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A SYSTEMS APPROACH TO AGRICULTURAL DEVELOPMENT IN GHANA WITH SPECIAL EMPHASIS ON GRAINS (MAIZE, GUINEA CORN, RICE AND MILLET)

Systems Approach to Agricultural Development in Ghana...

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Gerry Horne, Deputy Director
Office of Development Administration

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A SYSTEMS APPROACH TO AGRICULTURAL DEVELOPMENT IN GHANA - WITH SPECIAL EMPHASIS ON GRAINS (MAIZE, GUINEA CORN, RICE AND MILLET)

Gerry Horne, Deputy Director, TA/DA

INTRODUCTION

The history of Ghanaian agriculture and descriptions of geography, climate and cultural practices for various crops are well documented in a number of other sources, including studies such as Felton's sector reconnaissance (1967), the Nathan Study (1970) and the World Bank's (1971).

A number of other sources treat selected portions of the agriculture sector--such as Porter's study on exports (1971); Giles' report on agricultural mechanization (1969); Helman's survey of cattle production (1972); the Cox/Breitenbach research proposal (1972), and others.

These and local sources provide a perspective of agriculture in Ghana's total economy and development potential. In substance, with the agriculture sector involving 60% of the total population and generating about 75% of foreign earnings, it seems evident that Ghana's overall development in the years immediately ahead is likely to be closely related to development in the agriculture sector. Conversely, delays in agricultural development are likely to impede any significant development of the economy as a whole.

Ghana's agriculture sector, more or less typical of the LDCs in the tropics, includes a wide range of crops. Two of these crops are "traditional exports" which generate most of the foreign exchange earnings (cocoa and timber--75%) and which are very sensitive to fluctuations in world market prices (especially in the case of cocoa). Other crops might be categorized as:

1. Grains - maize, guinea corn (sorghum), rice and millet
2. Other food crops - cassava, cocoyams, plantains, ground nuts, etc.
3. Livestock - beef, poultry, swine, and fisheries
4. Tree crops - rubber, oil palm, coconut, citrus, etc.
5. Others - tabacco, cotton, sugar, bananas, etc.

It is my understanding that senior officials in the Government of Ghana (GOG) have indicated that one of the most urgent problems in the entire agriculture sector is the enormous and increasing deficiency of maize and rice.

It is also my understanding that during recent informal discussions GOG officials have suggested to USAID representatives that it is the GOG desire that U.S. assistance in agriculture focus primarily on supporting their thrust to ease this problem by moving rapidly toward self-sufficiency in grain requirements, particularly in maize, guinea corn, rice and millet.

Acreage-wise, with some 40 million acres under cultivation annually, corn is the number one crop in the U. S. Yields in Illinois and Ohio routinely average about 200 bushels per acre, and experimental trials have produced 300-bushel per acre yields. In sum, the U. S. has a tremendous experience/competence in every aspect of the technology and management required to complement the GOG and other collaborators' efforts to achieve self-sufficiency in corn (and other grains needs). This U. S. experience and competence is, of course, primarily in temperate rather than tropical environments. Nevertheless, considerable experience and capability in tropical areas have been accumulated, and much of the temperate climate capacity appears to be adaptable to the tropics.

The record of the inidividual U.S. form worker is equally impressive. He produces food, fiber and agricultural commodities for himself and 48 others.

It should be recognized, of course, that the major investments in a program of self-sufficiency in grains needs in Ghana will be from Ghana's own private and public sectors. Whereas investments from other sources such as the U.S., Germany, IBRD, UNDP, FAO and others may be substantial, they are nevertheless likely to be relatively modest with respect to the total amounts involved.

POLICY/PRIORITY BREAKTHROUGH?

A number of studies, some made in the 1960s and others of more recent date (e.g., one by Felton, et al--1967; another by Eicher--1971, and others) suggest that a major impediment to agricultural development in Ghana has been an apparent lack of concensus in the GOG on efforts to be undertaken, and a priority of actions on any such policy.

If the recent informal policy/program discussions concerning self-sufficiency in grains and the U.S. assistance therefore are in fact "formalized" by top-level GOG officials, a significant breakthrough in agricultural development may be in the making.

Given this GOG policy/priority/program posture, together with the U.S. response capability for supporting a grains development program, it should be possible to identify and quantify the nature, dimensions and timing of any potential U.S. inputs/support more precisely than in recent years.

It is the intent of this document to provide a suggested outline of concepts and methodologies which might be useful in developing a prospective program for any U.S. assistance, using the recent policy/priority discussions as a point of departure.

A PROFILE OF THE PROBLEM - MAIZE

As a "first phase" in developing a prospective assistance program for agriculture, and more specifically, a "model" for the maize component of such a program, it would be helpful to have a "profile" or "problem analysis." This problem analysis

is an effort to identify and quantify as precisely as possible the dimensions and specifications of the problem--that is, answers to the WHAT, WHY, HOW, WHEN, WHERE and WHO questions.

Nature and Scope of the Problem - WHAT: According to a recent staff report ("A Proposed Maize Development Project for Ghana, November 1972," Benbow, Slotten, et al), in 1972:

1. Maize production totaled an estimated 400,000 tons;

2. Consumption requirements were estimated to be (a) 622,000 tons for humans; (b) 75,000 tons for animals, or (c) a total of 692,200 tons--297,200 tons more than domestic production;

3. Per acre (major and minor crops) average yield is about four bags or 880 pounds (.44 ton)--using traditional methods;

4. Annual storage losses amount to at least 25% of production;

5. Total population in 1972 was 9.0 million with a 3.0% annual growth rate.

Using the above base approximations, and assuming 692,200 tons as the 1972 estimate of consumptive needs with a 3.0% annual increase, the following estimates for 1973 through 1978 would be:

YEAR	Total annual consumption needs (tons)	Annual increase consumption needs (tons)	Annual increase production needs (tons)	Annual increa (acres) - tra tional method
1972	692,200			
1973	713,000	20,800	27,800	63,100
1974	734,000	21,390	28,500	64,695
1975	779,100	22,710	30,400	69,000
1976	802,500	23,400	31,200	70,800
1977	826,500	24,000	32,000	72,640

For the five-year period, 1973 through 1977, approximately 340,000 additional acres--using traditional methods--would have to be put into cultivation to satisfy estimated additional consumption needs for maize.

These computations are based on very rough estimates rather than from data compiled by sophisticated sampling techniques. However, as noted in the Benbow/Slotten report, any errors are probably toward the "conservative" levels. For example, in determining the base consumption level, only 5.1 million people, or about 55% of the population with daily per capita consumption amounts of two thirds of a pound, were used.

Given the large portion of the population in the younger age groups--12 years or less--it is reasonable to expect that consumptive needs for maize during the next five/six years will probably exceed the average population growth rate.

Reliable data as regards present and future effective demands (as against consumptive demands) for maize are not available. If supplies could be increased to satisfy estimated consumption needs it is possible that income limitations would not allow purchase to meet total needs; the increased supplies to these amounts could reduce prices to levels below "break-even" costs for most producers; transportation, storage and marketing

facilities might be overloaded to the extent that large quantities could be lost due to spoilage and waste. Generally, for these and other reasons, effective demand in the LDCs tends to be well below consumption needs.

Recent price patterns suggest that effective demand for maize is and has been well above available supplies:

Price/bag (¢N)	Year
4.64	1954/55
6.88	1962/63
13.46	1969/70
18.-20.	May, 1973
25.00	June, 1973 (seasonal high)

The seasonal high for 1973 (approximately ¢N 25.00/bag) will probably decline sharply following commencement of harvest (early July). Rice prices are even higher (¢N65.50/bag), so substitution fo rice for maize in diets is unlikely.

Irrespective of the probable deficiencies in the basic data for estimated consumptive needs and estimates of effective demand during this same period, substantially increased supplies of maize are needed now, and even greater supplies will be needed during 1974-1977.

There are many options for responding to the very formidable challenge of satisfying estimated consumptive needs for maize during the next five/six years:

1. Reduce the "consumptive need" level to "effective demand";
2. Increase acreage under cultivation, mainly for traditional method farming;
3. Increase use of improved varieties (now limited to 30,000-40,000 acres);
4. Extend use of fertilizer on traditional varieties;
5. Reduce storage losses;
6. Increase imports;
7. Increase production of actual/potential foreign exchange earning exports such as cocoa, timber and pineapple and use the additional earnings to increase imports of maize;
8. Increase production of yellow maize and guinea corn for animal feed so that some pressure for maize for human needs is reduced;
9. Promote greater consumption of high-protein crops such as ground nuts, cowpeas, soybeans, etc; improve protein content of such high-starch crops as cassava, plantains and yams;
10. Some combination of these and other possible options, such as allowing diets to continue to deteriorate as supplies of maize decline.

Each of these options, and various combinations, has impractical, or perhaps impossible trade-offs. For example:

1. Increasing acreage under cultivation, with traditional methods, involves enormous and costly land clearing, etc.;

2. Large increases in use of improved varieties would seem to offer a "quick and easy" solution to the production problem. However, this is a high-risk option because:

(a) The Diacol/Composite II experience indicates consumer acceptance to non-traditional varieties is low, and this and other problems largely off-set increased yields;

(b) Improved varieties usually require much higher orders of technology and management, especially in the use of water and fertilizer, and also involve complex logistics problems.

3. Increased use of fertilizer, based on the GAA520 experience, suggests only limited promise at present because only about 15% of the farmers trained in using under intensive efforts continue its use following such training, and the low benefit ratio (3:1) without GOG subsidies finds limited acceptance (TVA experience suggests a benefit ratio of at least 6:1 is required).

It would appear therefore that the most practical of the available options, is likely to be major reliance on increased

maize production must come from increased acreages using traditional methods, with some modest increases from improved varieties, reduced storage losses, greater use of fertilizer and possibly other combinations.

In any event, more thorough study should be made to:

1. Determine more precisely the estimated annual and total consumptive needs for maize for 1974-1978;

2. Establish a more reliable estimate of the effective demand for the same time frames;

3. Identify and measure the advantages and disadvantages of each of the listed (and other available) options; including critical constraints of each and possible corrective measures;

4. Correct or confirm the estimated break-even costs of producing a bag of maize using the traditional methods (₦5.00) and by "modern" methods (₦8.50) and their comparative risks for the producers.

Given the best possible information available on these items, the reliability of policies, plans, programs and systems based thereon should be correspondingly more realistic.

A SYSTEMS APPROACH TO SATISFYING MAIZE CONSUMPTION NEEDS/EFFECTIVE DEMAND

Experience has shown that needs/effective demands for most commodities, including agricultural commodities, can be supplied most effectively and at the least cost by careful attention to all of the stages of the raw materials or seed-to-consumer processes for the commodity involved.

This approach might be a useful tool for answering the HOW question for satisfying Ghana's consumption needs/effective demands for maize during the next five years.

Concept: The seed-to-consumer processes, in aggregate, are usually referred to as an "agricultural commodity system" which includes a number of interdependent components such as production, harvesting/processing, storage, transportation and marketing, and one which requires a careful orchestration of inputs/support services from both the private and public sectors (see Figures 1-6, pages 12-17) and TA/DA Staff Paper--Attachment A --for a more detailed description of this concept and the methodologies involved).

Each of these components of the total "system" might, in turn, be considered as a "sub-system" which includes a number of interdependent elements, some of which might be provided by the private sector (farmer) and others which might have to be supplied by the public sector (see Figure 5, page 16, illustrative example for "production sub-system" showing inputs which might be provided by the farmer and GOG, and Figure 6, page 17, showing "support services" which would probably have to be provided by the public sector--GOG).

The "orchestration" or "management" of the various inputs and services required to make the sub-systems and the total system function effectively (see Figure 3, page 14), more often

AGRICULTURAL COMMODITY SYSTEM - (Private Sector Component) - LDCs

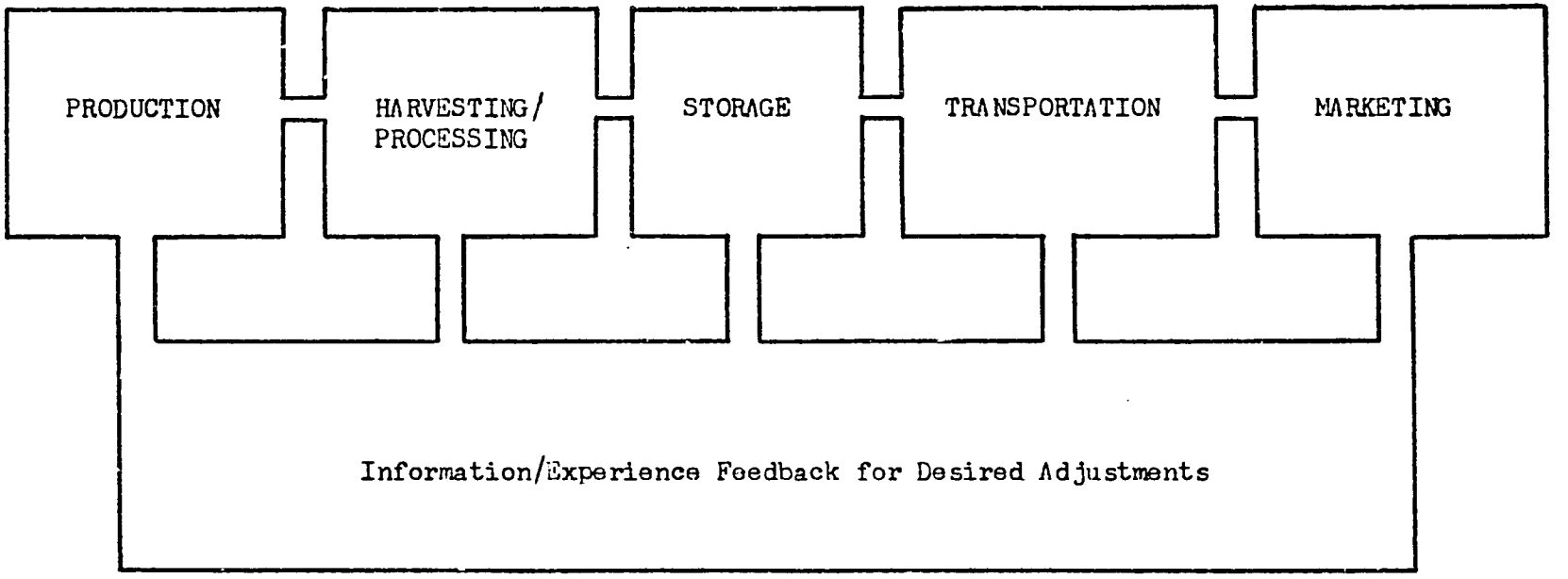

Figure 1.

AGRICULTURAL COMMODITY SYSTEM — (Public Sector Component) - LDCs

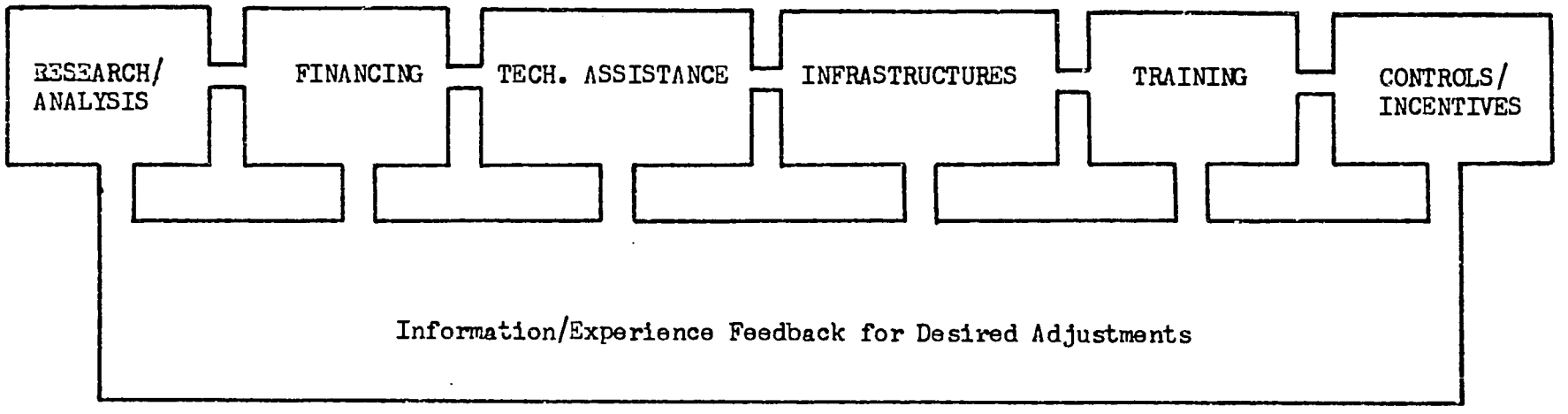

Figure 2.

AGRICULTURAL COMMODITY SYSTEM - Modern Management Component) - LDCs

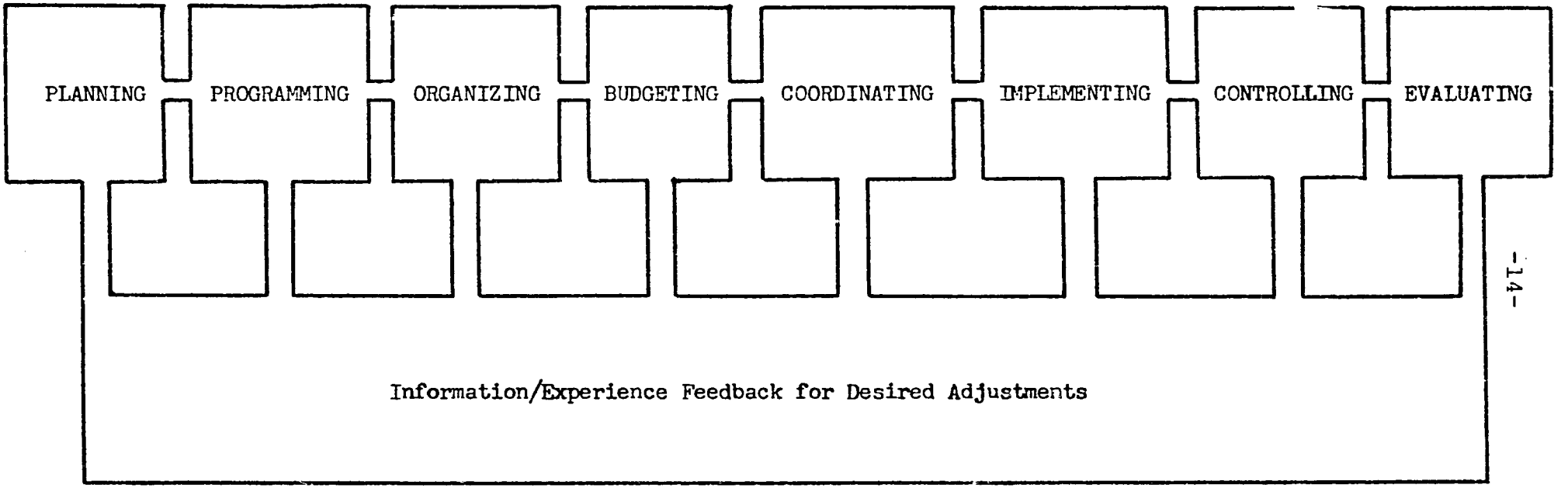

Figure 3.

AGRICULTURAL COMMODITY SYSTEM - LDCs (Vertical Integration)

(Pvt. Sector)	PRODUCTION	HARVESTING/ PROCESSING	STORAGE	TRANSPORTATION	MARKETING	
(Management)						
PLANNING						
PROGRAMMING						
ORGANIZING						
BUDGETING						
COORDINATING						
IMPLEMENTING						
CONTROLLING						
EVALUATING						
(Public Sector)	RESEARCH/ ANALYSIS	FINANCING	TECH. ASSISTANCE	INFRASTRUCTURES	TRAINING	CONTROLS/ INCENTIVES

Figure 4.

LDC NON-TRADITIONAL AGRICULTURAL EXPORTS - COMMODITY SYSTEM

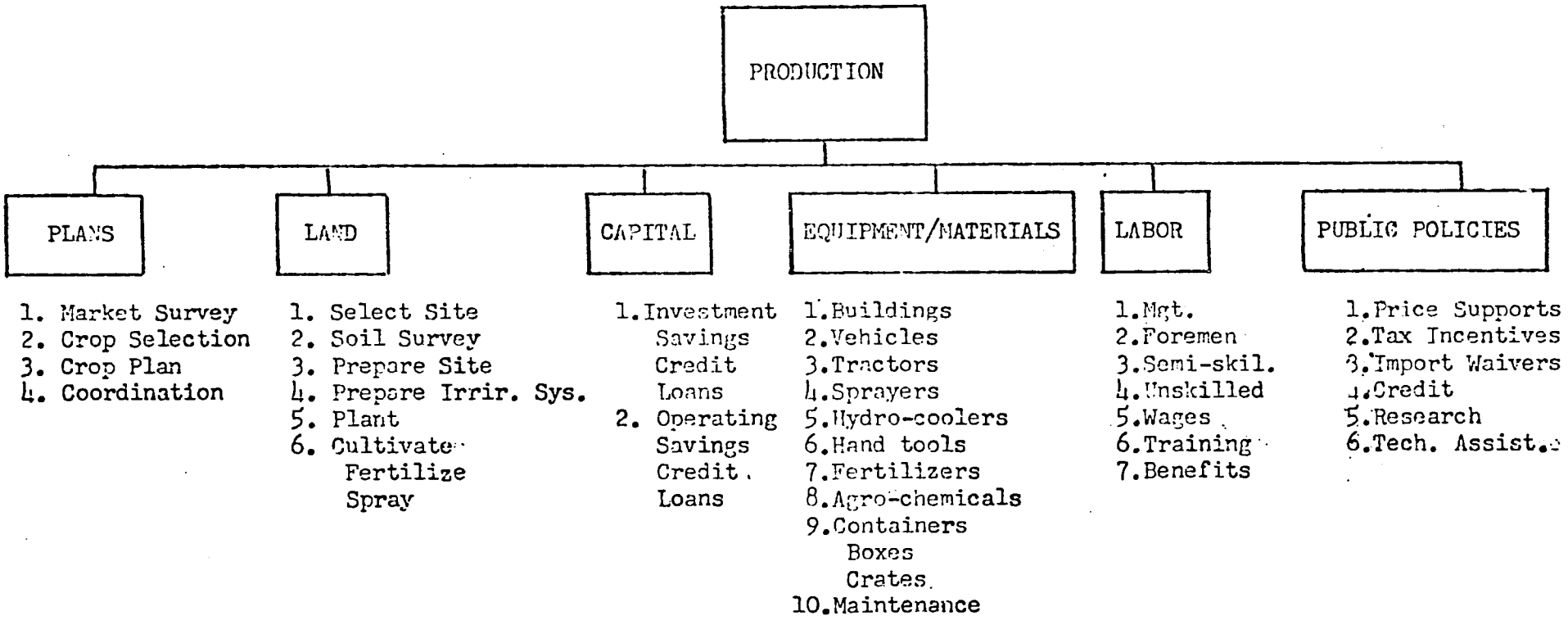

Figure 5.

TA/DA: 9/8/72

LDC AGRICULTURAL COMMODITY SYSTEM - Public Sector Support Services

PRODUCTION	HARVESTING/PROCESSING	STORAGE	TRANSPORTATION	MARKETING
Research (MinAg./Univ.)	Research (MinAg./MinInt/Univ.)	Research (MinAg/MinInt/Univ.)	Research (MinPubW/MinInt)	Research (MinAg/MinF/MinInt/Univ)
Extension (Min.Ag./Univ./Pvt.)	Extension (MinAg/Pvt.)	Extension (MinAg/Pvt.)	Extension (MinAg/MinEd/Pvt)	Extension (MinAg/MinEd/MinInt/Pvt)
Training (MinAg./MinEd./Univ.)	Training (MinEd/Pvt.)	Training (MinEd/MinAg/Pvt.)	Training (MinEd/MinPubW/Pvt)	Training (MinEd/MinInt/Pvt)
Credit (MinAg./MinF./Banks)	Credit (MinF/MinAg/Banks)	Credit (MinF/MinAg/Banks)	Credit (MinF/MinInt/Banks)	Credit (MinF/MinInt/MinAg/Banks)
Price Policies (MinF./MinAg.)	Market info. (MinInt/MinF)	Price Policies (MinF/MinAg)	Freight Rates (MinInt/MinF)	Price Policies (MinF/MinInt)
Market Info. (MinAg./MinInt./MinInfo.)	Quality Stds. (MinInt/Minag)	Market Info. (MinAg/MinInfo)	Quality Stds. (MinH/MinInt/MinAg)	Market Info. (MinAg/MinInt/MinInfo)
Quality Stds. (MinAg./MinInt./Pvt.)	Roads (MinPubW/MinF)	Quality Stds (MinInt/MinH/MinAg)	Infrastructures (MinF/MinH/MinInt/MinPubW)	Quality Stds. (MinH/MinInt/MinAg)
Roads (MinPubW./MinF.)	Taxes (MinF/MinInt)	Roads (MinPubW/MinF)	Taxes/Duties (MinInt/MinF)	Infrastructures (MinPubW/MinF)
Taxes (MinF./MinInt.)	Imports (MinInt/MinAg/MinF)	Taxes (MinInt/MinF)	Imports (MinInt/MinF)	Taxes/Duties (MinInt/MinF)
Imports (MinInt./MinAg./MinF.)	Exports (MinInt/MinF/MinH)	Imports (MinInt/MinAg)	Exports (MinInt/MinF/MinPubW)	Exports (MinInt/MinH/MinF)

Figure 6.

than not, is even more critical than either the material inputs or support services in agricultural development efforts in the LDCs. Typically, seed, fertilizer, credit or extension services might be available, but largely because of poor management, they are not available at the time required, or in the amount and kind needed. Management or coordination/integration of the several support services provided by various governmental institutions (see Figure 6, page 17) is a particularly difficult task in most LDCs, including Ghana. The delay in delivery of fertilizer for the current maize crop is an example; it was needed in February/March, but has just arrived in Accra (June) --much too late for effective use.

Methodology: The methodologies involved in the suggested grains development program outlined in this document include:

1. A conceptual design for the "program" as a "total system" including the major interdependent components requiring private sector inputs (and perhaps also some public sector inputs in Ghana), interdependent "support services" required from appropriate GOG institutions and the "management dimension" (planning, programming, budgeting, etc.) of the system.

2. A conceptual design of a selected sub-system (production).

3. Designs for step by step or PERT-type flow charts of the major sequential events for selected grains commodities (maize, guinea corn and rice) appropriate to the crop cycles and Ghanaian

environment (see Attachments C and D--maize and sorghum by Mr. Benbow, and Attachment D--rice--by Mr. Slotten).

4. A set of criteria for testing the "operability" of each of the events in the sub-systems, and of each sub-system as an interdependent component of each commodity system--at actual and/or hypothetical levels of anticipated effort, as well as the response-capability of participating collaborators (see Attachment B).

5. A preliminary (and illustrative) "problem analysis" or approach for determining the basic parameters or size of the problem or objective, i.e., estimates of annual consumptive needs of maize through 1978 (see table, page 7).

6. An array of options or alternatives for "solving" the problem or achieving the "objective"--satisfying the estimated consumptive needs for maize during the 1973-1978 period (see page 8).

7. A four-phase outline of one approach which might be useful in determining the feasibility/desirability of a U.S. assisted grains program in Ghana for 1974 and possibly for succeeding years (see Attachment G).

8. A "decision tree" schematic illustrating the array of choices/consequences in sequential steps of a maize program (Attachment H).

9. A suggested "Ghanaian Team" approach for planning/organizing/coordinating/implementing a maize "prototype system" in Ghana (see Attachment I).

10. A roster of institutions and individuals who might be able to assist in any follow-up actions that might be warranted (see Attachment J).

SUMMARY

The "systems" approach is essentially a proven tool for visualizing the total spectrum of an objective or goal; for identifying potential/actual problems or bottlenecks in various parts of the system at particular points or time periods; for mobilizing and using the resources required to resolve such problems or bottlenecks in the appropriate sequence, and for organizing/controlling/evaluating and improving the entire system so that it might function more effectively and so that the goal or objective may be achieved during the prescribed time frame. It does not provide any inputs, make any decisions or guarantee success for any given venture.

Limited data and time (one week) make it necessary to confine the focus of this complex problem to brief outlines of concepts, methodologies and suggested approaches--all of which need to be considered in much greater depth and particularly with respect to the Ghanaian environment. While the emphasis is on grains, the principles are also applicable to other crops

and to other sectors such as health, education, etc. The emphasis has been primarily at the micro or operational levels in the private and public levels (i.e., at the farm and technical or action levels of the public institutions) since the experience in most LDCs has been that it is at these levels where projects, programs and plans for agricultural development most often succeed or fail. Generally, good "delivery systems" at these operational levels can overcome deficiencies in policies, plans and programs. On the other hand, where these delivery systems are poor or incomplete, even good policies, plans and programs are implemented only rarely--if ever.

These very tentative and incomplete efforts will, of course, need to be treated more thoroughly in the months ahead, if it is determined that this approach has any useful application in Ghana.

ATTACHMENT A

THE AGRICULTURAL COMMODITY SYSTEM:

A Multi-purpose Tool for Managing Agricultural Development in LDCs

Preliminary Staff Paper
Office of Development Administration

No. 2
March, 1973

-72

D R A F T

A COMMODITY SYSTEMS APPROACH TO AGRICULTURAL DEVELOPMENT IN THE LDCS

THE BASIC PROBLEM - Generalized

> Producing quality crops or agricultural commodities in quantity, for a price that consumers can afford to pay and at a cost which allows the producers and participa ting intermediaries a reasonable return on their investments and risks is probably the LDCs' most urgent problem for the 1970s--and perhaps for the remainder of this century.

In those countries where significant progress toward resolving this problem has been made, combinations of modern technology and modern management have been integrated in both the public and private sectors. Such integrated efforts, in turn, have been most effective and least costly when they have been undertaken as total "systems" which include the entire seed-to-consumer stages designed specifically for the particular commodity involved and for the environment within which it is to be carried out. These systems have been sufficiently rigid to mainta in necessary order and control, yet flexible enough to accomodate accumulating knowledge, experience and changing circumstances.

In sum, there is ample evidence that agricultural development does take place where there is a practical "delivery system" which can channel modern technology and management throughout the entire seed-to-consumer stages in such a way that the producers and intermediaries can continue to produce quality crops, in quantity, for a price consumers can afford to pay and at a cost which gives the producers and intermediaries a reasonable return on their investments and risks. Conversely, there is also abundant evidence that where there are gaps or serious deficiencies in this delivery system for modern technology and management, agricultural

development takes place slowly--if at all.

We have come to accept these proven concepts and methodologies as virtual truisms in the industrial sector--for the manufacture and marketing of automobiles, household appliances, wearing apparel and so on--we seem to have difficulties in accepting them for agricultural development in the LDCs.

This document is intended as a preliminary working paper for outlining these concepts and some methodology/guidelines for developing, testing and using practical delivery systems for selected agricultural commodities in LDCs, with special emphasis on the operational levels in both the private and public sectors. Comments and suggestions which might make it more useful would be appreciated.

INHERENT ISSUES - Categorized

While the basic agricultural problem for LDCs, as stated above, seems simple enough, approaches to its solution involve awesome complexities and seemingly innumerable interdependent issuees, the untimely or inadequate resolution of which could negate the entire development effort for the crops involved.

Many of the most complex issues are common to most of the LDCs; others stem from or are peculiar to circumstances which are in large measure unique to each of the countries. Issues common to most LDCs might be categorized as:

1. Inadequate diets and poor health
2. Low levels of literacy and skills
3. Extensive unemployment and underemployment

4. Low per capita income and maldistribution of income
5. Low productivity per capita and per acre
6. High population growth rates
7. Massibe urban migrations
8. Inadequate institutions and infrastructures
9. Limited capital and borrowing capacity
10. Primitive technology and management.

Issues unique to or specific to individual LDCs might be categorized as:

1. Climate and geography
2. Population and resources
3. Socio-economics and politics
4. Institutions and infrastructures
5. Customs and values
6. Perceptions of needs and desires
7. Acceptance/rejection of foreign assistance
8. Capacity for self-sustained growth
9. Capacity for coordination and cooperation within and among the public and private sectors and with neighboring countries
10. Potential for short-term and long-term development.

MANAGEMENT - By Systems

Given the enormous array of common and unique issues cited in the above illustrative categories, which must be continuously orchestrated so that exacting kinds and amounts of inputs are infused at precise time periods throughout the entire seed-to-consumer stages of each agricultural commodity in order to solve the "basic agricultural problem" in the LDCs,

it is understandable that the technical and managerial problems involved are likely to be complex. Experience has shown that most complex and interrelated tasks can be performed faster, at less cost and more efficiently if they are planned, organized, programmed, coordinated, controlled and evaluated, i.e. if they are "managed in an orderly and systematic way.

In the developed countries, and particularly in their industrial sectors, modern management has evolved more or less concurrently with modern technology. In recent years, and especially in the United States, many of the industrial management concepts and techniques have been adapted in the agriculture sector. One of the most promising of these concepts, together with its supporting methodologies, is management by "systems". There is no definition of this term that is accepted completely by either the theoreticians or the practicioners in the field. As used in this paper, it is intended to mean simply " that aggregation of resources and actions required to produce a desired end product during a prescribed time period". The desired end product in this case is resolution of the "basic agricultural problem for the LDCs" cited at the beginning of this paper--"producing quality agricultural commodities, in quantity, for a price consumers can afford to pay and at a cost which allows the producers and participating intermediaries a reasonable return on their investments and risks".

The Agricultural Commodity System

Conceptually, the commodity system for improving the management dimension of the agriculture sector in the LDCs is considered herein as an aggregation

of three major components:

1. In the private sector - providing the necessary kinds and quantities of inputs at the required time periods - (see Figure 1);

2. In the public sector - providing the necessary kinds and quantities of support services and resources at the required time periods (see Figure 2); and

3. Providing the modern management services and resources necessary to orchestrate the many interdependent components of the private and public sectors' inputs which, collectively, make up the total "system"(see Figures 3 and 4).

Each of the major elements of the Private Sector, the Public Sector and the Modern Management Components of the Agricultural Commodity System illustrated by Figures 1, 2 and 3 respectively, require continuous "horizontal" integration and coordination to maintain the kind of balance and harmony required to make the system function effectively. For example, in the Private Sector Component, any substantial increase in production of a crop, without simultaneously providing for adequate and timely capacities for transporting, storing and marketing the increased production could result in spoilage and/or reduced prices and therefore, losses, rather than profits, for the producers. Conversely, increases in transportation, storage and/or marketing facilities in excess of increased production could cause increases in production costs and higher prices for consumers and probable losses for producers and/or intermediaries. Similarly, in the Public Sector Component, significant increases in the Research/Analysis element without appropriate and timely increases in Financing, Technical Assistance, Training and other elements, would probably delay or prevent effective utilization of the findings of the Research/Analysis and thereby continue costly and inefficient technology.

AGRICULTURAL COMMODITY SYSTEM - (Private Sector Component) - LDCs

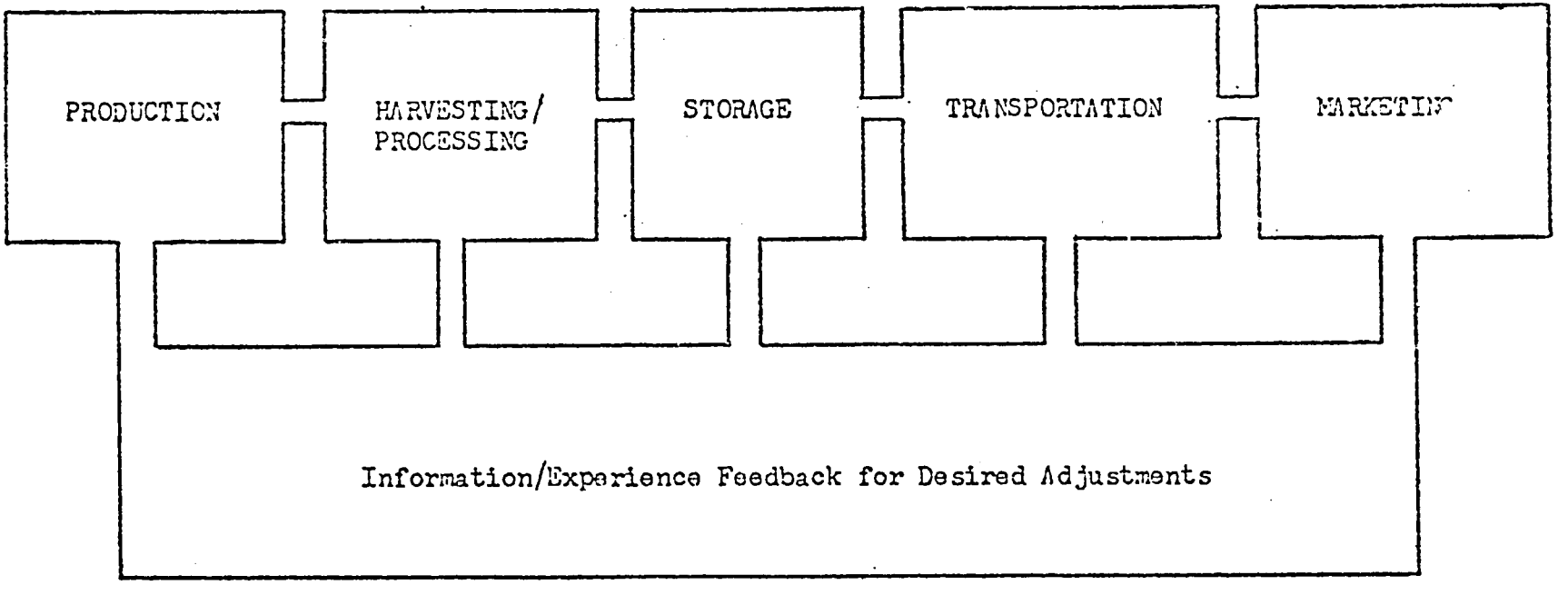

Figure 1.

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AGRICULTURAL COMMODITY SYSTEM —(Public Sector Component) - LDCs

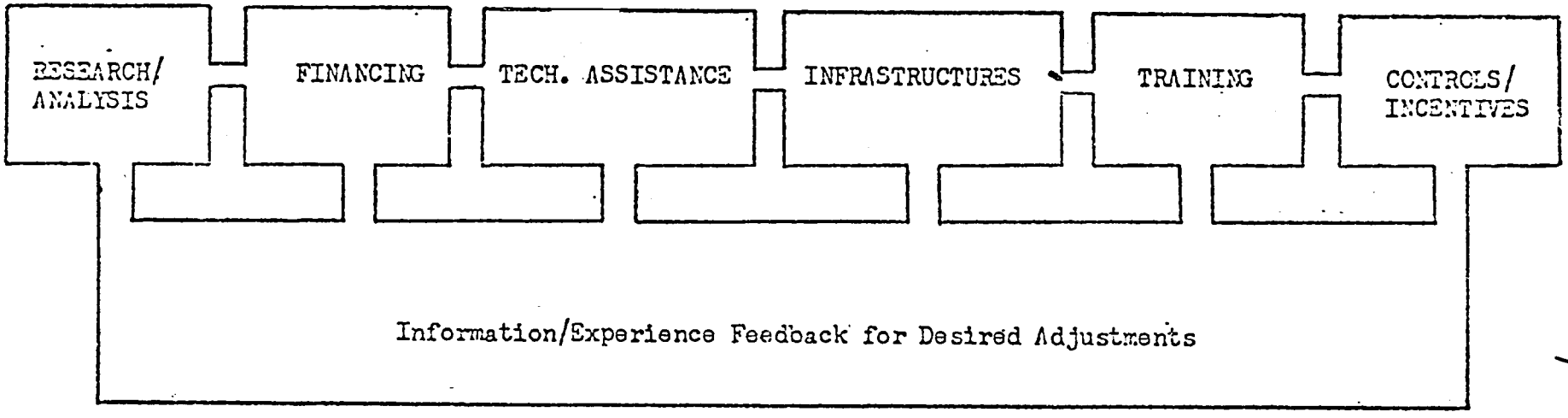


Figure 2.

AGRICULTURAL COMMODITY SYSTEM - Modern Management Component) - LDCs

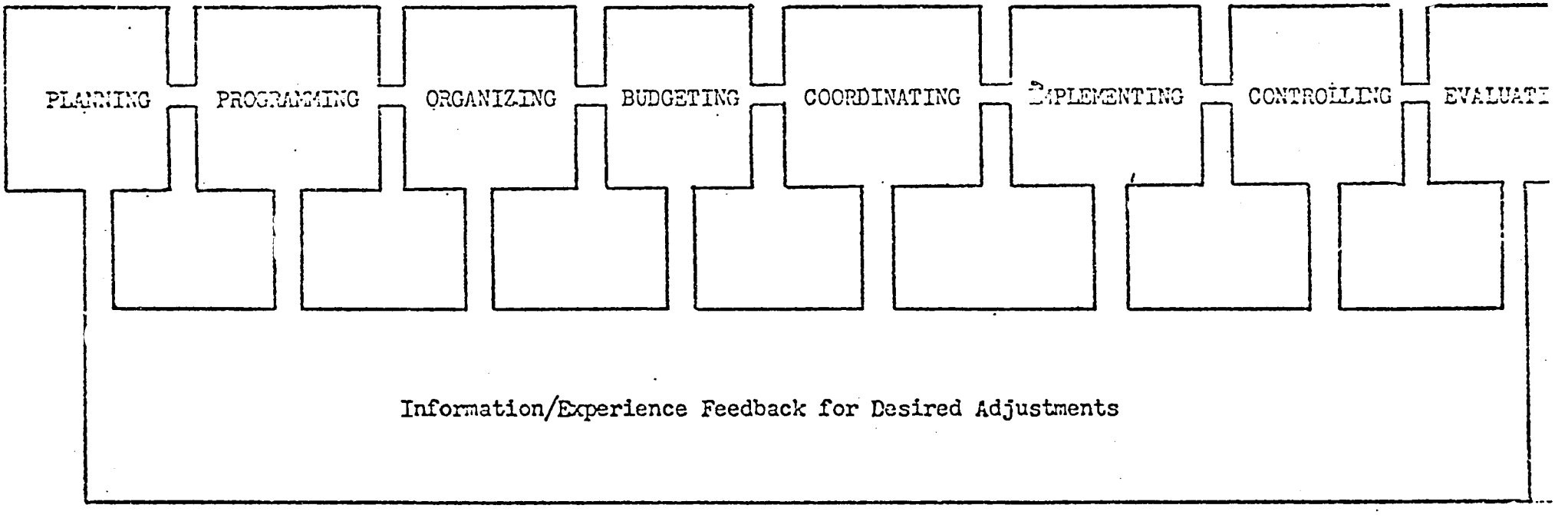


Figure 3.

AGRICULTURAL COMMODITY SYSTEM - LDCs (Vertical Integration)

(Pvt. Sector)	PRODUCTION	HARVESTING/ PROCESSING	STORAGE	TRANSPORTATION	MARKETING	
(Management)						
PLANNING						
PROGRAMMING						
ORGANIZING						
BUDGETING						
COORDINATING						
IMPLEMENTING						
CONTROLLING						
EVALUATING						
(Public Sector)	RESEARCH/ ANALYSIS	FINANCING	TECH. ASSISTANCE	INFRASTRUCTURES	TRAINING	CONTROLS/ INCENTIVES

Figure 4.

And, of course, in the Management Component itself, excessive emphasis in Planning or any one particular element at the expense of other elements such as Programming, Organizing, Budgeting, Coordinating, Implementing, Controlling or Evaluating, would probably contribute to inadequate and/or untimely use of any available modern technology inputs and skilled support services, thereby negating the potentials of these costly resources.

Except for the largest and self-sufficient agricultural enterprises in the LDCs, The Private Sector Component of the Commodity System requires an array of support services from public sector institutions to achieve any effective horizontalcoordination in the production-through-marketing cycles.

As illustrated in Figures 5a the production element, and each of the other elements as well, usually requires support services from one or more public instutions, including:

1. Analysis/Research - from the Ministry of Agriculture, Ministry of Education/Universities, or Ministry of Finance;
2. Technical Assistance/Extension - from the Ministry of Agriculture or Ministry of Health;
3. Credit - Ministry of Finance, National Banks;
4. Training - Ministry of Education or Ministry of Agriculture;
5. Roads and Infrastructures - Ministry of Public Works, Ministry of Finance, Ministry of Interior;
6. Import Authorizations - Ministry of Interior, Ministry of Finance;
7. Quality Standards/Controls - Ministry of Health, Ministry of Interior;
8. Marketing Information - Ministry of Interior, Ministry of Education, Ministry of Information, Ministry of Agricult

TRANSPORTATION	MARKETING
Research (MinPubW/MinInt)	Research (MinAg/MinF/MinInt/Univ)
Extension (MinAg/MinEd/Pvt)	Extension (MinAg/MinEd/MinInt/Pvt)
Training (MinEd/MinPubW/Pvt)	Training (MinEd/MinInt/Pvt)
Credit (MinF/MinInt/Banks)	Credit (MinF/MinInt/MinAg/Banks)
Freight Rates (MinInt/MinF)	Price Policies (MinF/MinInt)
Quality Stds. (MinH/MinInt/MinAg)	Market Info. (MinAg/MinInt/MinInfo)
Infrastructures (MinF/MinH/MinInt/MinPubW)	Quality Stds. (MinH/MinInt/MinAg)
Taxes/Duties (MinInt/MinF)	Infrastructures (MinPubW/MinF)
Imports (MinInt/MinF)	Taxes/Duties (MinInt/MinF)
Exports (MinInt/MinF/MinPubW)	Exports (MinInt/MinH/MinF)

Figure 5

LDC. AGRICULTURAL COMMODITY SYSTEM - Public Sector Support Services

PRODUCTION	HARVESTING/PROCESSING	STORAGE
Research (MinAg./Univ.)	Research (MinAg./MinInt/Univ.)	Research (MinAg/MinInt/Univ.)
Extension (Min.Ag./Univ./Pvt.)	Extension (MinAg/Pvt.)	Extension (MinAg/Pvt.)
Training (MinAg./MinEd./Univ.)	Training (MinEd/Pvt.)	Training (MinEd/MinAg/Pvt.)
Credit (MinAg./MinF./Banks)	Credit (MinF/MinAg/Banks)	Credit (MinF/MinAg/Banks)
Price Policies (MinF./MinAg.)	Market info. (MinInt/MinF)	Price Policies (MinF/MinAg)
Market Info. (MinAg./MinInt./MinInfo.)	Quality Stds. (MinInt/Minag)	Market Info. (MinAg/MinInfo)
Quality Stds. (MinAg./MinInt./Pvt.)	Roads (MinPubW/MinF)	Quality Stds (MinInt/MinH/MinAg)
Roads (MinPubW./MinF.)	Taxes (MinF/MinInt)	Roads (MinPubW/MinF)
Taxes (MinF./MinInt.)	Imports (MinInt/MinAg/MinF)	Taxes (MinInt/MinF)
Imports (MinInt./MinAg./MinF.)	Exports (MinInt/MinF/MinH)	Imports (MinInt/MinAg)

Figure 5

LDC NON-TRADITIONAL AGRICULTURAL EXPORTS - COMMODITY SYSTEM

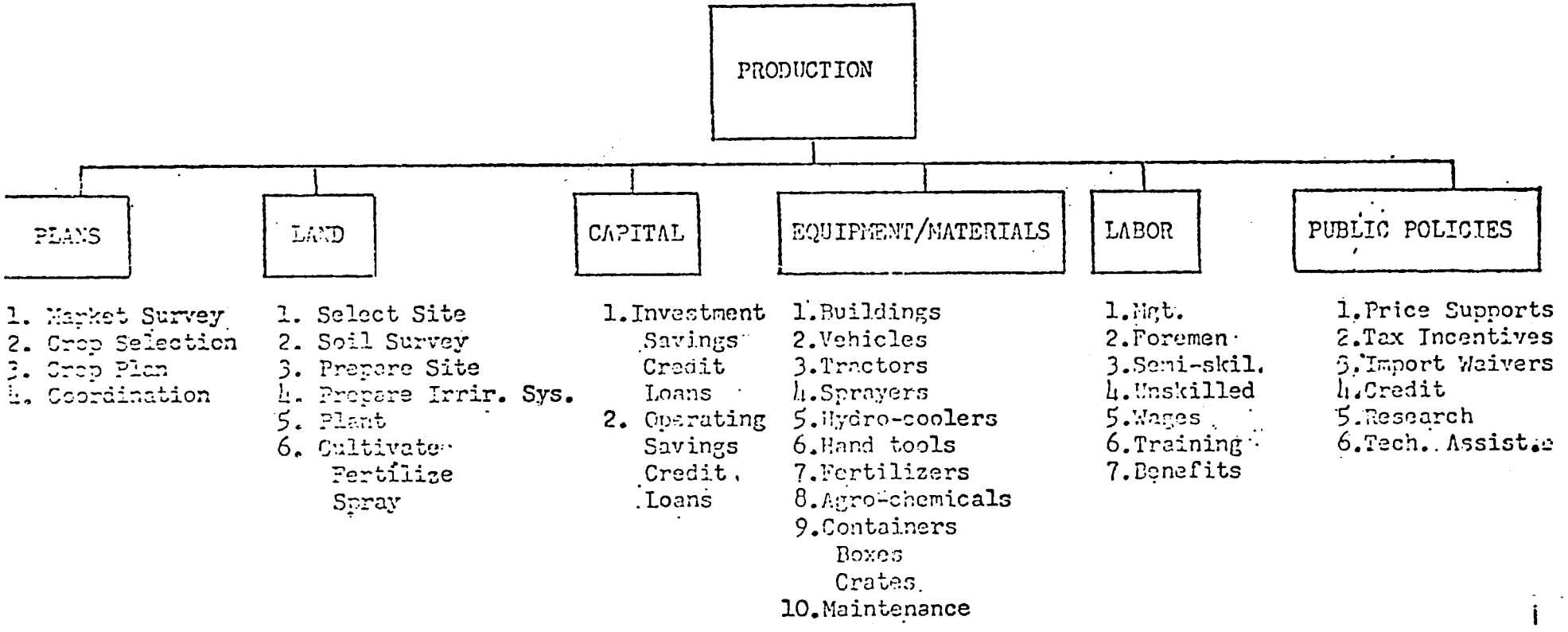


Figure 5a

to provide all of the kinds and quantities of the necessary inputs from both the public and private sectors at each of these decision/action points at the appropriate time and in the required sequence, there is a high degree of risk that the system will be inefficient, or inoperative, and that the venture will not yield a profit.

It is not enough that the LDC farmers are supplied with better seed, fertilizers, insecticides and so on. Nor is it enough that they also be instructed in the proper use of these modern inputs and technology for each of their crops. It is equally important that the inputs, including the support services, be available in the kinds and quantities needed and at the time and in the sequence required for their most effective use at the least cost so that prices of the crops produced can be kept at levels acceptable to consumers while allowing reasonable returns for the growers and intermediaries. Such efficiencies and economies require detailed advance planning for each commodity for most favorable purchases of inputs and services, including transportation; scheduling of planting and harvesting to harmonize with storage facilities and markets; and to accomodate available support services capabilities. Effective implementation of the advance planning, in turn, requires systematic orchestration of all these related actions necessary to produce and market the commodities.

In sum, sound management throughout the operations levels, i.e., at the farm and in the services institutions working directly with the farmers on each crop is necessary if the benefits of research, modern technology and skilled support services are to be realized in the form of increased net profits for the farmers and greater quantities of quality products at reasonable prices for consumers.

A specific example of a situation which illustrates the LDC producers' needs for multiple public sector support services is an extensive insect infestation or disease in a crop. In such a situation, the producer would need help and resources from one or more of the following:

1. Ministry of Agriculture - to identify the kind of insect or disease, and to recommend the kind and amount of agro-chemicals and equipment required for control measures;

2. Ministry of Health - to determine any potential health hazards in the use of the recommended chemicals;

3. Ministries of Interior and Finance - for authorization to import needed chemicals and equipment and credit for their purchases;

4. Ministries of Education and Agriculture - for training personnel in the use of the chemicals and equipment;

5. Ministry of Labor - for information on wages, benefits and working conditions for labor; and

6. Ministry of Public Works - for transport and/or storage of the chemicals and equipment.

Delays of even a few hours, or other deficiencies in the delivery or use of any one of the many essential inputs and/or support services indicated in the above partial listing could, and frequently does, result in disastrous losses for the producer and/or other investors in the enterprise.

This illustrative example involves only one (Production) of the several production-through-marketing elements in a crop cycle in an LDC. Similar operational problems requiring equally critical public sector support services are also common in the harvesting, processing, storage, transportation and marketing elements. The potential for losses due to any delay or deficiency in availability of such services are also equally great.

Both the private and public sector components also require continuous and concurrent "vertical " integration and coordination of the essential inputs and support services for each element. For example, if private sector production inputs such as land, labor, capital, water and equipment, and public sector support services such as technical assistance, credit, research and infrastructures are to be provided in adequate and timely kinds and quantities, these needs must be planned, programmed, organized, budgeted, coordinated, implemented, controlled and evaluated continuously as shown in Figure 5.[6] That is, they must be "managed" if each of the elements and the entire component are to function effectively.

Information/Communications in Management by Systems

Horizontal and vertical integration and coordination of the several elements which make up the agricultural commodity system require that decision-makers and managers have adequate data to make operational decisions for:

1. Anticipating future needs;
2. Coping with current situations; and
3. Evaluating and adjusting ongoing and future plans, programs as may be required as a result of accumulating experience and changing circumstances.

Continuous two-way exchanges of information throughout the system are thus a pre-requisite of sound management decisions and an effective management process.

The test of the effectiveness of the management decisions and of the management processes in the commodity system is usually reflected very quickly in the profit, or losses, in the private sector component;

it is less apparent in the public sector.

The Agricultural Commodity System - Operational Level

The concept of the agricultural commodity system is generally understood by most senior officials of LDC public sector institutions. And, while the major elements of both the public and private sector components are recognized -- in aggregate -- the exacting order, discipline and coordination requirements among and between the interrelated individual inputs and support services within these elements are not usually recognized, nor are the consequences of delays or inefficiencies in the delivery of such inputs and services well understood by most public officials in the LDCs.

Managers of commercial-scale private enterprises, on the other hand, tend to have a good understanding of the operational aspects of the commodity systems and an appreciation of the complex management issues involved, including the consequences of any functional deficiencies.

Experience has shown that agricultural commodity systems are unique to each crop or commodity. Furthermore, there are also distinctive differences within the system for a given crop due to inherent genetic variations; geographic/climatic differences; cultural practices and so on. For example,

1. Some varieties of corn are more resistant to insects and diseases than others;

2. Many varieties have higher yields in temperate than in tropical climates;

3. Some have higher yields in lower than in higher elevations;

4. Some are more responsive than others to fertilizers, water and modern technology than others;

5. Many varieties vary considerably in texture, flavor and appearance; and

6. Some have different storage, processing and preserving qualities.

Other crops, such as certain fresh fruits and vegetables or meat products, require highly specialized packaging, refrigeration, transportation and storage facilities and services in order to maintain the exacting health, quarrantine and cosmetic standards demanded by regulatory institutions and consumers.

Finally, most crops have comparatively precise physilogical cycles or schedules which tolerate deviations of no more than a few hours without adverse effects on yield, quality and/or health standards. Illustrative examples include:

1. The optimal pollination period for some crops (e.g. cantaloupes) is usually about 24 hours;

2. The decay processes for most fresh fruits, vegetables and meat products begin immediately following harvest unless refrigeration or other preservative measures are taken;

3. Optimal quality for many crops (e.g. garden peas, okra, cucumbers et al) require harvesting within a range of a few hours.

Ordinarily, any appreciable reductions in the quantity of the yield or in the quality of the commodity are reflected in higher unit costs and lower profits.

Given the unique characteristics of each agricultural commodity, including distinctive differences between varieties of the same commodity, together

with the usually substantial adverse effects of failure to conform to the physiological cycle or schedule of the commodity involved, it follows that the commodity system must be designed specifically for each commodity and its environment. It follows also, that operational management of the entire system must be equally exacting if the venture is to be successful (profitable).

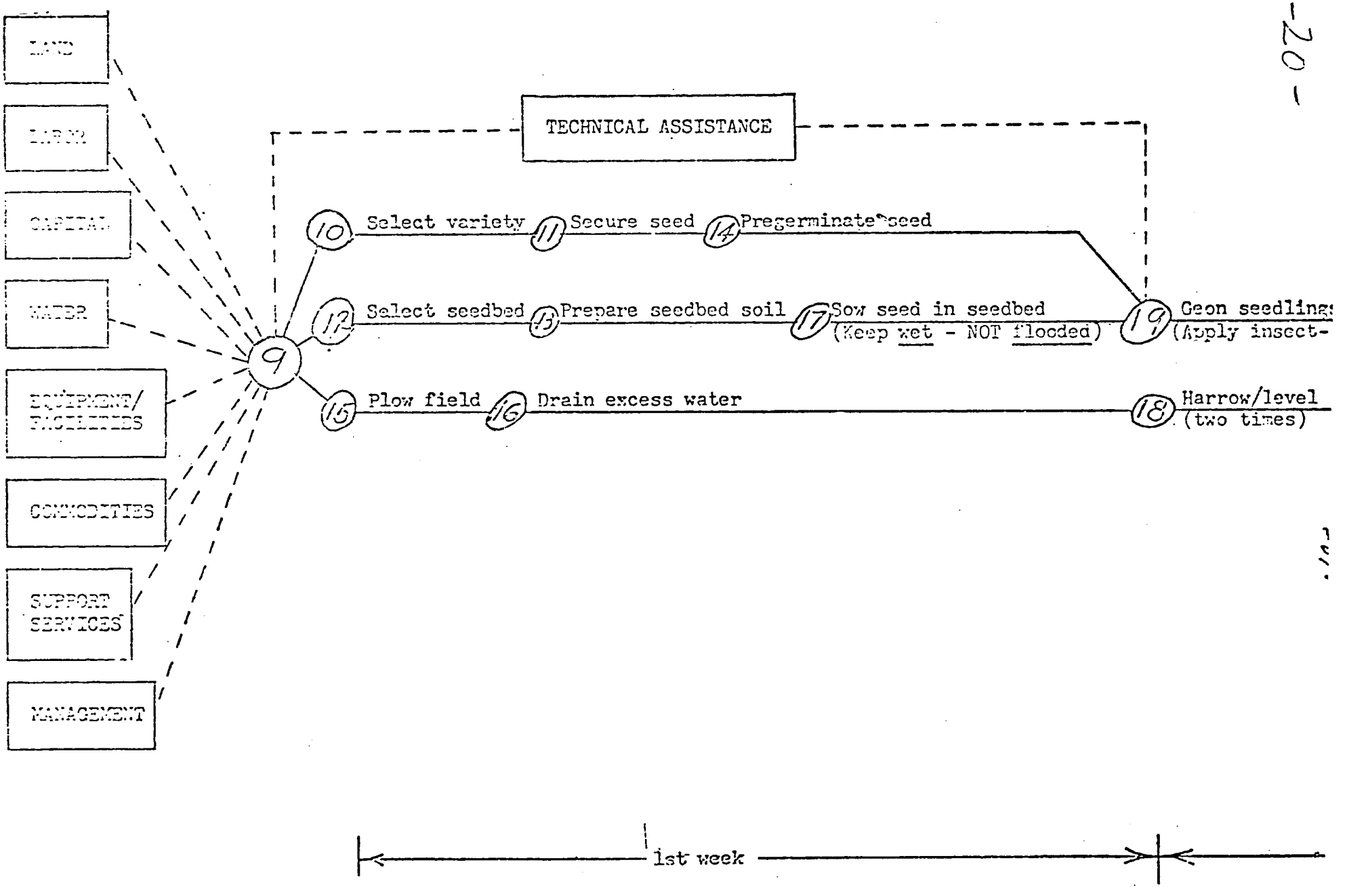
An illustrative example of a commodity system for rice (paddy conditions; for small farmers) is shown in Figure 6.

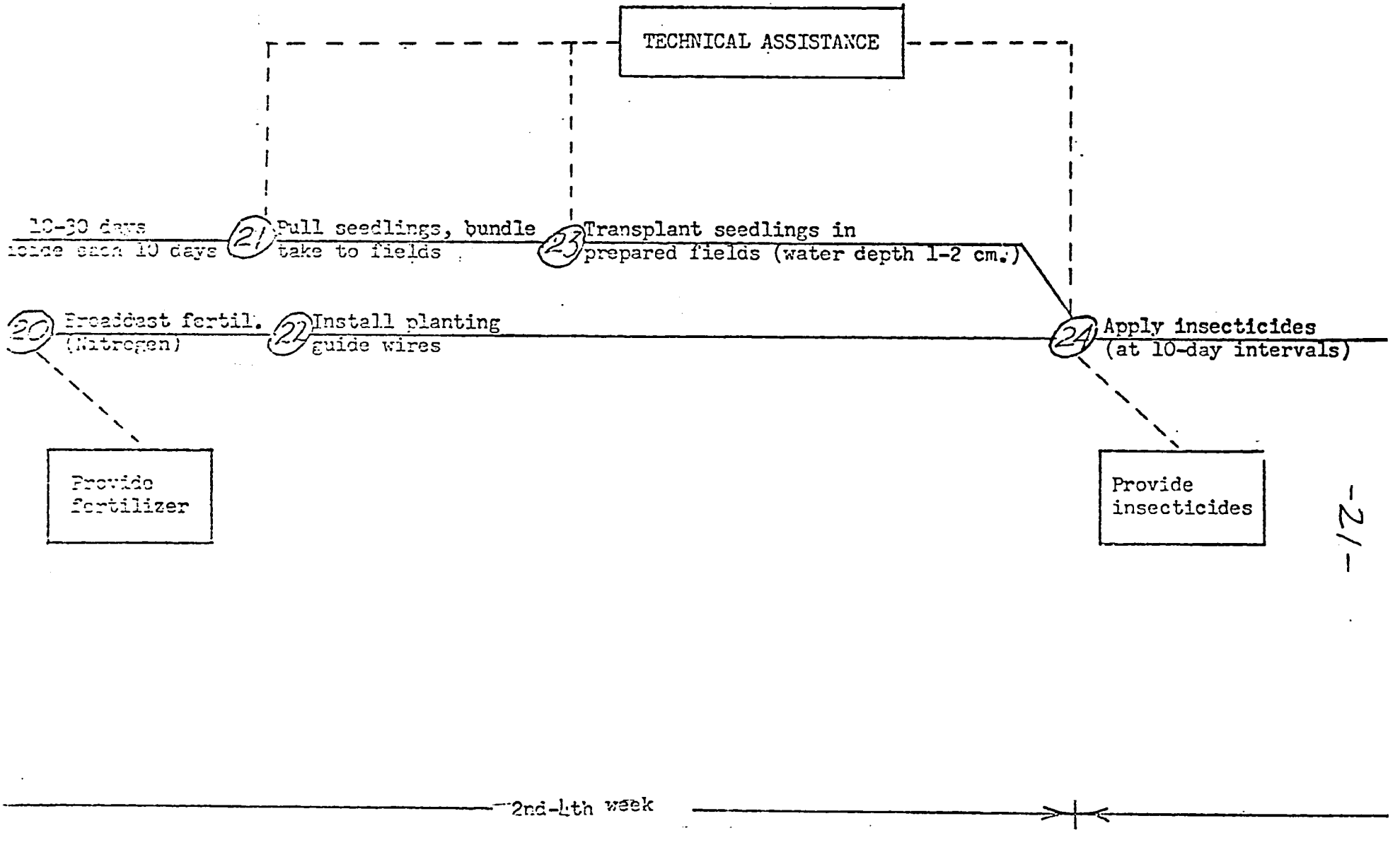
For simplicity, in this schematic, the array of support services to be provided by the various public sector institutions are designated as "TECHNICAL ASSISTANCE". Such support services are intended to include those illustrated in Figure 4 and described on pages and . .

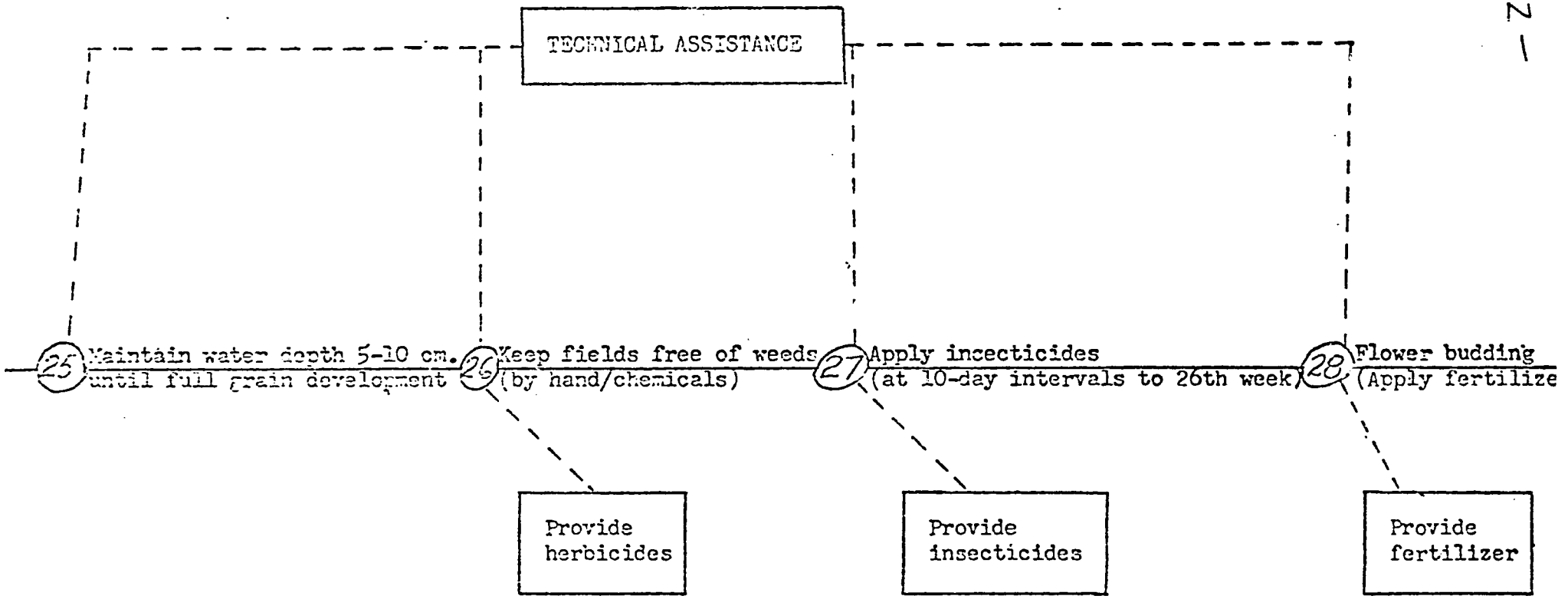
In the design of a commodity system for a particular crop such as the one illustrated by Figure 6, it is usually possible to determine quickly and without prior committment of policies or resources, its potential feasibility in a given environment, through a careful test of each of the decision/action points in the system against a five-point diagnostic criteria. That is, unless it can be established beyond any reasonable doubt that it is:

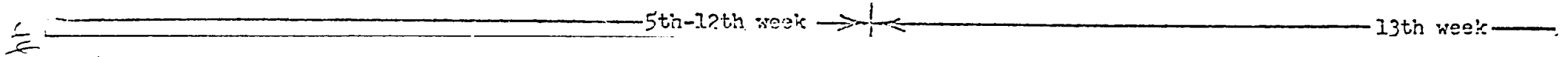
1. Technically possible;
2. Economically feasible;
3. Politically acceptable;
4. Operationally practical; and
5. Socially desirable

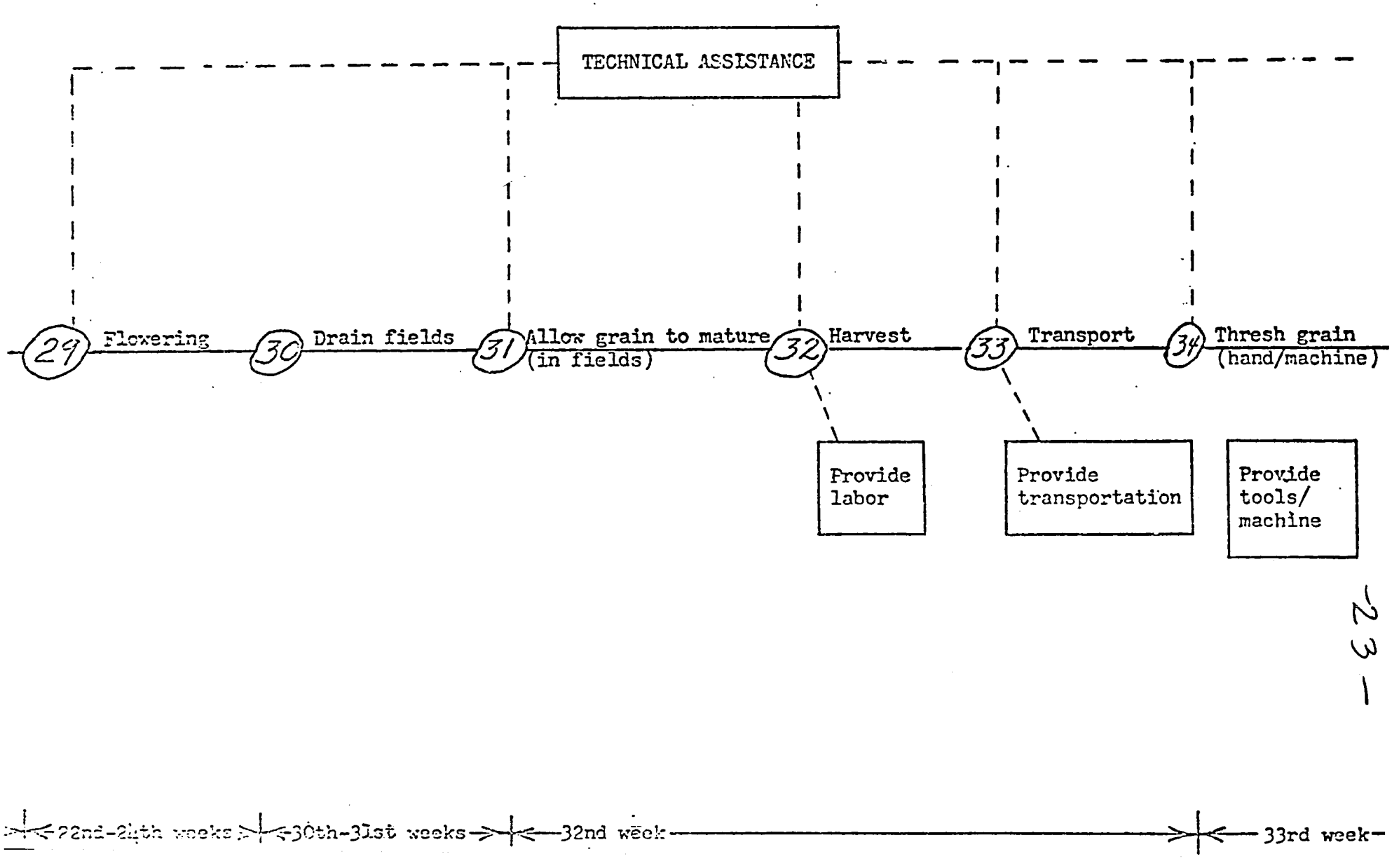
AGRICULTURE COMMODITY SYSTEM FOR RICE (PADDY)

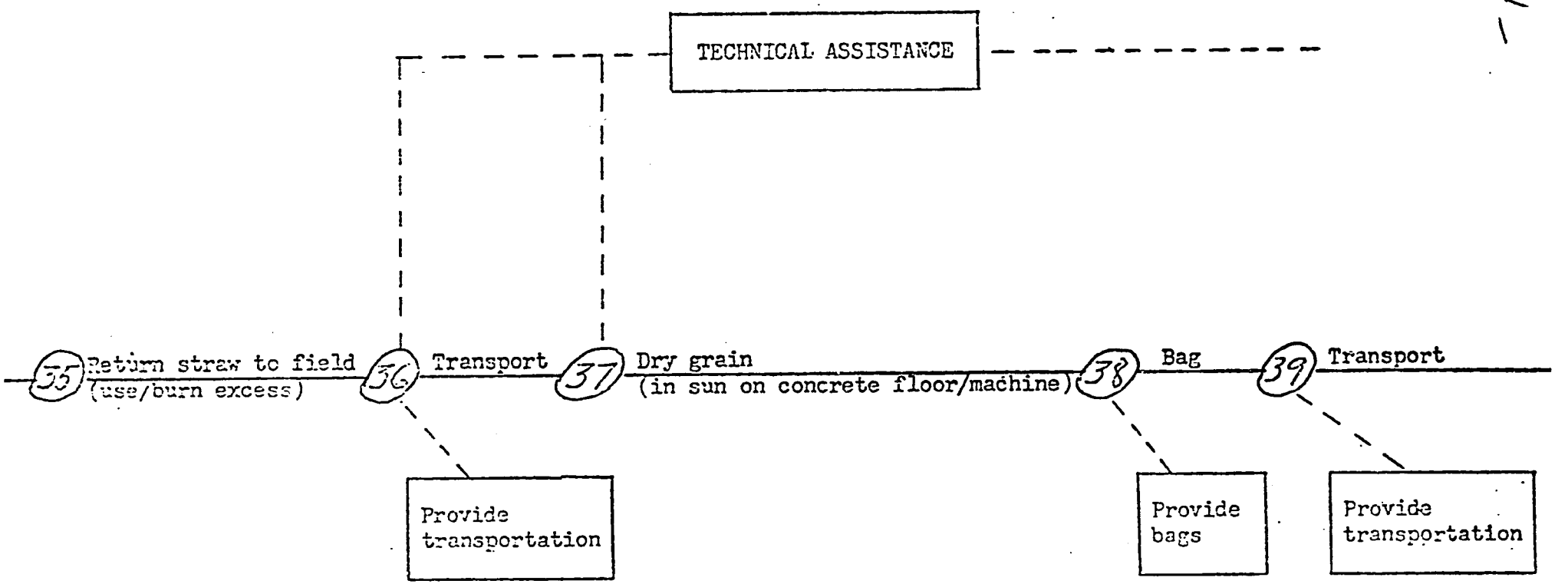


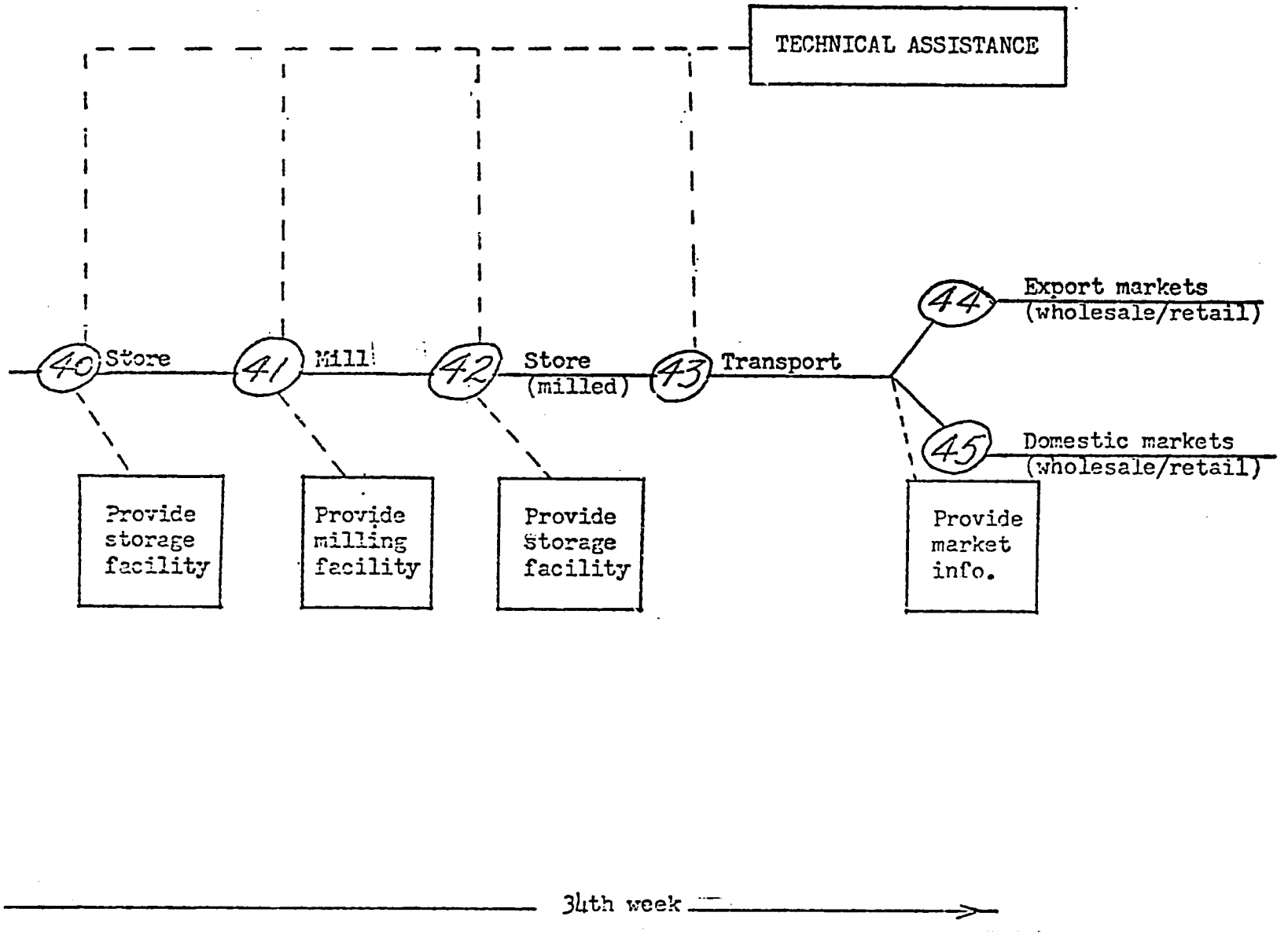

TECHNICAL ASSISTANCE
10-30 days
20
Broadcast fertil.
(Nitrogen)
21
Pull seedlings, bundle
take to fields
22
Install planting
guide wires
23
Transplant seedlings in
prepared fields (water depth 1-2 cm.)
24
Apply insecticides
(at 10-day intervals)
Provide
fertilizer
Provide
insecticides
2nd-4th week


TECHNICAL ASSISTANCE
25
Maintain water depth 5-10 cm.
until full grain development
26
Keep fields free of weeds
(by hand/chemicals)
27
Apply incecticides
(at 10-day intervals to 26th week)
28
Flower budding
(Apply fertilize
Provide herbicides
Provide insecticides
Provide fertilizer


5th-12th week
13th week


TECHNICAL ASSISTANCE
29
Flowering
30
Drain fields
31
Allow grain to mature
(in fields)
32
Harvest
33
Transport
34
Thresh grain
(hand/machine)
Provide labor
Provide transportation
Provide tools/ machine
22nd-24th weeks
30th-31st weeks
32nd week
33rd week


TECHNICAL ASSISTANCE
35
Return straw to field
(use/burn excess)
36
Transport
37
Dry grain
(in sun on concrete floor/machine)
38
Bag
39
Transport
Provide transportation
Provide bags
Provide transportation


TECHNICAL ASSISTANCE
40
Store
41
Mill
42
Store
(milled)
43
Transport
44
Export markets
(wholesale/retail)
45
Domestic markets
(wholesale/retail)
Provide storage facility
Provide milling facility
Provide storage facility
Provide market info.
34th week

The ultimate test of analyses, policies, plans, strategies, procedures, and allocations/expenditures of resources is therefore at these "action" levels. It follows then, that the potential for success of such plans, policies, strategies and procedures--for national, sector, regional, village or project levels-- should be greater if they reflect actual needs, experience, desires and circumstances of these operating levels for each and every agricultural commodity involved. It seems eminently reasonable therefore, that if such policies, plans, strategies and procedures are intended for implementation, they should evolve as an aggregation of realistic data and experience from farmers and intermediaries involved in production and marketing, and their support service institutions.

There is abundant experience that indicates that most plans, policies and procedures for agricultural development in the LDCs are usually developed in comparative isolation at national or sectoral levels, with regional and lower level versions being little more than smaller-scale editions or disaggregates of the larger editions which do not in fact realistically reflect on-site situations.

The Agricultural Commodity System - Sector/Multisector Levels

Just as modern technology and support services per se are not sufficient for effective (profitable) agricultural commodity systems, so also are such systems in themselves not sufficient for long-term stability and growth of agriculture in LDCs. Many LDCs have learned that heavy reliance on a few very profitable crops such as coffee, sugar and bananas, can be disastrous when there are substantial declines in world market prices; when storms, diseases or other natural disasters occur, or when political events disrupt established trade patterns

Individual commodity systems therefore, need to be considered within the framework and from the perspective of the entire agricultural sector (Figure), as well as such other sectors as nutrition, health, education and population.

Modern data gathering, processing and analytical tools and techniques make it possible to provide policy makers in LDCs with an array of alternative choices in the use of their resources, together with insights into the probable short-term and long range consequences of various choices or combinations of choices.

Traditionally the sectoral and multisectoral analyses have tended to be largely "economics oriented". More recently, however, with the development of more sophisticated analytical techniques, and in response to increasingly urgent needs, socio-political and environmental considerations are becoming important factors in plans, policies, strategies and procedures for development in the LDCs. As these additional factors are incorporated into plans, programs and projects, it is reasonable to expect that their implementation in both the individual commodity systems and in the total sectors will become more complex and that their "management dimensions" will likewise become increasingly significant.

Any detailed treatment of the sector-multisector issues are, of course, outside the scope of this document. They are identified here only for the purpose of noting the interrelationships of a given agricultural commodity system to the entire agricultural sector and to related sectors.

IDC AGRICULTURE SECTOR - Schematic

TRADITIONAL EXPORTS

- Bananas
- Coffee
- Cotton
- Sugar
- . . . .

BASIC FOODS CROPS

- Beans
- Cassava
- Corn
- Rice
- Sorghum
- Yams
- Wheat
- . . . .

LIVESTOCK

- Beef
- Fish/Shrimp
- Poultry
- Swine
- . . . . . .

NON-TRADITIONAL EXPORTS

- Flowers/Ornamentals
- Fruits
- Nuts
- Vegetables
- Wood Products
- Textiles/clothing
- . . . . . .

RESEARCH/EXTENSION/EDUCATION

LAND REFORM

RESOURCES/INSTITUTIONS

. . . . . .

TA/AGR: 9/8/72

The Agricultural Commodity System - As a Multi-purpose Tool

While the agricultural commodity system, as already noted, is perhaps most useful as a mechanism for planning, organizing, coordinating, controlling and evaluating day-to-day operations of the total seed-to-consumer process at the action levels --on the farm and in the support service institutions in the LDCs--it also has potential for other practical uses in these countries:

1. As a "delivery system" which can serve as a vehicle for transferring relevant technology and management from the developed countries to LDCs, and as a focus around which the LDCs can organize a unity of purpose and a cohesion of efforts within and between their own institutions in formulating and implementing their own policies, plans, programs, strategies and procedures for development (see Figures and);[1]

2. As a diagnostic tool for determining specific kinds and amounts of manpower skills required for effective implementation of plans, programs and projects[2];

3. As a teaching aid for training individuals and groups in the concepts and techniques of integrated or "systems" operations and management in short term and/or long term manpower development programs;[2]

4. As a diagnostic tool for predetermining the operational feasibility of prospective projects, programs and plans; for identifying constraints or bottlenecks in ongoing project operations,[2] and for evaluating the effectiveness of completed or terminated projects or programs; and

5. As a frame of reference for structuring or restructuring public support service institutions, including ministries and their component entities in LDCs, to improve their response capabilities, i.e., for institutional development.[3]

1/ A study now under way via contractual arrangements between TA/DA and the Governmental Affairs Institute (AID/csd 3630) will test this proposition.

2/ Experience in Central America and studies by Harvard Buisness School, under contractual arrangements with TA/DA (AID/csd 3153) confirm this proposition.

3/ An exercise now in progress (Ghana) with TA/DA collaboration will test this proposition.

This is not to suggest that a commodity system is a panacea for agricultural development, or that it can provide quick and easy solutions to all program and project management problems in LDCs. It does not, ipso facto, eliminate the economic, socio-political or institutional constraints that impede development and/or management, nor supply essential resources, incentives and motivations. It does offer a versitale and practical tool that managers, technicians and government officials can use to help farmers to produce quality crops in quantity, for a price consumers can afford to pay and at a cost which gives the producer a reasonable return on his investment and risks.

ATTACHMENT B

TEST CRITERIA FOR OPERABILITY OF GRAINS SYSTEMS

Systems techniques are sometimes disarming or even misleading because of their apparent order and "logic." They do not, in fact, provide a panacea or easy solutions to difficult and complex problems; they can make such problems "easier" if these systems and their proponents or managers maintain constant surveillance throughout the entire system and constantly test all of its critical functions against a set of exacting criteria. One set of such criteria that has been useful is the following:

1. Technical possibility;
2. Economic feasibility;
3. Political acceptability;
4. Social acceptability; and
5. Operational practicality.

As an illustrative example, one might ask if it is "technically possible" to clear 63,100 acres of land for additional corn acreage in 1973; and another 64,695 acres in 1974 and still another 69,000 acres in 1977 (assuming that the estimated additional consumptive demand for maize is to be produced on such lands). If it is determined that this enormous task is "technically possible," the next question should be if it is "economically feasible"--are the farmers and/or the GOG able and willing to provide the necessary funds and other resources. If the effort is economically feasible, then it must be established

that the effort is "politically acceptable"--to GOG officials who are authorized to make such decisions; to local Chiefs and to heads of GOG institutions who must collaborate in the effort. Then, of course, the "social acceptability" issue needs to be examined to determine if the farmers involved and the public in general supports or accepts the venture. Finally, it must be established that it is actually "operationally practical" for all the participating institutions and individuals to carry out the project during the prescribed time periods with the resources provided. Similar "tests" need to be made against each and every function of the entire system, and particularly against those which might become critical constraints or bottlenecks. Thus the "management" of such systems is a major factor in their effectiveness.

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ATTACHMENT C
(Narrative supplement)

AGRICULTURAL COMMODITY SYSTEMS SCHEMATICS

MAIZE, SORGHUM and UPLAND RICE - Ghana

Attachments C, D and E show schematically the sequence and timing of the major tasks which need to be carried out in the "seed-to-consumer" processes for maize, sorghum and upland rice respectively, during a crop cycle in Ghana.

Each of the illustrative tasks represents a critical decision which directly affects subsequent follow-on decisions and actions throughout the entire "system" during the crop cycle, not only for the individual farmer/producer involved, but also for the several public sector institutions which assist in providing material inputs and support services, and for other private sector intermediaries or "middlemen" between the producer and the consumer, including the consumer himself. For example, a producer's decision to clear a given area of land for planting largely predetermines the kinds, amounts, sequence and timing of material inputs required--such as hand-tools, seed, fertilizer, insecticides and so on--as well as the kinds, amounts, sequence and timing of support services needed--such as training, credit, extension, transportation, storage and marketing (see Attachment F).

Similarly, the aggregation of producers' decisions at district, regional and national levels, predetermine the kinds, amounts, sequence and timing of such material inputs and

support services required for each crop or commodity involved at each of these levels.

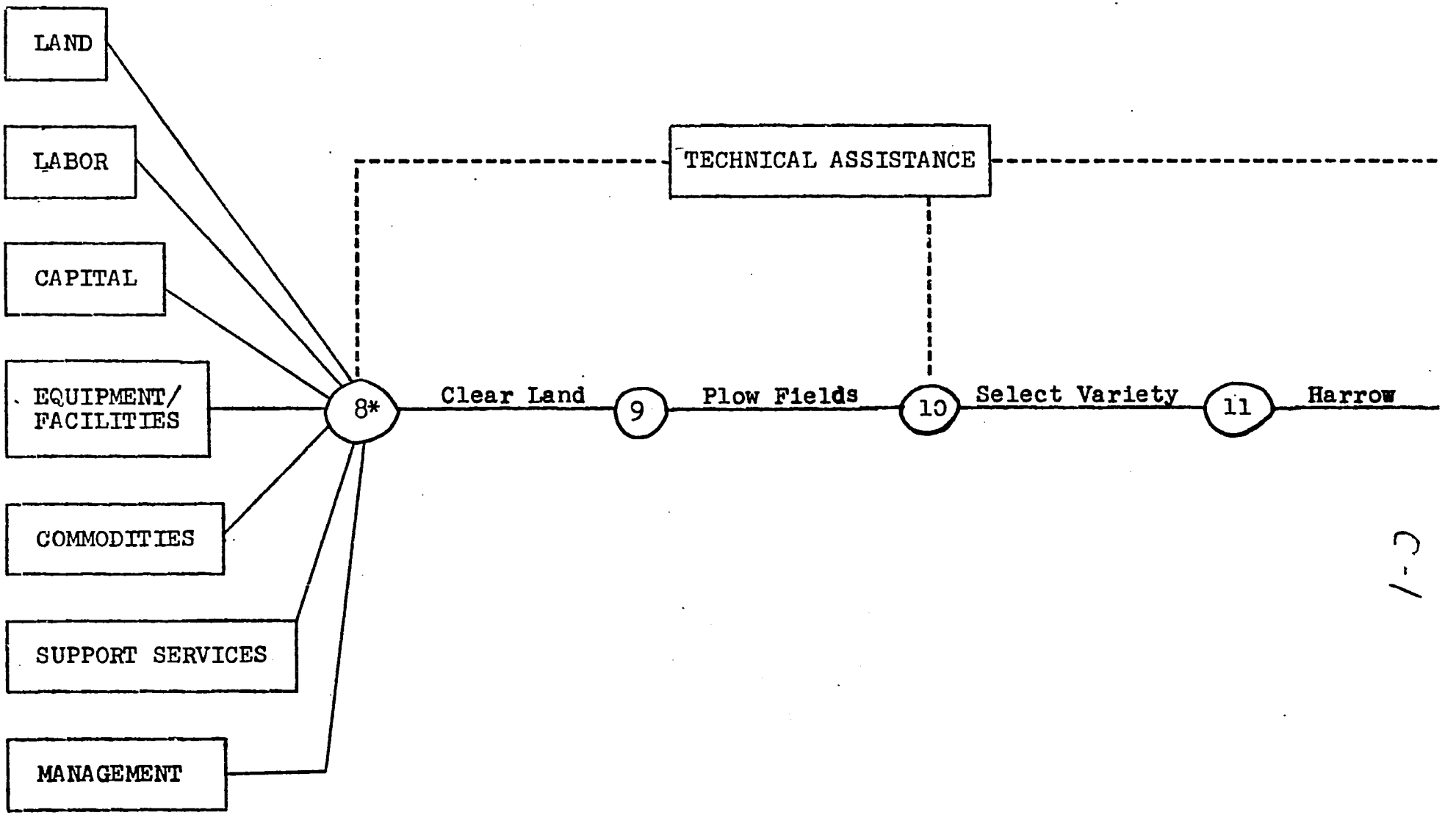
In turn, the efficiency/effectiveness of both the private and public sector participants in each commodity system, in acquiring and delivering the kinds and amounts of essential material inputs and support services in the required sequence and time periods, is the measure of the technical possibility, economic feasibility, political acceptability, social desirability and operational practicality of the government's objectives, policies, plans, programs and projects for each commodity. That is to say, the individual and collective capacity of the participants to carry out each and every one of the illustrative tasks of a given commodity system, determines whether or not national, regional and/or district objectives, policies, plans, strategies, programs and projects can, in fact, be implemented at the levels and during the time periods prescribed therein with the resources available. The capacities to carry out these tasks efficiently and effectively also determine whether or not maize, sorghum and upland rice can be produced in Ghana for a price that consumers can afford to pay and at a cost which allows the producers and participating intermediaries a reasonable return on their investments and risks during the near future.

Given the comparatively low efficiency/high cost of producing these crops (maize, sorghum and upland rice) by "traditional methods" (because of use of low-yielding varieties, little or

no fertilizer, high losses due to weeds, insects, diseases and storage problems, and inadequate transportation and marketing facilities) together with generally deficient support services by public sector institutions, and the absolute necessity for converting the "traditional" technology and management to "modern" technology and management throughout each commodity system, the producers, intermediaries, public institutions and consumers in Ghana will have to cope with many extremely comple and difficult problems during the years immediately ahead in order to "catch up" with enormous and growing food grains shortages. The array of "technological" problems that need to be resolved in order to establish and maintain a modern agricultural commodity system for these food grains in Ghana is formidable; the "managerial" problems likely to be involved in orchestrating the procurement and delivery of material inputs and support services by the participating public sector and other institutions--illustrated in Attachment F--are awesome.

ATTACHMENT C

AGRICULTURAL COMMODITY SYSTEM - MAIZE (Ghana)

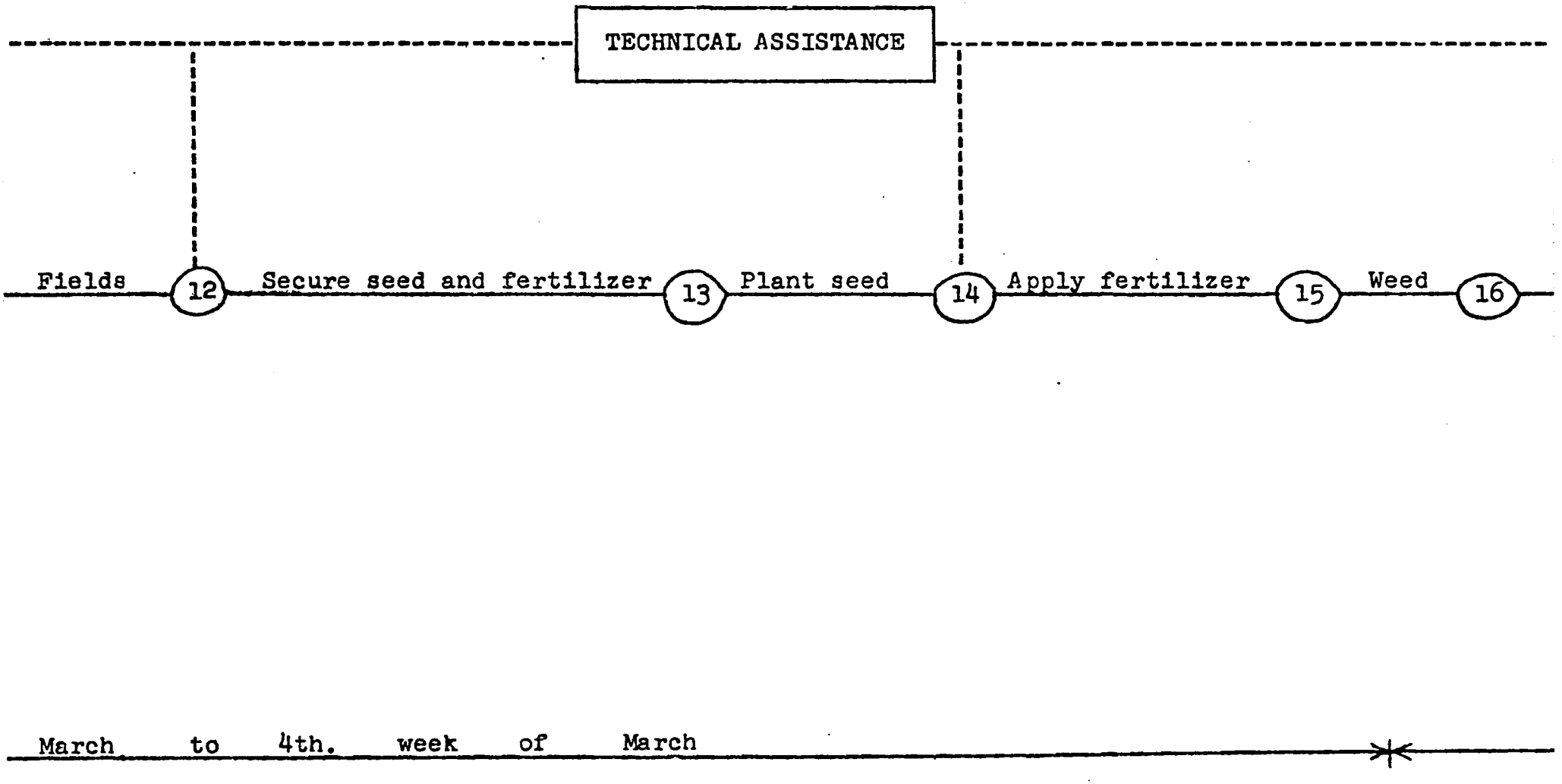


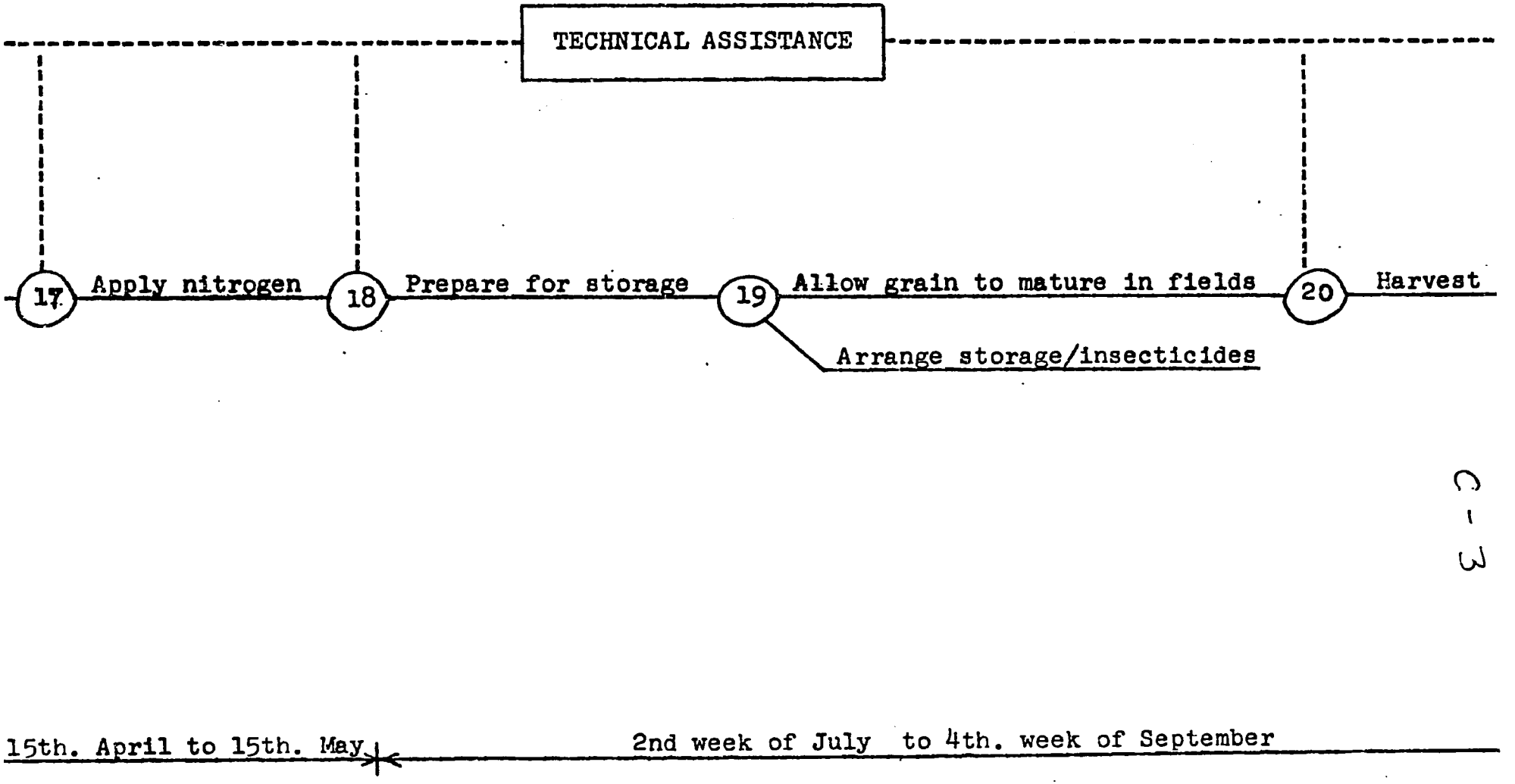
* Check delivery seed/fertilizer (government)

C-1

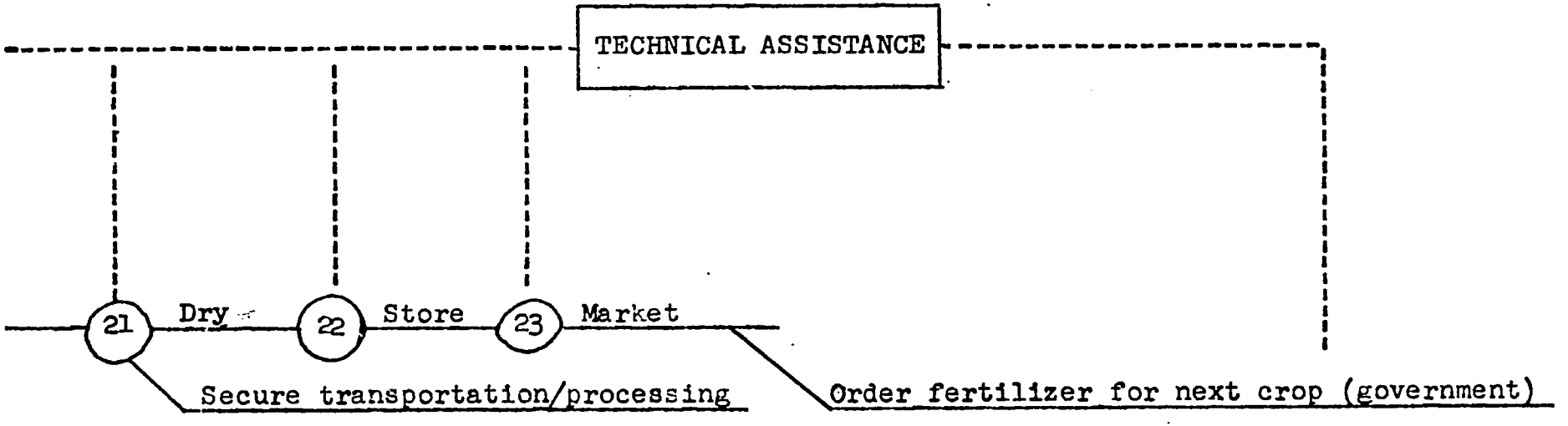
58

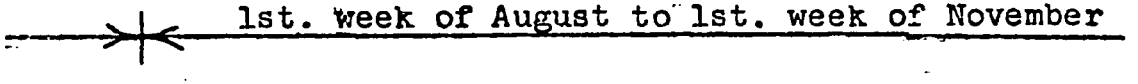
C-2


TECHNICAL ASSISTANCE
Fields
12
Secure seed and fertilizer
13
Plant seed
14
Apply fertilizer
15
Weed
16
March to 4th. week of March

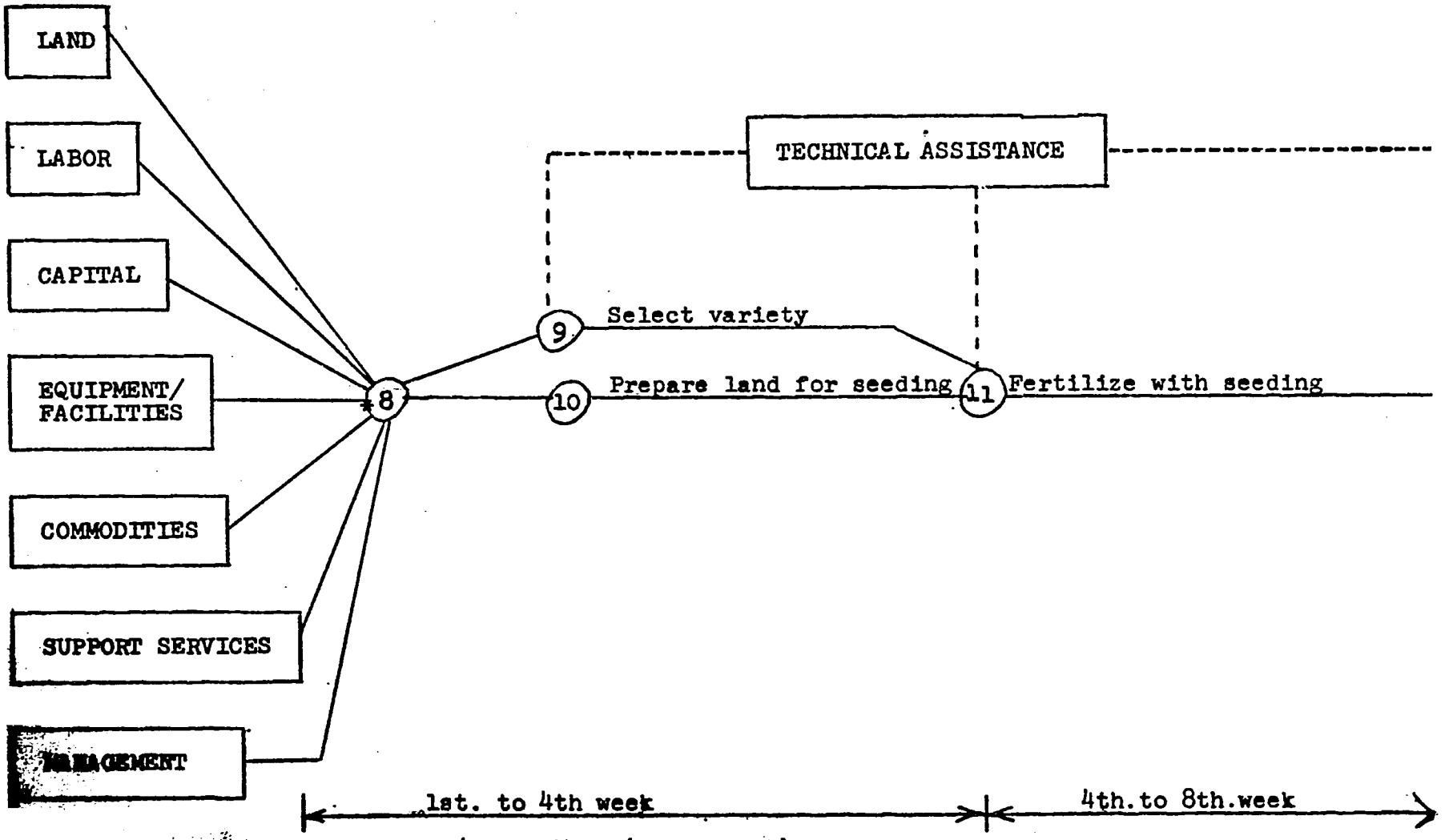

TECHNICAL ASSISTANCE
17
Apply nitrogen
18
Prepare for storage
19
Allow grain to mature in fields
20
Harvest
Arrange storage/insecticides
15th. April to 15th. May
2nd week of July to 4th. week of September

C-3

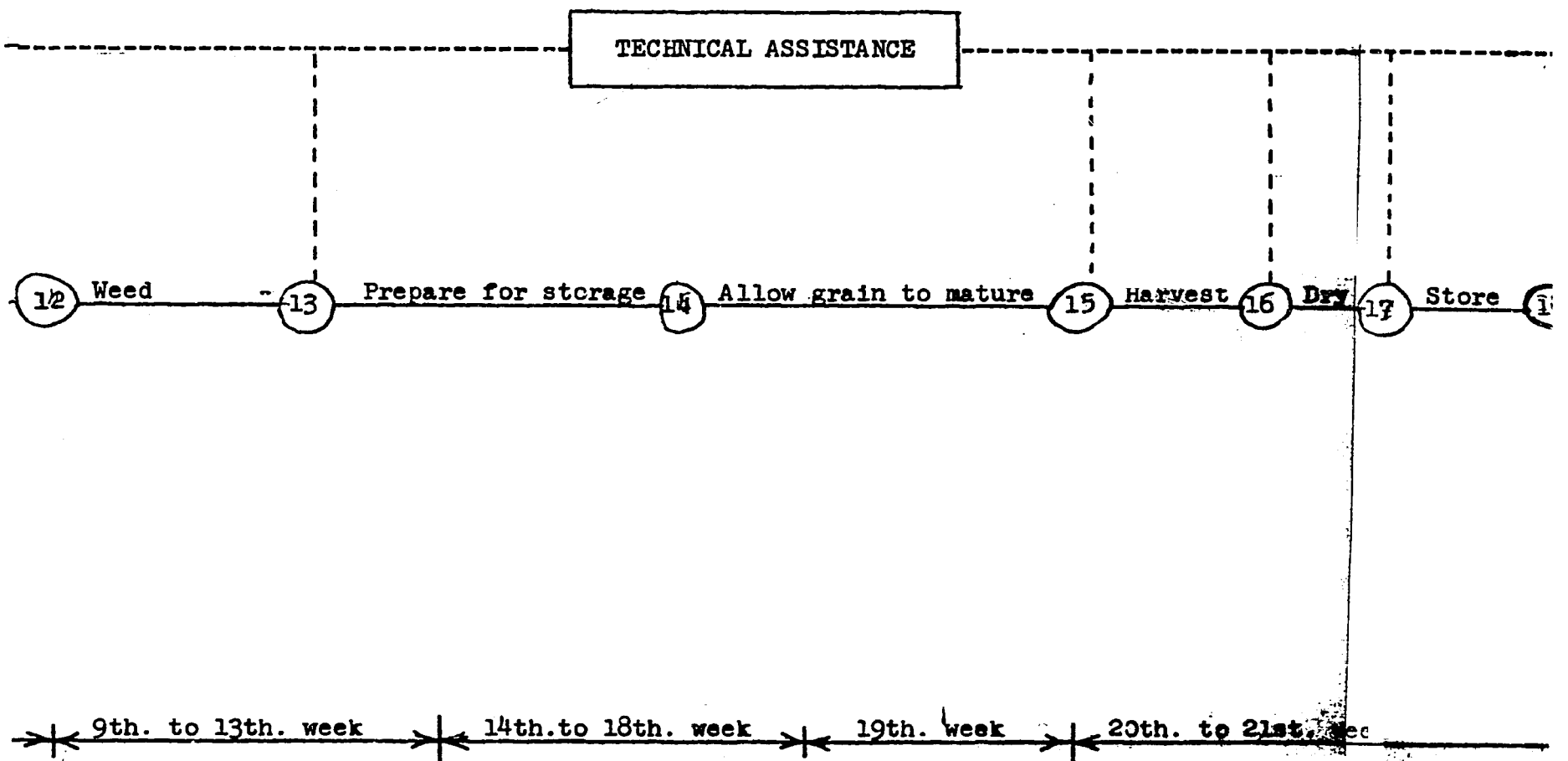

TECHNICAL ASSISTANCE
21
Dry
22
Store
23
Market
Secure transportation/processing
Order fertilizer for next crop (government)

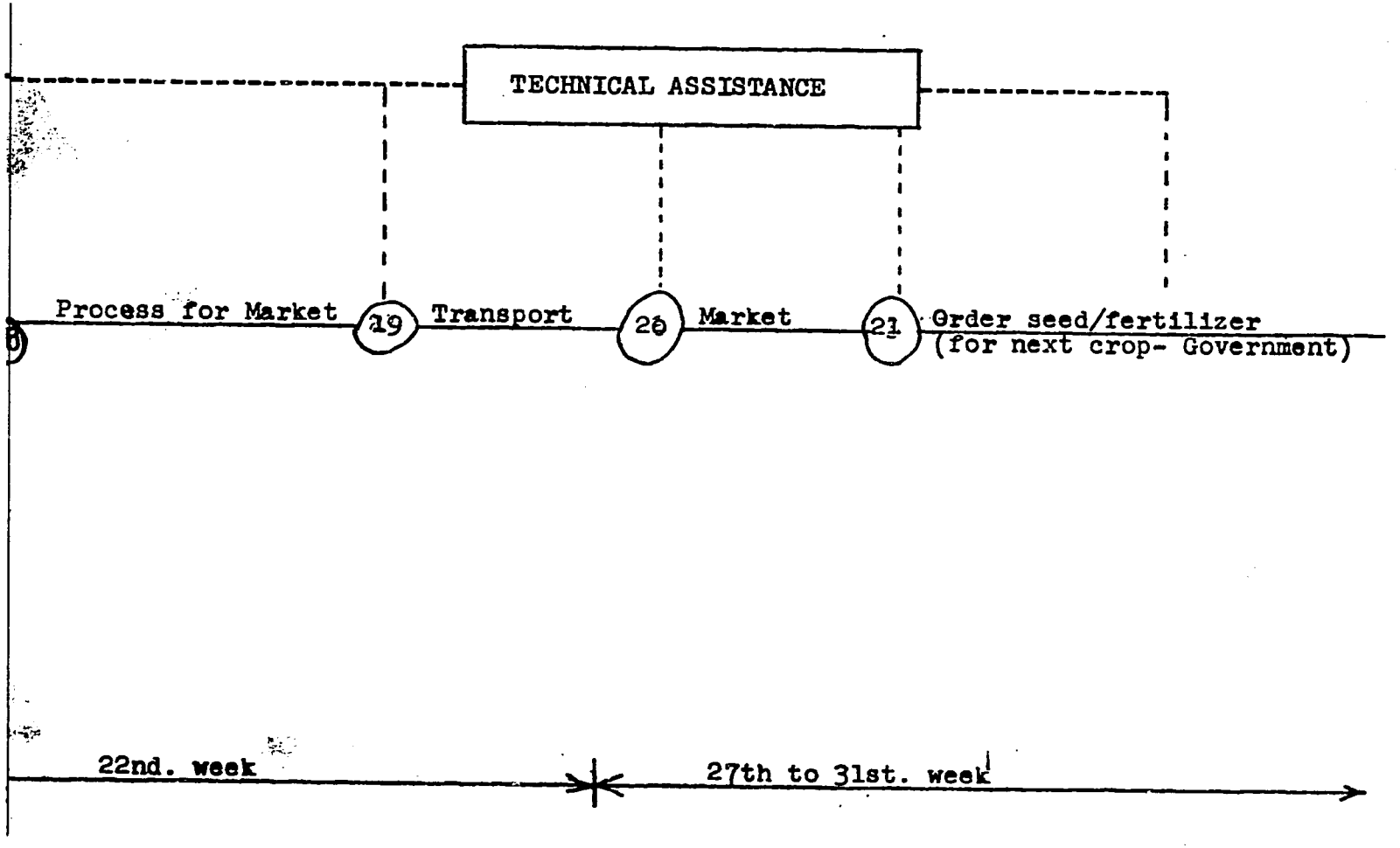

1st. week of August to 1st. week of November

AGRICULTURAL COMMODITY SYSTEM - SORGHUM (Ghana)



* Check delivery seed/fertilizer (government)

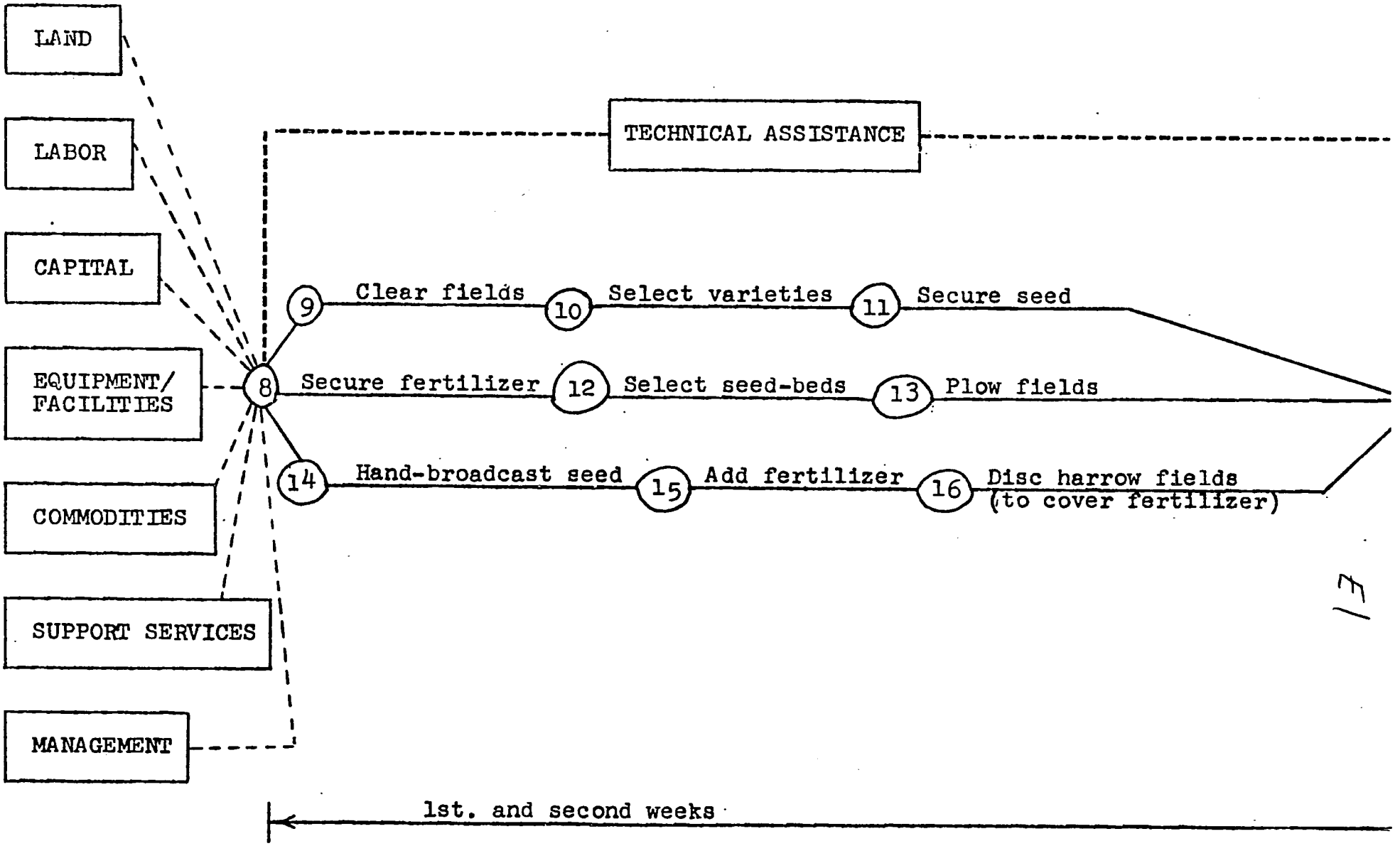

TECHNICAL ASSISTANCE
12
Weed
13
Prepare for storage
14
Allow grain to mature
15
Harvest
16
Dry
17
Store
9th. to 13th. week
14th.to 18th. week
19th. week
20th. to 21st. week

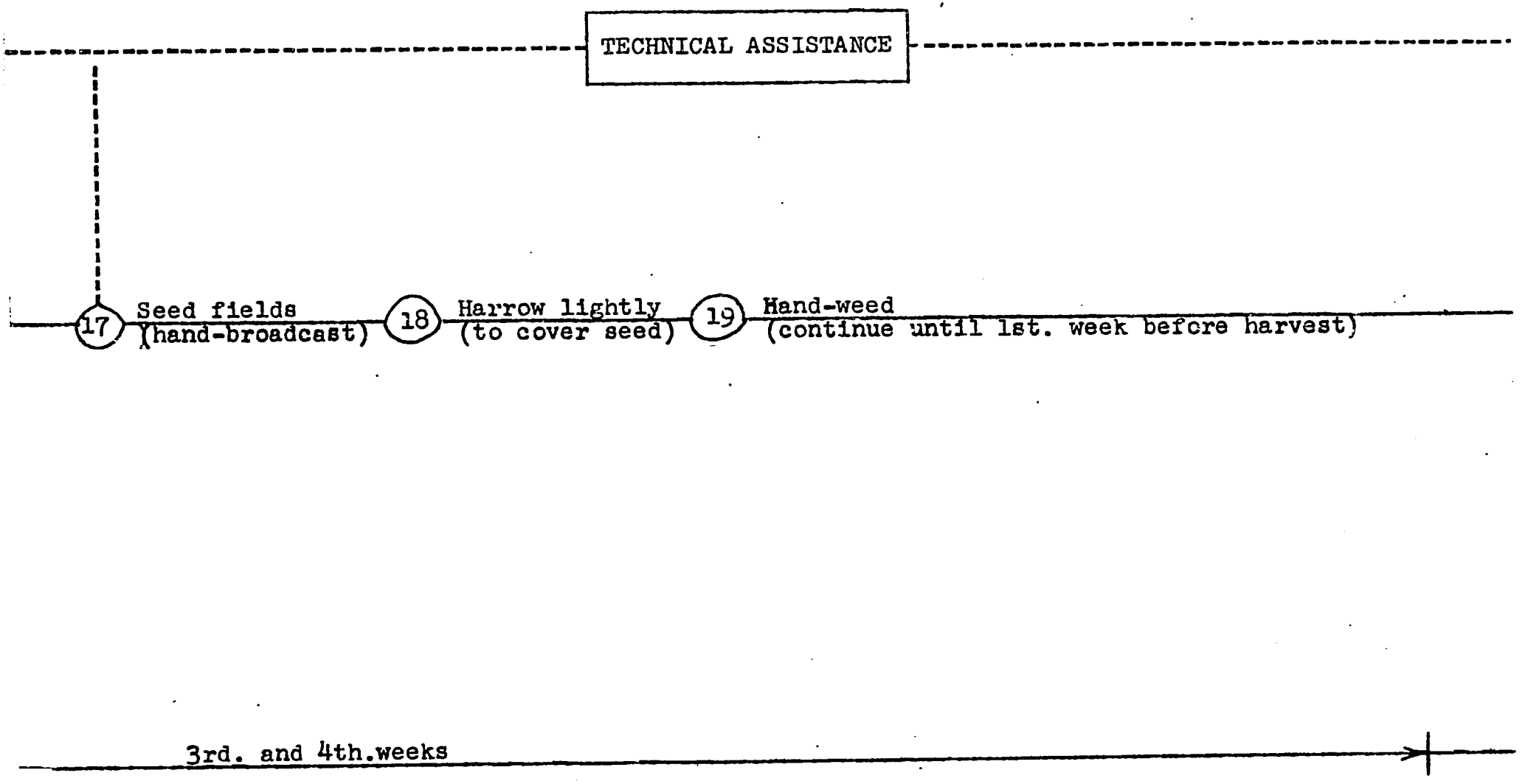


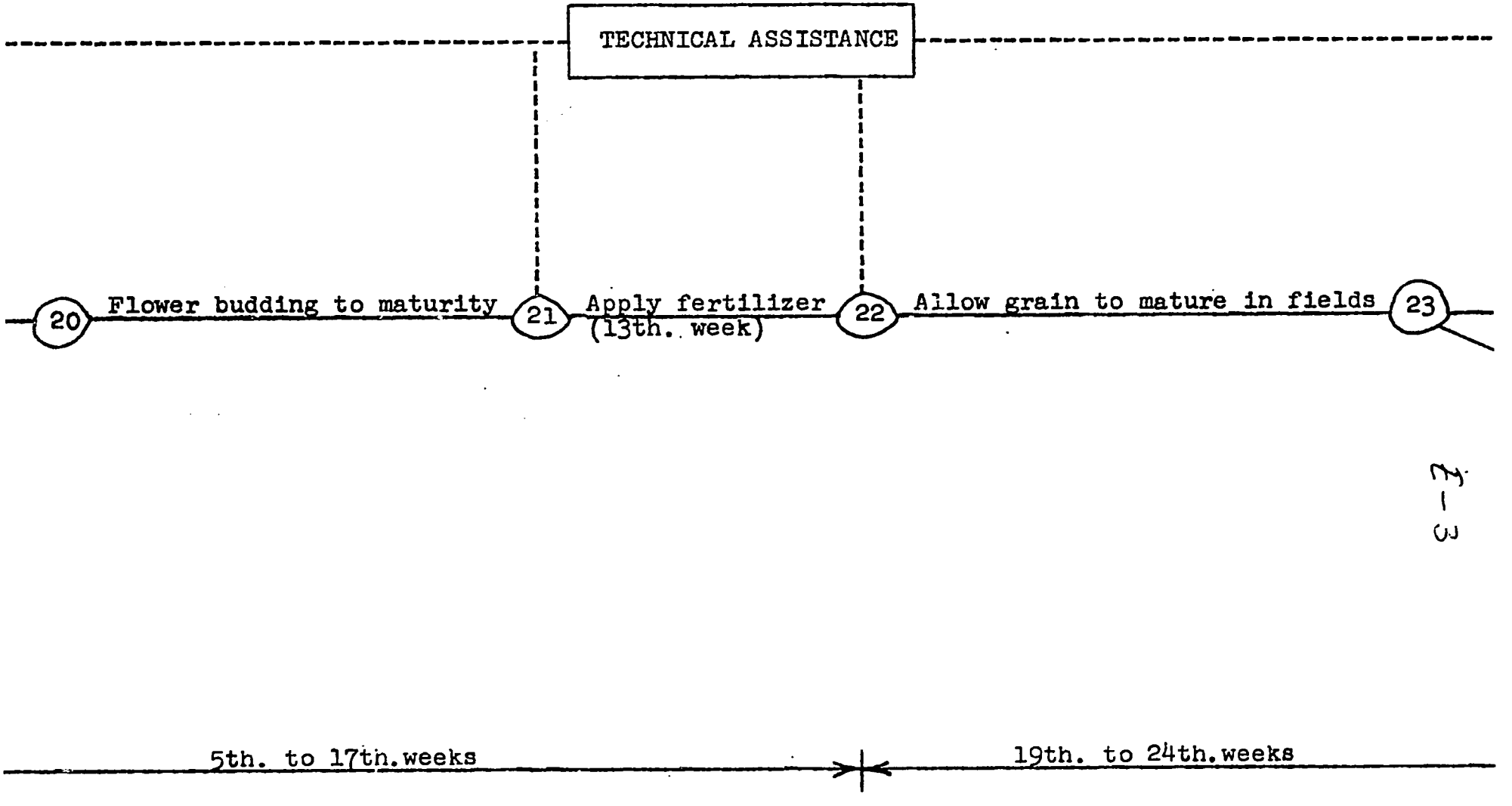
Benbow: USAID/Ghana 6/73

ATTACHMENT E

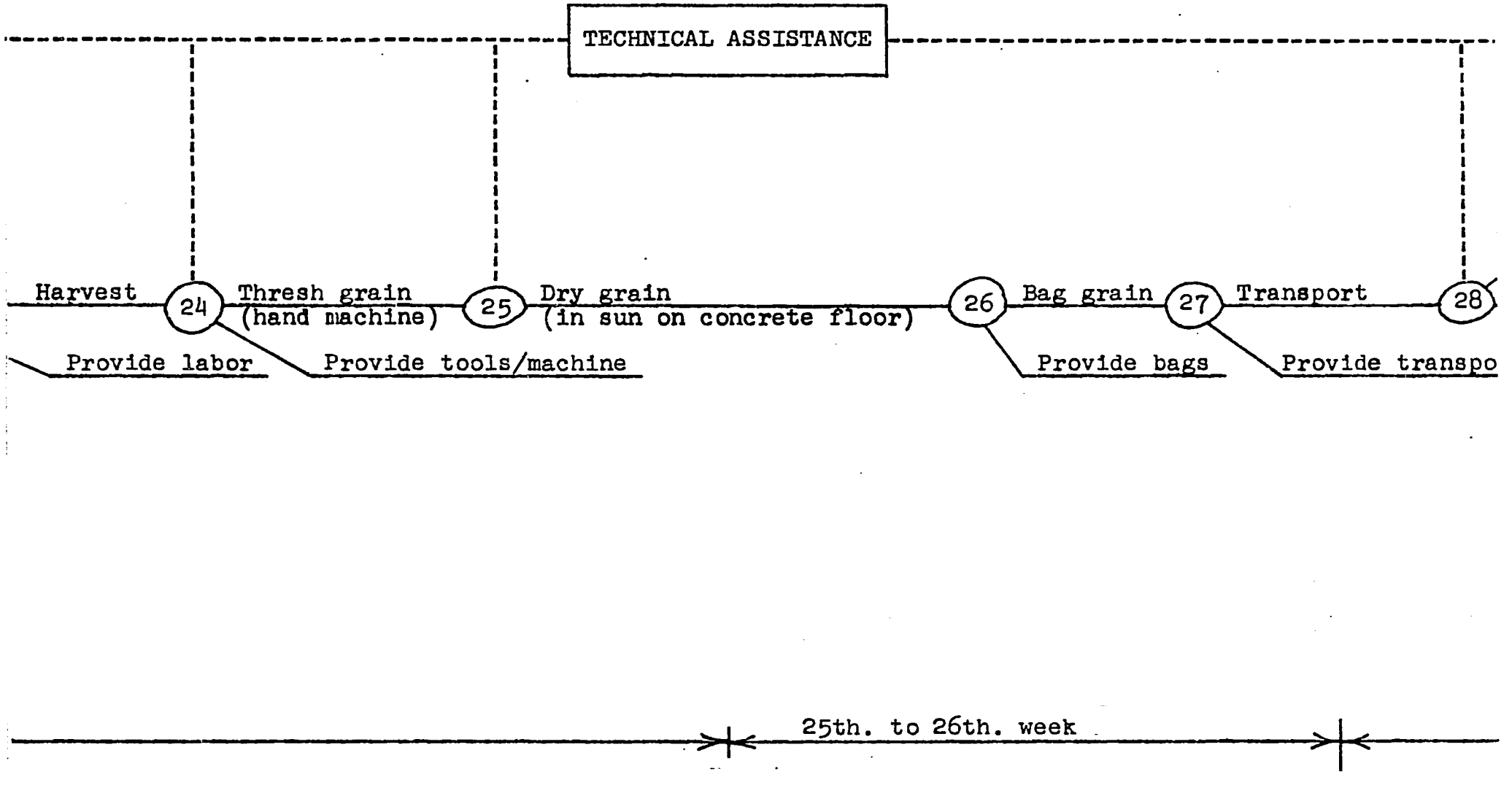
AGRICULTURAL COMMODITY SYSTEM - UPLAND RICE (Ghana)

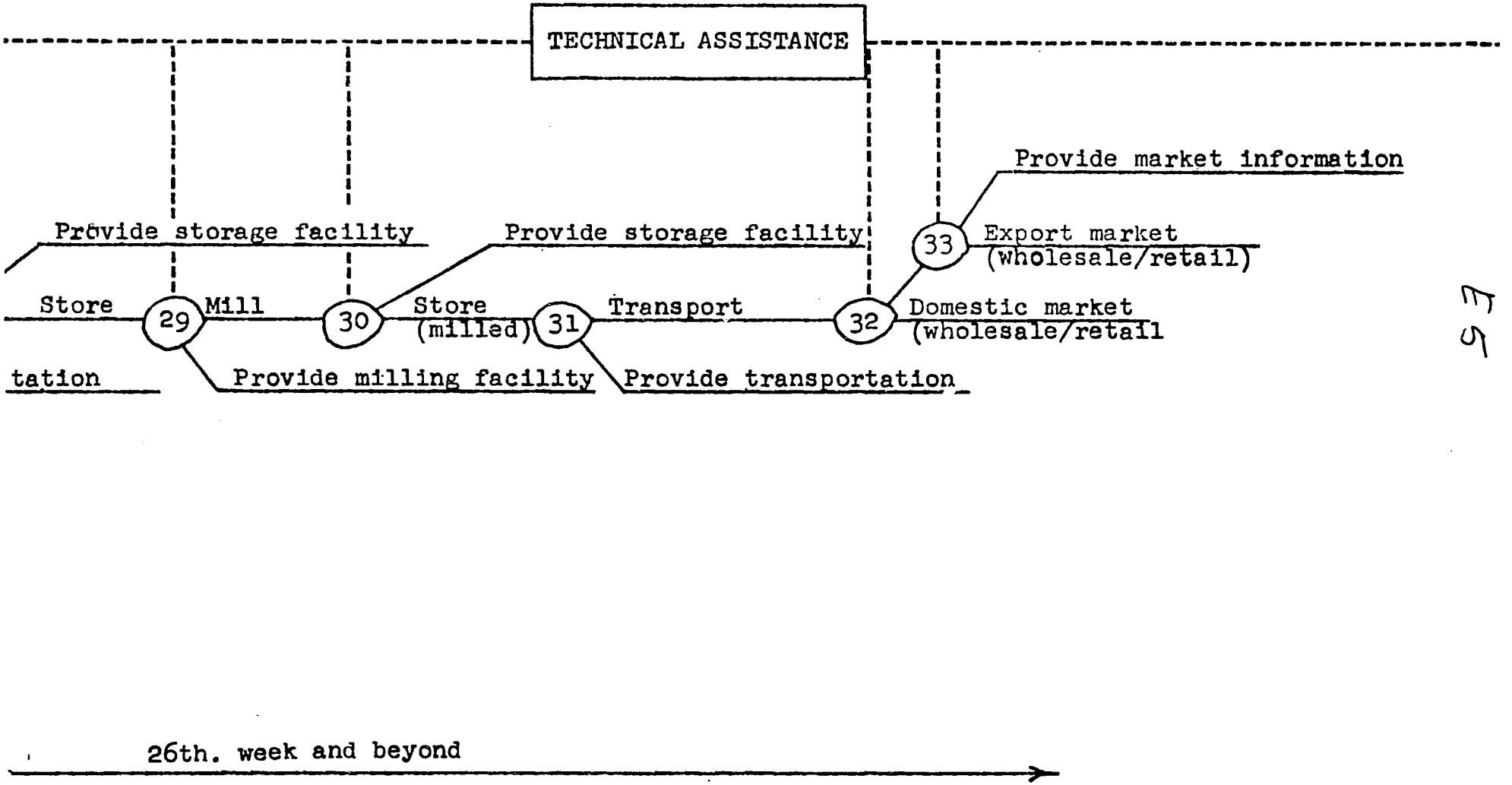



TECHNICAL ASSISTANCE
17
Seed fields
(hand-broadcast)
18
Harrow lightly
(to cover seed)
19
Hand-weed
(continue until 1st. week before harvest)
3rd. and 4th.weeks


TECHNICAL ASSISTANCE
20
Flower budding to maturity
21
Apply fertilizer
(13th. week)
22
Allow grain to mature in fields
23
5th. to 17th.weeks
19th. to 24th.weeks

7-3


TECHNICAL ASSISTANCE
Harvest
24
Thresh grain
(hand machine)
25
Dry grain
(in sun on concrete floor)
26
Bag grain
27
Transport
28
Provide labor
Provide tools/machine
Provide bags
Provide transpo
25th. to 26th. week


TECHNICAL ASSISTANCE
Provide storage facility
Provide storage facility
Provide market information
Store
29
Mill
30
Store
(milled)
31
Transport
32
33
Export market
(wholesale/retail)
Domestic market
(wholesale/retail
tation
Provide milling facility
Provide transportation
26th. week and beyond

Organization Responsibility Chart
Agency's Involvement Code

1. Approve by
2. Must be Consulted
3. Action
4. Direct Supervision
5. General Supervision
6. Implementations
7. Acquisition of Land
8. Technical Coordination & Service
9. Follow Up
10. Procurement of Supplies
11. Approve Policies
12. Direct Asst.
13. Personnel Deployment

TASK FORCE FUNCTION	Ministry of Agric.; Extension & Field Coordination									Ministry of Finance		Local Gov. & Traditional Rulers		Farmers			
	Commiss. of Agric.	Dir. of Agric.	Asst. Dir. for Extension	Asst. Dir. for Agric.	Div. Agric. Officer	Dist. Agric. Officer	Project Area Off.	TOs & FAs	Seed Mult. Unit	Dept. of Coop.	Agric. Dev. Bank	Minister or Commissioner of Finance	Ministry of Finance Official	Trad. Chiefs	District Admin. Officer	Research
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Commissioner of Agric.	Director of Agric.	Director for Extension	Asst. Dir. of Agric.	Divisional Agric. Officer	Dist. Agric. Officer	Project Area Officer	TOs & FAs	Seed Multiplication Unit	Minister of Finance	Ministry Official	Traditional Chiefs	Dist. Ad. Min. Officer			
											Agri. Dev. Bank					
Preparation & Plng.	1,3	23	9 2568	1,3 25689	1,3 34589	1,3 89 3456	4. 3589	4,12, 359	10,	12 1,2	3 1,2,21	1,2,10	1,2	2,7	2,7,9	
Procedure, Policy & Guidline	11, 1,2,5	11, 1,2,5	2,5	2	2						1 2					9,2,3 1,2
Short-Term Plans	1, 2,3	1,2,3	2,3,4,5,8,9	2,3,4,5 8,9	3,4,5,8,9	5 4,9	5,9	5,9			2					
Long-Term Plans	1,2,3	1,2,3	2,3,4,5,8,9	2,3,4,5 8,9	3,4,8,9	5 4,9	5,9	5,9			2					
Annual Plans	2	2	1,3	4 2,6,5	2,4,5 6	4,5 8,9	4,5 8,9	4,5			2					
District Plans					1,2	4,9	9								2	2,3
Selected Area Plans						1,2,4	5,9	5,9								2,3
Supply Fertilizer									11, 1,3,4,6,8							
Supply Seeds																
Select Participants (Farmers)			11,					1,3,4 5,8,9								
Set up Demonstration			11,					1,3,4 6,8								2,3,5,11
Supervise Demonstration								1,4 8								2,3,5,11
Summarize Results						3	3	3								
Eval. & Report Results				3,9	3,9	3,9	3,9	3,9								

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	Commiss. of Agriculture	Director of Agriculture	Asst. Dir. of Extension	Asst. Dir. of Agriculture	Div. Agric. Officer	Dist. Agric. Officer	Project Area Officer	TO's and FA's	Seed Multi-plication Unit	Dept. of Coop.	Dev. Bank	Ministry of Finance	chiefs	Dist. Admin.	Research
For Extension Selected Area Project Preparation															
Procedure, Policy & Guideline	1	2,3		2,3	2,3										
Technical Assistance Guideline (District)				1	2	2,2	2								
Technical Assistance Guideline (Area)					1	2,2	2	2							
Preliminary Planning of Project	1	2	3,4												
Field Staff Participation Guideline					1,3	3,2,4 8									
Schedule of Work						1,3,9									
Training of Senior Staff				12		11									
PRODUCTION															
Project Area-Extension Oper.															
Organizing village farmer						1	1,3	1,3							
Organizing village meeting						9	5,9								
Presenting of pck. to farmer							1,3 6	1,3,6,9 6							
Organizing farmer coop.							2,3	2,3		1,2 3,4 6,9,11					
Select demonstrator farmers							8	1,4,8							
Lay out demonstration							8 4 1,3	8 1,3							4,8 1,2,3,11
Supervise demonstration							9	1,3,9							2,9
Cultivation Procedure							3,4,8, 9	3,4,8,9							2,3,8,9
Check grain maturity							4,8,9	4,8,9							2,3,8,9
Harvest Project Area															
Preparation on farm Storage							8,9 1,3,4	8,9 1,3,4							2,3,8
Preparation on village Storage							8,9 1,3,4	8,9 1,3,4							2,3,9,12
Harvest information & demonstration				3,5,9	3,5,9	3,5,9	3,5,9	3,9							2,3,9,12
Storage															
Storage demonstration							3,5,9	3,9							2,3,9,12
Marketing															
Process information							3,5,9 8	3,9 8							2,3,9,12
Marketing information				3,5,9	3,5,9	3,5,9 8	3,5,9 8	3,5,9 4,8							2,3,9,12
Transportation information			1,2 3,5,9	1,2 3,5,9	3,5,9	3,5,9	3,5,9	3,9							

ATTACHMENT G

PRELIMINARY OUTLINE OF STEP-BY-STEP PROGRAM FOR U.S. ASSISTANCE TO AG SECTOR DEVELOPMENT - GHANA

PHASE I

ISSUE:

TO DETERMINE PRESENT STATUS/FUTURE INVOLVEMENT OF U.S. ASSISTANCE IN AG SECTOR DEVELOPMENT - GHANA

ACTIONS:

A. Review/evaluation, present efforts

1. USAID Technical Staff
2. GOG Technical Staff

B. Summary concensus - current situation

(for feed-back use in design of future program, etc.)

C. Develop tentative options for future consideration

USAID Technical Staff

1. Continue present efforts at current levels;
2. Increase levels of present efforts;
3. Reduce levels of present efforts;
4. Terminate present efforts;
5. Propose new program/projects;
6. Combination of 5. and other.

D. Prepare analysis/"positions" for options USAID Technical Staffs

E. Informal consultations/negotiations

(Mid-level USAID/GOG representatives)

1. Overview - National plans, programs, priorities
2. Overview - Ag Sector plans, programs, priorities
3. Desired U.S. assistance

(major support - grains, with maize priority)

(minor support - other)

G-1

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PHASE II

ISSUE:

TO PREPARE CONCEPTUAL DESIGN, METHODOLOGIES AND PRELIMINARY OUTLINE OF OPERATIONAL PLAN FOR MAJOR SUPPORT (GRAINS: MAIZE PRIORITY) GOG REQUEST

ACTIONS:

A. Prepare conceptual design
(see working manuscript - TA/DA Staff Paper - "agricultural commodity system")

B. Prepare supporting methodologies -
(see working manuscript - "agricultural commodity system")

C. Prepare preliminary outline of step-by- step operational plan
(see this document)

G-2

PHASE II (continued)

ACTIONS: (continued)

D. Determine parameters or dimensions of efforts involved, etc.

YEAR	Total annual consumption needs (tons	Annual increase consumption needs (tons)	Annual increase production needs	Annual increase (acres) - trad'l methods
1972	692,200			
1973	713,000	20,800	27,800	63,100
1974	734,000	21,390	28,500	64,695
1975	779,100	22,710	30,400	69,000
1976	802,500	23,400	31,200	70,800
1977	826,500	24,000	32,000	72,640

PHASE II (continued)

ACTIONS: (continued)

E. Determine available options for satisfying estimated annual additional consumption needs/ effective demand (estimated effective demand levels should be more realistic base for planning, programming, etc.) -- see suggested listing below:

1. Increase acreage under cultivation using traditional methods;
2. Increase use of improved varieties
3. Expand use of fertilizer, improved weed control and other "modern" production practices;
4. Reduce storage losses (in fields and post-harvest);
5. Increase imports;
6. Increase production of yellow corn/guinea corn for animal feed (to reduce demand for white maize as animal feed);
7. Increase production of traditional/non-traditional exports (cocoa, timber; pineapple, etc.) and use additional foreign exchange earnings for increased maize imports;
8. Encourage greater consumption of high-protein crops such as goundnuts, cowpeas, soybeans;
9. Encourage higher-protein varieties of high-starch foods (cassava, plantains, yams);
10. Allow diets to continue to deteriorate because of growing shortages of maize.

F. Determine most realistic combination of above (and/or other) options -- USAID/Ghana staffs, local/foreign experts.1/

G. Make "dry run" test of "best option" determined under F. above (i.e., test each critical element and sub-system of entire system against "operability criteria"--Attachment B-- in all GOG and foreign institutions involved); by "corn commodity team" of local/foreign experts?

H. Revise concepts, methodologies and data as warranted from "tests" under G.

1/ See Attachment I.

PHASE III

ISSUE:

DESIGN AND TEST "PROTOTYPES" OF MAIZE "SYSTEM" IN SELECTED AREAS UNDER REPRESENTATIVE CONDITIONS

ACTIONS:

A. Select 3-4 areas for "small-scale" trial of "system" under actual operational conditions (trials should not be considered as "demonstrations" or "research studies" by actual applications of systems approach to small geographical areas). Areas selected should be in "high potential for success" locations (if approach can't function in such areas, prospects for poorer areas and as national-scale effort may be too remote for success).

   USAID/GOG/other collaborators' staffs, consultants, et al.

B. Develop estimated annual needs/effective demand levels for selected areas; identify available "options;" select "best option;" and prepare/implement detailed "action plan" for each selected area. (At least two-year trials may be required to develop operable prototypes.)

   USAID/GOG/other collaborators' staffs, consultants, et al.

C. Analyze experiences record of "prototype development" efforts acquired under B.

   USAID/GOG/other collaborators' staffs, consultants, et al.

D. Redeisgn concepts/methodologies of "maize commodity system" as warranted from accumulated knowledge, skills and experiences emerging from C., or abandon effort if there is overwhelming evidence that it cannot succeed, or that constraints which preclude its success cannot be corrected.

   USAID/GOG/collaborators' staffs, consultants, et al.

PHASE IV

ISSUE:

TO DESIGN AND IMPLEMENT A NATIONAL MAIZE COMMODITY SYSTEM (assuming the "prototypes" prove to be successful and assuming the GOG favors and supports the effort)

ACTIONS:

A. Drawing upon the skills, knowledge and experience acquired in PHASE II, prepare a detailed "action plan" for a National Maize Commodity System.

B. Test all elements and sub-systems of the entire system against the "operability criteria (see Attachment B) and PHASE II experience.

C. "Promote" a "National Campaign" through appropriate "mass media" means as necessary to gain acceptance/support (premature "promotion" efforts should be avoided if at all possible, pending "proving" the "systems approach" via the prototypes and gaining requisite understanding, skills, knowledge and demonstrated competence in using this approach under local conditions).

D. Assemble and organize the necessary resources and CHARGE!!

E. Develop "commodity systems" for other grains such as rice and guinea corn, and for other major food crops (cassava, yams, etc.) and for non-traditional exports (pineapple, etc.).

F. Adapt the agricultural commodity systems approach to other sectors, such as health, education, etc.

(Above "actions" to be undertaken by USAID/GOG/other collaborators' staffs, consultants, et al.)

ATTACHMENT H
(Narrative Supplement)

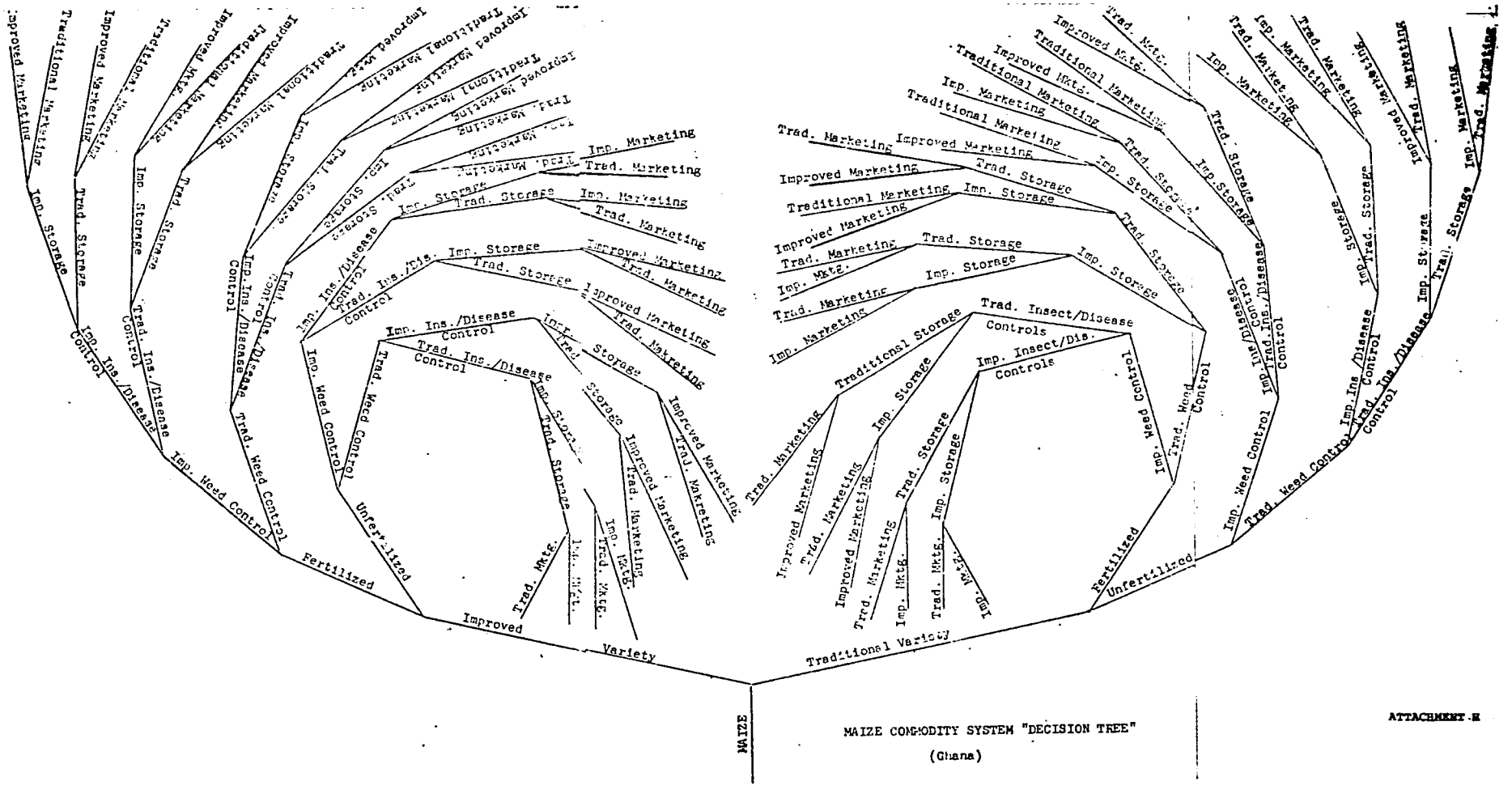
SYSTEM POLICY DECISION OPTIONS - MAIZE

The attached schematic of a "decision tree" for maize illustrates some of the more significant policy/decision actions throughout the seed to consumer system for maize.

As indicated, each policy/decision action taken (or not taken) by a producer and/or governmental support service institutions involved, triggers a subsequent choice of options for each succeeding step or stage in the system. Each of these decisions (and the effectiveness of its implementation) can have a significant influence on the action immediately following, and all subsequent actions in the system to the end of the crop cycle. As an example, a choice of an "improved" over a "traditional" variety could begin a chain of actions that has a high potential for major increases in yield, provided this choice is not negated by subsequent choices/actions which are essential for maintaining the potential of the improved seed. For example, appropriate fertilizers, weed control practices, insect and disease control measures, storage and marketing can help to realize the potential of the genetic superiority of the improved seed. On the other hand, failure to use adequate kinds and amounts of fertilizer at appropriate periods usually offsets the potential of the improved seed. Similarly, any serious deficiencies of gaps in using appropriate insect and disease control measures, and proper storage and marketing practices can largely negate the improved variety potential.

Usually, each of these significant decisions is "irreversible" for the given crop cycle, i.e., failure to use the necessary kind and amount of fertilizer at the appropriate time cannot be "corrected" by superior weed control, improved insects/diseases practices, and so on. These practices can, of course, usually prevent further "losses" that would probably accrue if they are not used.

In practice, therefore, it is important to consider carefully the entire array of options throughout the entire system, including the "trade-offs" for each option, at national, regional and individual farm levels, and in both the private and public sectors.



MAIZE COMMODITY SYSTEM "DECISION TREE"

(Ghana)

ATTACHMENT-H

ATTACHMENT I

A GHANAIAN TEAM APPROACH TO DESIGN/IMPLEMENTATION OF A MAIZE COMMODITY SYSTEM PROTOTYPE

For the technical "staff services" that might be required to carry on with Phase II and beyond, and referred to as "USAID/GOG/other collaborators' staffs," it is suggested that a "working team" (not a committee) be assigned studying the "maize commodity system" draft in depth and making needed inputs, modifications, etc., to adapt it to the Ghanaian environment.

This working team should, in my opinion, include the following members:

1 Ghanaian agronomist - preferably in the MOA (Extension Service?) who is thoroughly knowledgeable and experienced in all aspects of maize production in Ghana.

1 Ghanaian agricultural economist in the MOA or National "planning office" and who is thoroughly familiar with local/regional/national statistics, their sources/reliability and interpretation, and preferably especially knowledgeable of grains (maize) data.

1 Ghanaian marketing economist (or equivalent) - preferably from the Grains Development Board and who is thoroughly familiar with the maize marketing processes in Ghana.

1 Ghanaian research scientist - preferably a maize breeder with the Crops Research Institute who is especially knowledgeable about "improved varieties" of maize and their problems/potential, and possibly also knowledgeable of weeds control and other agro-chemicals (other than fertilizer).

1 Ghanaian agricultural chemist (or equivalent) who is familiar with the "fertilizer" problems/potential of traditional and improved maize varieties in Ghana (possibly present or former participant in GAA520 Project?).

1 Ghanaian "bureaucrat" who is thoroughly familiar with the "bureaucracy" of the GOG, and particularly with those institutions directly involved in the "maize commodity system."

1 foreign expert(s) representing any other major collaborator in the maize effort (e.g., IBRD, UNDP)--management expert?

1 USAID agriculture representative--Joe Goodwin, maintaining the "low profile" and also serving as advisor on the "systems" concept/methodology, etc., and any other matters where he might contribute as time/circumstances allow.

This Team would be primarily a Ghanaian Team and most of the inputs--knowledge, experience, ideas, suggestions, etc. should come from them and their contacts. They should have the benefit of short-term local/foreign experts/consultants on special problems if and when they should arise. It should be allowed the time and resources/cooperation to carry on the many complex and difficult tasks involved in doing the research, developing the prototypes, analyzing results and re-designing the system.

It might be helpful and desirable, especially for Ghanaian Team Members who might not have had previous training/experience in "systems" theory/techniques, to receive a "short-course" training (e.g., 6-8 weeks) period at Harvard Business School, A. D. Little, the Economic Development Institute (World Bank), Battelle Institute, University of Connecticut or some similar institution.

It seems to me that it is especially important to encourage Ghanaian input/involvement throughout the entire maize commodity system effort, and particularly in the specific details and operational levels. The U.S. input/involvement, on the other

hand, would seem more important in suggesting concepts, methodologies, identifying available options, providing expertise on request for problem-solving support, training, etc., rather than design, preparation and presentation of complete "blueprints," with detailed "specifications" and other elements of an all-U.S. product.

The Ghanaian Team suggested herein, or some comparable group of wide-ranging talent/experience, should be able to offer insights and experience, and suggest realistic approaches to such functions as research, credit, extension, institution-building, production, marketing, storage and so on, not only in the traditional more or less compartmentalized specialties, but also as interdependent components of an integrated system under actual operational environments. Even more important perhaps, the Ghanaians would be acquiring skills, knowledge and experience in the assembly, organization and use of their resources to resolve urgent problems through their own joint efforts. Finally, of course, a Ghanaian Team would examplify the present GOG leadership's highest-priority goal--SELF RELIANCE.

ROSTER OF POTENTIAL SOURCES OF ASSISTANCE IN FOLLOW-UP ACTIONS

Assuming that (1) the GOG decides to make a substantial effort to develop and maintain modern commodity systems for selected food grains, including maize, sorghum and upland rice, and commits the resources required for such commodity systems, and (2) A.I.D., through USAID/Ghana, provides certain financial and technical assistance in support of this effort, the GOG/USAID may have need for additional technical/management expertise. Among the potential sources that might be considered are the following:

1. The International Institute for Tropical Agriculture (IITA), in Ibadan, Nigeria--a prime source for improved varieties for conditions similar to Ghana, and for advice/assistance in research problems.

2. Research on improved varieties and more effective agricultural research efforts by GOG institutions are vital factors in the commodity systems. These issues are not covered as such in this report since they have been treated in depth in a separate document by Cox and Breitenbach.

3. EXPERIENCE INCORPORATED, a private consulting firm in Minneapolis, Minnesota, has had recent experience advising on cereals grain crops in Ethiopia under contractual arrangements with the Mission. This firm, or a comparable private consulting enterprise, might be a "prime contractor" for technical and management assistance for a grains program. The contractual arrangements could include an entire "package" of services, phase-out of the consulting services at the end of a predetermined time period. An arrangement of this sort would probably require minimal demands on the small Mission staff.

4. A group of U.S. universities with special competence in cereals grains, such as Kansas State University, Mississippi State University, Iowa State University, the University of Nebraska, and others, might form a consortium for a joint support effort to the Mission and the GOG. Generally, the experience in arrangements of this type has been that considerable time and effort by Mission staff is required to handle the many complex administrative details involved.

5. Because of his recent assignments in Ghana, including the in-depth study of the Ministry of Agriculture, and his excellent working relationships with many GOG officials, Dr. Marshall Watkins is a key prospect as a "senior advisor/consultant" for any major grains program effort.

6. TAB direct-hire and consultant staff and the extensive AID/W "complement" of technicians include an array of experience and talent that probably could be tapped for a variety of assignments.

7. There are many other sources of specialized expertise in all aspects of cereals grains commodity systems in U.S. Government agencies such as the USDA, TVA, HEW, etc.. and in many private enterprises involved in the vast U.S. grains operations. Arrangements could probably be made for such expertise through AFR/CWR, other AID/W offices, or the Mission, as appropriate.