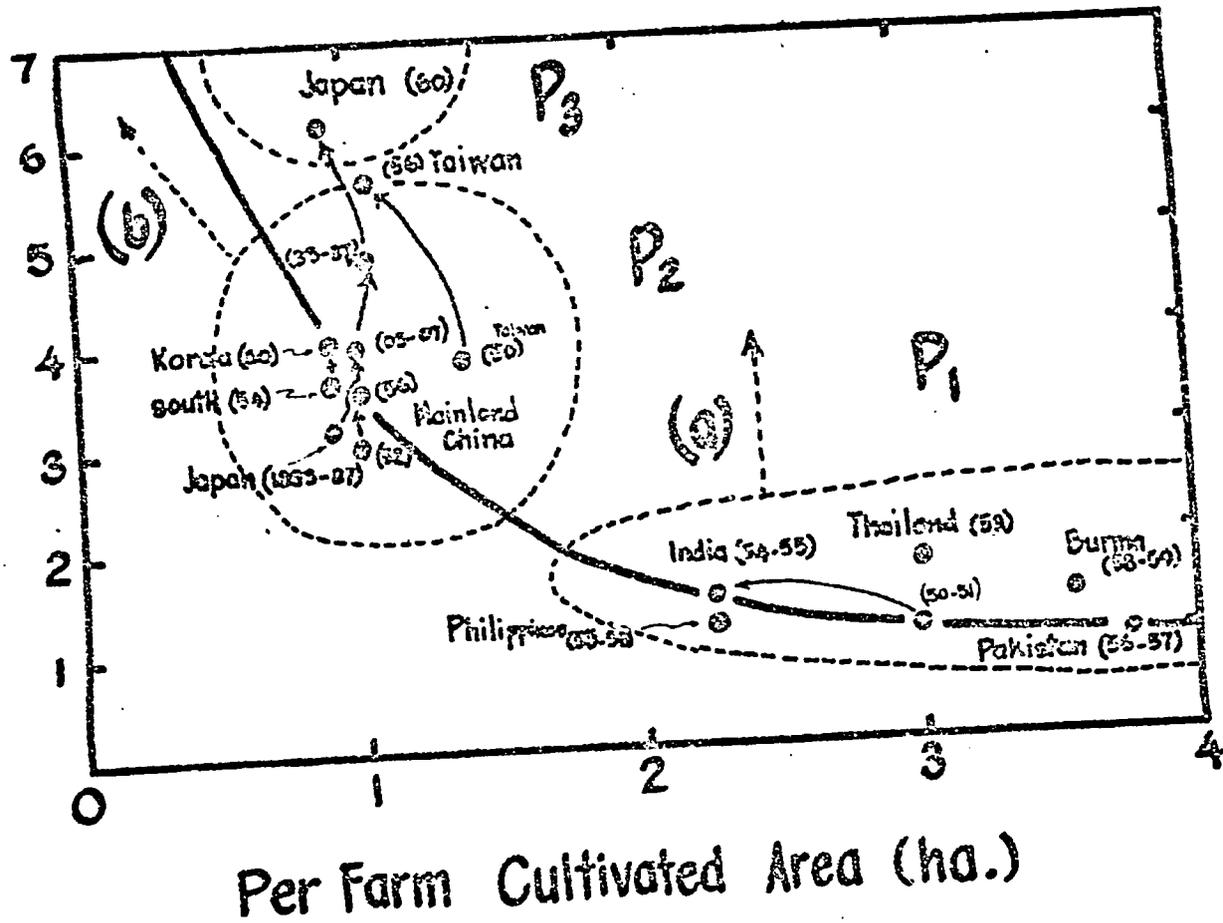
This comparative analysis brings me to my second observation which touches upon the question of "the sequence of developmental inputs," and "the strategy factors in the development process" for a real breakthrough in achieving stepped up agricultural productivity. It seems to me that before we proceed to formulate policies and programs affecting agricultural development we should have a better understanding and appreciation of the phases or stages of a country's agriculture under its existing conditions and this must be related closely with its development strategies and input program.

Following the observations and the line of thought presented in a graphic way in Charts 1 and 11 which clearly indicate the important difference between improved productivity per unit area under cultivation and increase in area or size per operating farm unit, one can reasonably deduce that when a country's agriculture is still in the early phase of development, as is the case in countries like the Philippines, Thailand, Pakistan and India, the dominant input pattern in agriculture should be concentrated on the construction of infra-structures, such as flood control, irrigation, and farm to market roads. If the agricultural development programs for increasing productivity at this early stage are totally directed toward improved seed varieties and wider use of chemical

# Relationship Between Farm Cultivated Area And Hectare Yields (Selected Countries in Asia)

4a

Per Hectare Yields of Rice x Multiple Cropping Index (M. Tons, Paddy Term)



Notes: For Japan, in 1883-87, land productivity is measured simply

fertilizers, the response in agricultural productivity will probably be quite limited. This has been the experience in both the Philippines and Thailand during the past two decades. However, when a country's agriculture has been developed to a more advanced stage with such infrastructures as flood control and irrigation systems, then the dominant input pattern for increased productivity will depend on improved seed varieties, fertilizers, better credit and marketing services, etc. This is the present situation in Japan and Taiwan.

Chart No. III shows the close relationship between low productivity per land unit with low irrigation ratio in such countries as Cambodia, the Philippines, Burma, Thailand, Malaya, India and Ceylon which all have less than 20% of the cultivated land under irrigation and whose level of production falls below two metric tons per hectare. Conversely, Taiwan and Japan where the ratio of irrigated areas to total land under cultivation is well over 50%, the productivity per hectare with irrigation ranges from three metric tons to upwards of five metric tons.

This striking contrast points up, the crucial problem of determining on the one hand, the priorities relating to agricultural infrastructure requirements essential for inducing increased productivity, and on the other, the necessary technical and physical inputs for improving farm production in the developing countries of Asia. We therefore ought to specify carefully the sequence of requirements which are of primary and paramount importance to any rational and realistic plan for increasing agricultural productivity. Without a minimum of infrastructure in the form of flood control and irrigation systems, money spent for improved seed varieties, fertilizer and similar inputs will pay off very poor returns on costly developmental investment. It seems to me that this is a most important guiding principle for any development programming designed to effect productivity increases in agriculture.

## II. Some Observations on Projects for Increasing Agricultural Production in the Philippines

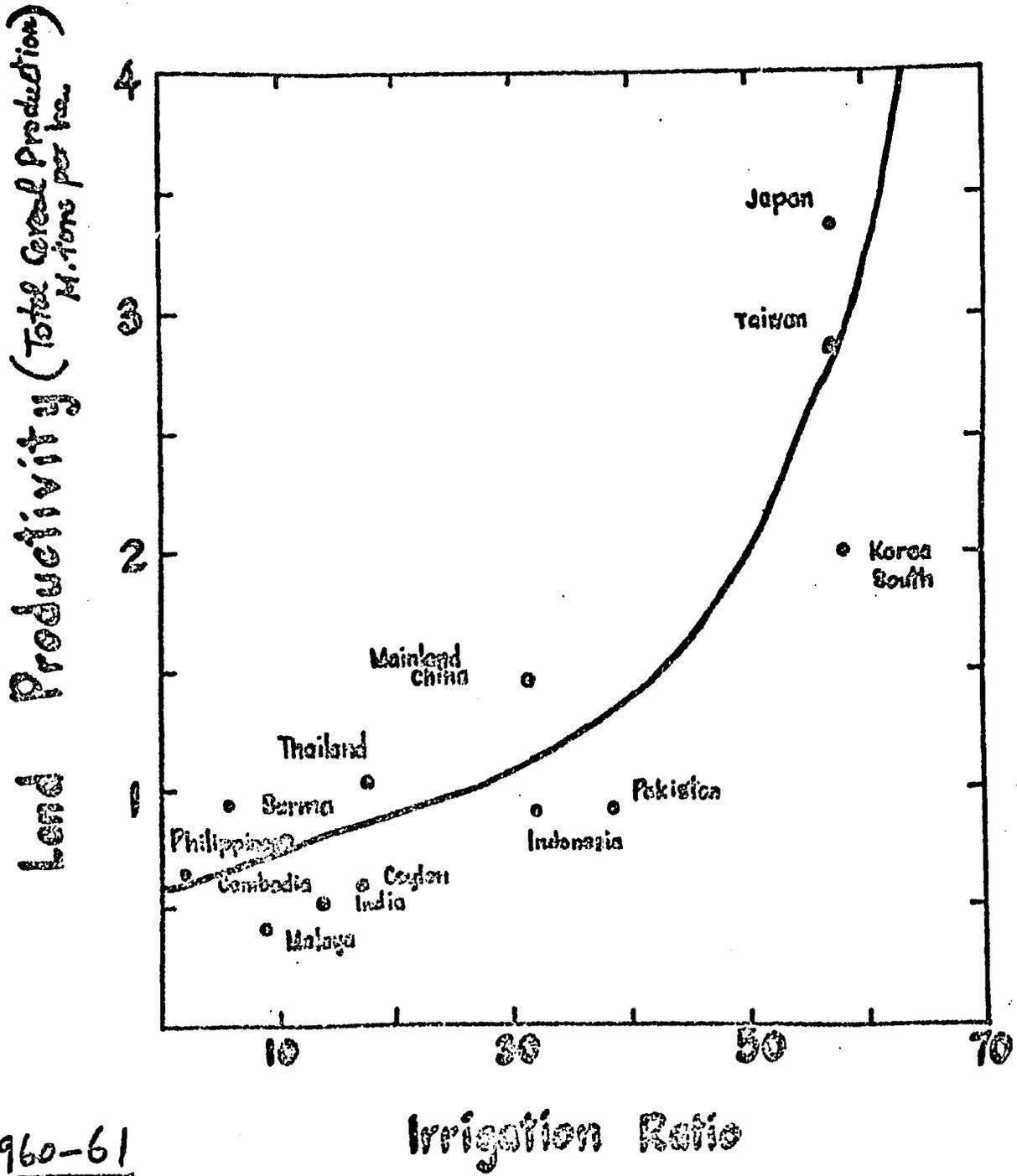
Allow me to cite some observations I have noted on my field trips to some of the rice-growing areas of Bulacan. These examples may help to illustrate the points I have made concerning the importance of following a well-tested and proven strategy and sequence of developmental inputs for increasing agricultural productivity.

In one area I visited, the government agricultural extension workers informed me of an experiment they had conducted among the local farmers to make them adopt some of the improved seed varieties, use more fertilizer and follow better tillage practices. The first time the experiment was being conducted, heavy rains and strong floods practically wiped out the experimental plots of the farmer cooperators. The second time it was being tried there was a long dry period and the stunted rice plants grew no higher than the weeds around them. The sad experience of these poor extension workers and farmers is a typical example of failure that can easily be traced back to a wrong strategy, that is, the lack of a proper sequence in the development of primary infrastructure in the form of an effective flood control and irrigation system prior to undertaking an experiment on improved seed varieties, physical and technical inputs which were not immediately relevant to and of any practical value under the conditions prevailing in the area.

On another occasion I was shown two barrios - one in the morning and the other in the afternoon. In the barrio we visited in the morning, the extension worker told me of the high yielding rice varieties that he had succeeded in convincing a number of farmers to plant in their fields. But as we went through the barrio I noticed that only one part had water, while the

6a

# Relationship Between Land Productivity and Irrigation Ratio in Selected Countries\* in Asia



\* 1960-61

Land - Arable land and land under permanent crops.

other was quite dry. I pointed out that what the barrio as a whole needed first and most of all was better irrigation and probably more effective water management (which would include flood control), and not so much the experiment and demonstration plots of improved seed varieties. And experience in this case, as in many previous cases have shown, instead of becoming convinced, farmers grow more skeptical about improved varieties and recommended inputs and practices because the lack of water and flood control measures have nullified the productive capacity and performance of these improved varieties.

In the afternoon we visited another barrio where the extension worker informed me that he had managed to persuade the farmers to move up their planting season by one month and in this way take full advantage of the rainy season. This extension worker had offered better and more practical advice (though only a temporary and imperfect one) than the one in the barrio I visited in the morning.

On still another field trip I witnessed the down-to-earth wisdom of some farmers and the bitter disappointment of others within the same rice growing area where agricultural extension workers had been promoting more fertilizer use. The farmers whose rice fields were situated on slightly higher ground had used fertilizer, while those on the lower levels did not apply any fertilizer. When the heavy rains came the water carried away the fertilizer and some enriched top soil and flowed down from the upper fields to the lower fields. Those who had not used fertilizer reaped a rich harvest of from 60 to 65 cavans per hectare, while those who had used fertilizer on the upper fields had no remarkable increase in rice production. Is it any wonder that farmers sometimes become disinterested and perhaps disenchanted with the "magic power" of fertilizers to increase agricultural production?

### III. Some Comments on Current Agricultural Programs

I would next like to make certain comments about three widely-publicized agricultural programs which are expected to bring about impressive improvements in agricultural productivity. I refer to the envigorated land reform program, the agricultural extension and the production credit programs. With regard to land reform, I submit that this program may indeed offer a social and political answer to long-standing agrarian grievances and unrest, but I doubt that it will necessarily solve the problem of low production per cultivated land unit. While I have no objections at all to the social and political principles underlying the land reform legislation, I have genuine misgivings (from the point of view of an agricultural economist) about its validity and practical value on the operational level in generating increased agricultural productivity. While the land reform program may effect a more equitable participation in the ownership of land, and possibly even contribute to a better redistribution of income, it will not per se (of itself) and with absolute certainty effect increased productivity per unit area under cultivation. The examples and experiences I cited above all indicate that no matter how much you change over from tenancy to leasehold and eventually to full ownership, no significant increases in agricultural production can be expected of and attributed to a new land tenure situation unless you first provide the basic and primary irrigation and flood control measures that will actually contribute and affect directly the improved productivity per unit area cultivated. In some instances, the enlightened and progressive farm management of responsible landlords have provided both the needed capital and the technical knowhow for their tenants to double their productive performance on the same land units they have been operating for years. Can the government-supervised land reform program offer good assurances

that it will offer as good, if not better, incentives to the vast number of emerging new owner operators?

With regard to a basic assumption of the agricultural extension program that by training a select group of farmers who are more innovation-prone and responsive to experimentation that they in turn would show others how to improve their agricultural production per land unit, this over-optimistic theory has not been tested and verified sufficiently and it would be quite risky to use it as a working principle for a nationwide program for improving agricultural productivity. When farmers are faced with the hard choice between following the example and the instructions of these farmer-leaders versus the harsh realities of suffering crop losses or decreases they generally prefer to continue farming in the same old and safe way rather than adopt the more modern farming methods that they have observed and even admired. By what means does one reinforce their initial interest in adopting the improved farm practices and applying the necessary physical inputs? Possibly by some form of crop insurance protection against crop losses or sharp decreases due to natural disasters, and, of course, by a stable and protected market price for their farm products.

Then there is the popular program of supervised agricultural credit (this would include both the present farm production credit system and the corresponding commodity loan arrangement with selected Rural Banks). The question I wish to raise about this program does not pertain to the importance of farm credit nor the desirability of a well-administered program that would serve the financing needs of small and medium size farms. My main concern would be to find out whether these farms have the productive potential to qualify for these loans, and whether the marketing facilities for their farm products are adequate. And again I must return to my dominant theme of first providing for the essential

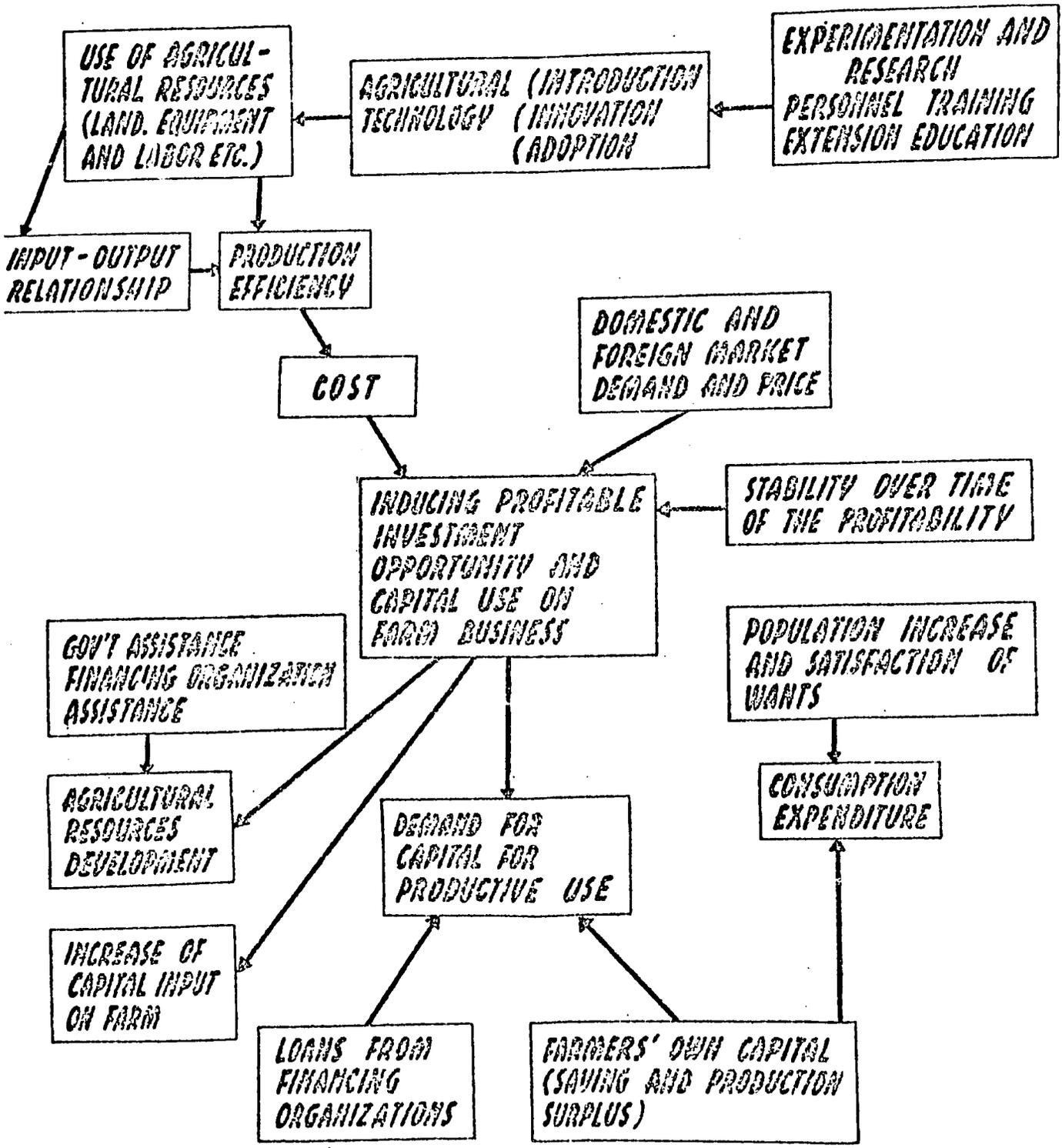
irrigation and flood control and roads infrastructures and the machinery needed to obtain basic information about their specific potentials for increased production given the required inputs, and the proper functioning of a marketing and price system for their farm products.

#### IV. Capital Requirements and Financing Strategy

Another point I would like to stress is the problem of the capital requirements and financing to fulfill the technical conditions and the strategic inputs for improving agricultural productivity. In transforming traditional subsistence agriculture to modern commercial agriculture, there must be an infusion of capital for the use of agriculture in order that the required technology and strategic inputs can be made available to the farmers. However, under conditions usually existing in traditional subsistence agriculture, the key problem in most cases is the lack of production possibilities and very limited investment opportunities on farming and farm-related operations. Consequently, the provision of credit and capital to the farmers does not necessarily bring about higher production nor improved production capabilities. In the final analysis, the key solution consists in discovering the type of low-cost technology derived from readily available sources that will generate a rapid and prolific rise in agricultural productivity under poor, low income farm conditions. This impressive breakthrough in agricultural production may very well create a stimulating climate of new and profitably attractive opportunities for capital investment in the agricultural sector of the economy.

Let me illustrate by means of Chart No. IV the factors affecting capital use and investment in agriculture. You can readily see the comprehensive and complex linkages that are involved in this farm business picture. The central point focuses on the inducement of profitable investment opportunities

# FACTORS AFFECTING CAPITAL USE AND INVESTMENT ON FARM BUSINESS-



and capital uses toward the farm business by the impact of market demand and price stability on the one hand, and reduced cost by higher production efficiency on the other. Sometimes we tend to place all the blame for the stagnation and bottlenecks of low agricultural production on the lack of capital, when in reality it may very well be that we have failed to first identify and assess accurately the actual and feasible potentials of the investment opportunities that the farm and allied agro-business have to offer.

### Conclusion

Finally, I think we are agreed that we are facing a dilemma when we consider the capital needs for financing productivity improvement for early stage agriculture. Since agricultural productivity and the farmers' average income are both low at this early stage, the need for capital is quite sizeable. How to finance the minimum primary (or principal) infrastructures and other technical inputs for initial productivity increase presents a serious problem for the developing countries. In this connection, the experiences of Japan and Taiwan during the period 1890-1920, and the 1900-1930, respectively, may offer some valuable concepts and practical guidelines for other Asian countries. In both countries, the government levied heavy land taxes on the landlords and the landlord in turn collected high rentals from the tenants. Both the government and the landlords applied to a large extent the revenue from the tax and rental collections to the development of infrastructures, which mainly consisted of flood control, irrigation, feeder roads and agricultural research aimed at improving productivity per cultivated land unit.

In view of the present day need for social welfare and the demand for improving the living standard of the farmers, developing countries today

will have to face squarely and solve the difficulties of revising their tax structures for raising needed funds for infrastrucutre development and mobilizing capital necessary for early stage agricultural production improvement. This is a hard choice for government planners but they must make it.

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## MAJOR CHARACTERISTICS IN DIFFERENT STAGES OF AGRICULTURAL DEVELOPMENT

GENERAL CHARACTER	STAGE I	STAGE II	STAGE III
	STATIC	TRANSITIONAL	DYNAMIC
1. GENERAL VALUES, ATTITUDES, MOTIVATIONS (ORIENTATION TO CHANGE)	NEGATIVE OR RESISTANT		POSITIVE OR RECEPTIVE
2. GOALS OF PRODUCTION	FAMILY CONSUMPTION AND SURVIVAL		INCOME AND NET PROFIT
3. NATURE OF DECISION-MAKING PROCESS	IRRATIONAL OR TRADITIONAL		RATIONAL OR "CHOICE-MAKING"
4. TECHNOLOGY OR STATE OF ARTS	STATIC OR TRADITIONAL WITH NO OR SLOW INNOVATION		DYNAMIC OR RAPID INNOVATION
5. DEGREE OF COMMERCIALIZATION OF FARM PRODUCTION	SUBSISTENCE OR SEMI-SUBSISTENCE		COMMERCIAL
6. DEGREE OF COMMERCIALIZATION OF FARM INPUTS	FAMILY LABOR AND FARM PRODUCED		COMMERCIAL
7. FACTOR OF PROPORTIONS AND RATES OF RETURN	HIGH LABOR/CAPITAL RATIO; LOW LABOR RETURN		LOW LABOR/CAPITAL RATIO; HIGH LABOR RETURN
8. INFRASTRUCTURE INSTITUTIONS AFFECTING OR SERVING AGRICULTURE	DEFICIENT AND IMPERFECT		EFFICIENT AND WELL DEVELOPED
9. AVAILABILITY OF UNUSED AGRICULTURAL RESOURCES	AVAILABLE		UNAVAILABLE
10. SHARE OF AGRICULTURAL SECTOR IN TOTAL ECONOMY	LARGE		SMALL
11. DOMINANT INPUTS IN FARM PRODUCTION	FLOOD CONTROL IRRIGATION		FERTILIZER, INSECTICIDES, IMPROVED VARIETIES, ETC.
12. DEGREE OF HUMAN CONTROL IN AGRICULTURE	VERY LITTLE CONTROL, MOSTLY WEATHER DEPENDENT		MORE STABLE AGRICULTURE, MORE CONTROLLABLE

SOURCE: 1-10 FROM RESEARCH ON AGRICULTURAL DEVELOPMENT IN SOUTHEAST ASIA BY CLIFTON R. WHARREN, JR. PUBLISHED BY THE AGRICULTURAL DEVELOPMENT COUNCIL, INC., 1965.