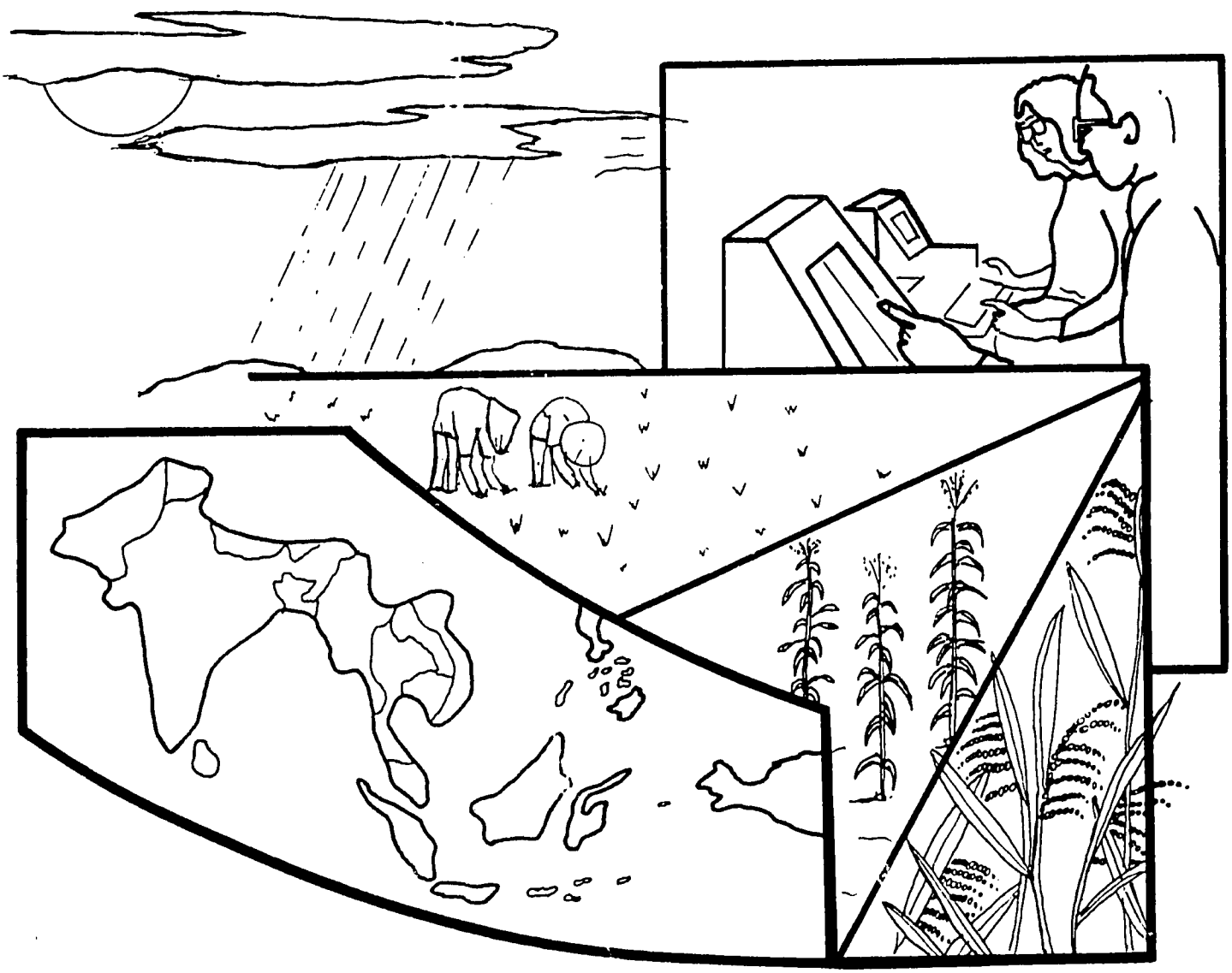
Agroclimatic Assessment Methods for Drought/Food Shortages in South and Southeast Asia

TEST AND EVALUATION



JUNE 1982

FINAL REPORT

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AN EARLY WARNING ASSESSMENT PROGRAM FOR DROUGHT/FOOD SHORTAGES IN SOUTH AND SOUTHEAST ASIA: FINAL REPORT ON TEST AND EVALUATION

to

International Development Cooperation Agency
Agency for International Development
Office of U.S. Foreign Disaster Assistance
Washington, D.C. 20523

by

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EXECUTIVE SUMMARY

AGROCLIMATIC ASSESSMENT METHODS FOR DROUGHT/FOOD SHORTAGES IN SOUTH AND SOUTHEAST ASIA: FINAL REPORT ON TEST AND EVALUATION

V. Rao Achutuni, Louis T. Steyaert and Clarence M. Sakamoto[1/]

The Agency for International Development (AID) requires a reliable early warning program to monitor potential food shortages in the developing countries of South and Southeast Asia. Some of these countries are periodically vulnerable to drought and flood related food shortages and frequently request relief assistance. It was for these reasons that the AID/Office of Foreign Disaster Assistance sponsored the project Agroclimatic Analysis and Development of Climate/Crop Yield Models for South and Southeast Asia. The developmental phase of this project, completed during June, 1981, was followed by a period of test and evaluation of the recommended early warning procedures.

The early warning program for South and Southeast Asia was successfully implemented and tested during the 1981-82 growing season and can provide AID/OFDA with the following:

1) Cost effective, timely and reliable early warning assessments of the potential for drought-related food shortages. The lead-time provided by the CEAS assessments is typically between 30-60 days prior to crop harvest. This may represent a 3-6 month lead-time before food shortages actually occur in a particular country.

2) Biweekly weather assessments and monthly crop condition assessments for 107 agroclimatic regions.

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3) Special assessments during the growing season for those countries that experience severe climatic impact.

4) A resource to base the transfer of climatic impact assessment technology to developing countries.

The success of the program is evident in the early warning assessments provided on the 1981-82 drought in Bangladesh, Sri Lanka and Malaysia. The potential for abnormal food shortages in Bangladesh and Sri Lanka was also emphasized in these assessments. The lead-time provided by these assessments was about two months prior to crop harvest. In all three cases, the assessments were subsequently verified by the USAID/Missions and FAO field visits.

The early warning program is based on cabled messages and reports of 1) biweekly weather assessments and 2) monthly crop condition assessments. Biweekly weather assessments provide reliable information on regional drought conditions, the incidence of typhoons and floods and the impact of weather on economic activities and also identify regions with potential problems for crops. Information from the monthly crop condition assessment is incorporated into the biweekly weather assessment as soon as it becomes available.

Regional agroclimatic crop condition indices form the core of the program. The Generalized Monsoon Index (GMI) and the Yield Moisture Index (YMI) are recommended for operational use. The "benchmark" criteria established for assessing drought impact on crops using these indices include: 1) moderate drought impact (16th - 30th percentile range) and 2) severe drought impact (0 - 15th percentile range). Index values above the 30th percentile indicate favorable crop conditions. Below normal crop conditions are associated with index values in the moderate drought category. Severe drought impact is indica-

tive of crop failures and the potential for abnormal food shortages in countries where food security is marginal. The vulnerability to potential food shortages is significantly increased if drought impacts crops in two successive growing seasons.

The crop yield models for India and Thailand were independently tested. Crop yield models for other countries will be tested at a later date when data becomes available. Generally, the crop yield models can provide useful information in the assessment process.

The early warning program for South and Southeast Asia was successfully tested during the 1981-82 growing season and is recommended for continued operational use. The program can provide AID/OFDA and interested users with timely, reliable and cost-effective early warnings on potential food shortages in South and Southeast Asia.

TEST AND EVALUATION OF AGROCLIMATIC ASSESSMENT METHODS FOR DROUGHT/FOOD SHORTAGES IN SOUTH AND SOUTHEAST ASIA: FINAL REPORT

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CHAPTER I

INTRODUCTION

This report describes the test and evaluation results for the Agency for International Development, Office of U.S. Foreign Disaster Assistance (AID/OFDA) sponsored project, "Agroclimatic Analysis and Development of Climate/Crop Yield Models for South and Southeast Asia," which was conducted by the U.S. National Oceanic and Atmospheric Administration, Environmental Data and Information Service, Center for Environmental Assessment Services (NOAA/EDIS/CEAS) through a cooperative agreement with the Atmospheric Science Department, University of Missouri-Columbia (UMC). The goal of this project phase during the 1981/82 crop growing season was to test and evaluate the Southern Asia Early Warning Program proposed in the joint CEAS/UMC report, Agroclimatic Assessment Methods for Drought/Food Shortages in South and Southeast Asia, developed by Steyaert, Achutuni and Todorov (1981).

The Office of U.S. Foreign Disaster Assistance (OFDA), Agency for International Development (AID), is responsible for providing disaster relief assistance to developing nations. To promote disaster preparedness, AID/OFDA asked the NOAA/EDIS/CEAS to develop an operational assessment capability to provide early warning assessments of drought-related food shortages in South and Southeast Asia. Countries covered by the study in South Asia include: Bangladesh, Burma, India, Nepal, Pakistan and Sri Lanka. Those in Southeast Asia include: Thailand, Malaysia, Singapore, Laos, Kampuchea, Vietnam, Indonesia and the Philippines.

During the developmental phase (1979-1981) the following objectives were accomplished:

1) AID/OFDA was routinely provided with qualitative biweekly weather assessment reports on the impact of anomalous weather events such as flooding and short-term climatic conditions.
2) Agroclimatic and episodic data bases were developed and used to investigate the impact of weather and non-weather factors on crop failures and food shortages.
3) A low-cost Climate/Subsistence Food Early Warning Program based on agroclimatic models was proposed to provide timely, reliable information on potential food shortages due to drought.

During this test and evaluation phase, initiated during July, 1981, the following objectives were accomplished:

1) AID/OFDA and other users (US/AID missions in Southern Asia, U.S. Embassies, United Nations/Food and Agriculture Organization, United Nations/Disaster Relief Organization and the U.S. Department of Agriculture) were provided with biweekly weather assessments and monthly assessments of climatic impact on subsistence food crops in countries of South and Southeast Asia.
2) AID/Food for Peace was provided with special climatic impact assessments on drought impact in Malaysia and the potential for drought-related food shortages in Sri Lanka and Bangladesh.
3) Agroclimatic/crop yield forecast models were tested and evaluated.
4) Agroclimatic/crop condition indices were calibrated to determine the critical index values associated with drought impact.
5) The proposed Early Warning Program was tested and recommended for operational use.

The success of agriculture in South and Southeast Asia is largely dependent on the timeliness, distribution and amount of monsoon rainfall. The Southwest Monsoon season extends from June-September, and the Northeast Monsoon season usually extends from October-January with some countries under the influence of both systems. Drought conditions are generally associated with erratic monsoon rainfall which can affect rice, the staple food crop for millions of people living in South and Southeast Asia. Maize and wheat are the other significant food crops.

Because of the large population pressure in most countries, a single crop failure due to drought can result in the potential for abnormal food shortages. These shortages are also related to inadequate domestic food security measures including: 1) low carry-over of food stocks, 2) excessive losses in storage and 3) large trade deficits which restrict grain purchases. In the event of disastrous drought, an appeal for food aid is sometimes made to donor countries. Relief assistance is usually provided either in the form of food grains or as subsidized credit terms for grain purchases.

This report discusses the test and evaluation of the Early Warning Assessment program for South and Southeast Asia during the 1981-82 growing season and provides decision makers with information on its capabilities and limitations. Chapter II describes the assessment procedures and methods for test and evaluation. Chapter III discusses the special assessment reports, routine biweekly weather and crop condition assessments, and the verification results. Chapter IV summarizes the results and provides conclusions and recommendations for operational applications.

CHAPTER II

PROCEDURE

A. Early Warning Weather Assessments

The CEAS/CIAD Early Warning Program for assessing drought related food shortages in South and Southeast Asia is outlined in Figure 2.1. Qualitative biweekly weather assessments and weekly updates are routinely issued by the CEAS/CIAD Climatic Assessment Branch (CAB), Washington, D.C., for 107 agroclimatic regions in South and Southeast Asia. The assessments are based on analysis for climatically similar regions (Figures 2.2a and 2.2b) and include regional rainfall analysis and statements on the impact of anomalous weather events on crops. Biweekly weather assessments are also supplemented with monthly quantitative crop condition/potential food shortage assessments which are provided to CAB by the CEAS/CIAD Models Branch. Agroclimatic crop condition/food shortage models including statistical climate/crop yield forecast models and agroclimatic indices are used for the monthly assessment.

The historic data bases required for the assessments are discussed in the final report by Steyaert, Achutuni and Todorov (1981). Real-time precipitation data for the available stations are obtained by CAB through the World Meteorological Organization Global Telecommunications System (WMO/GTS). Because these data are frequently limited by the sparse network of reporting stations or missing reports, major tasks include controlling the quality of data and, as appropriate, estimating precipitation within each assessment region for input

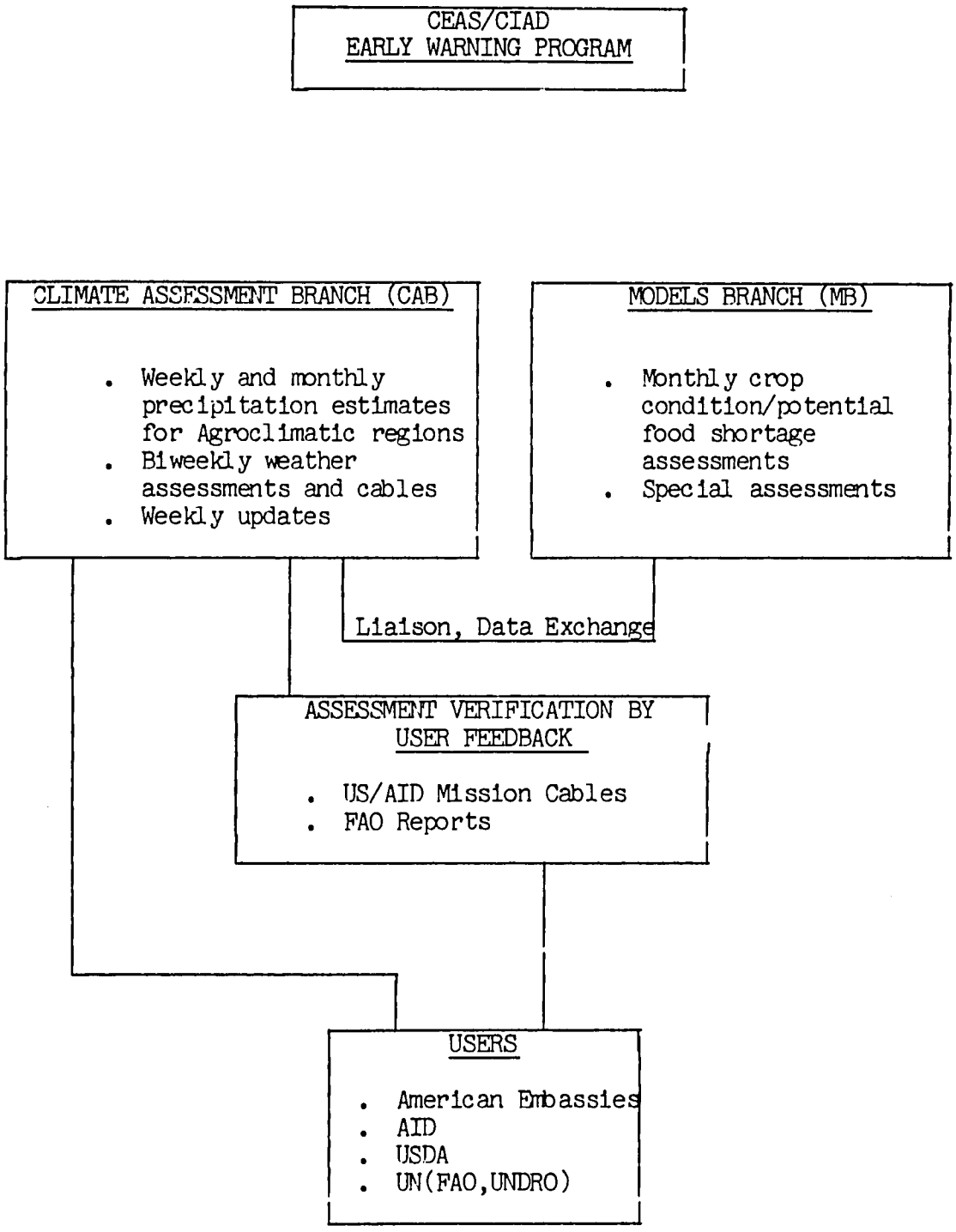


Figure 2.1 Flow Chart for the CEAS Early Warning Program

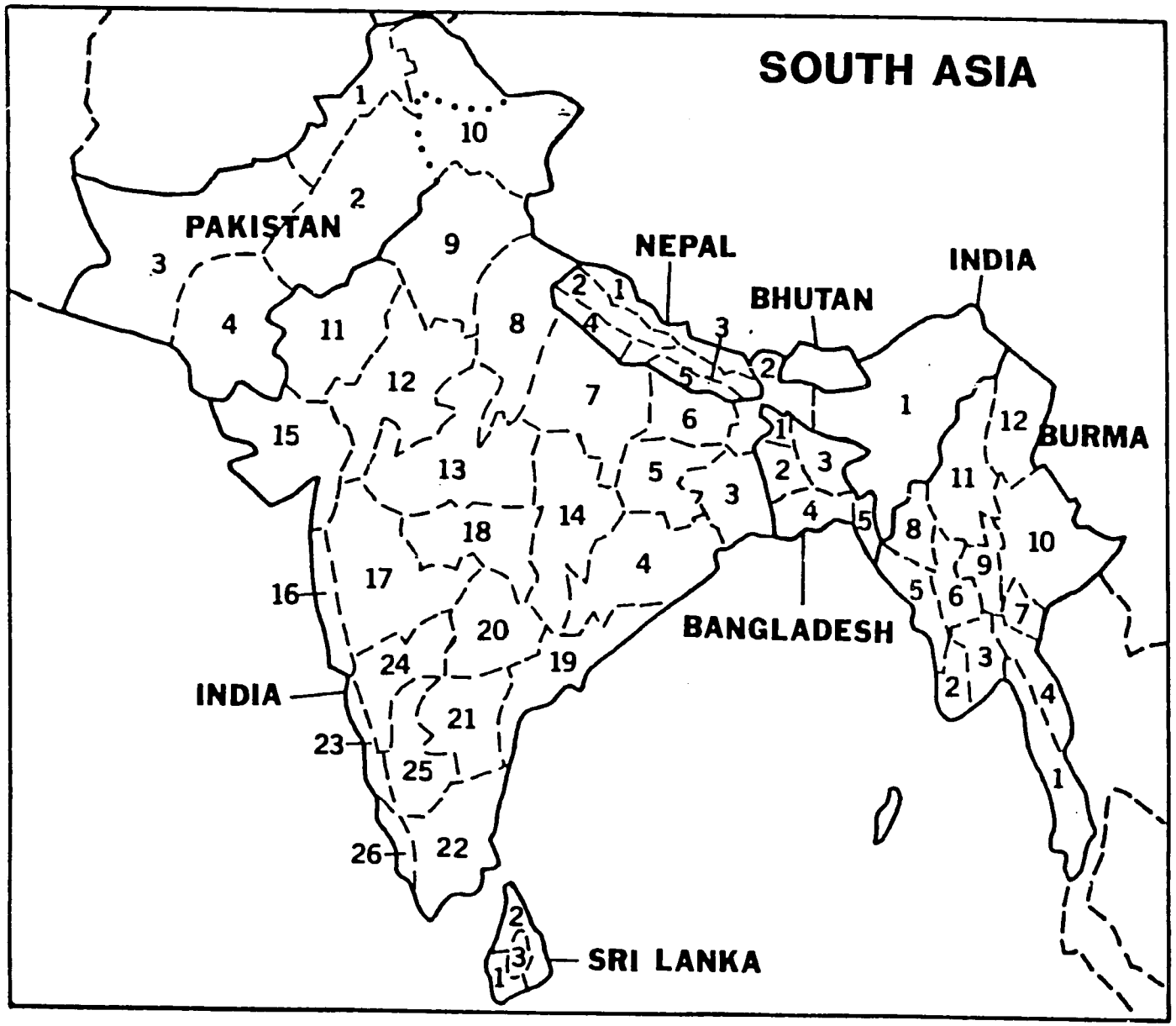


Fig. 2-2a Agroclimatic regions used in Early Warning Assessments for South Asia.

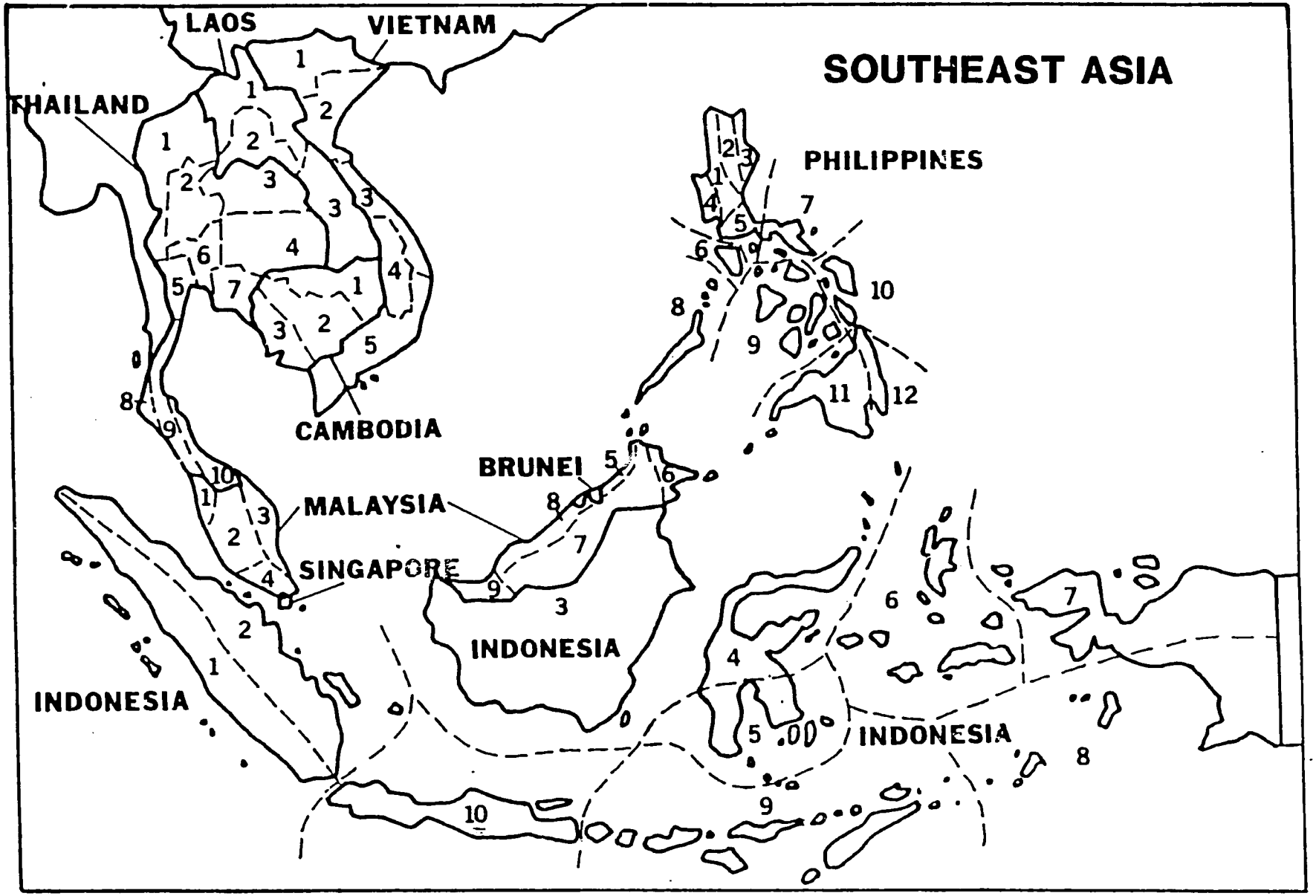


Fig. 2-2b Agroclimatic Regions used in Early Warning Assessments for Southeast Asia.

into agroclimatic models. For example, surface and upper air weather analyses provided by NOAA/National Weather Service are used to identify those regions in which atmospheric dynamics suggest the occurrence of precipitation. Additionally, satellite imagery from various meteorological satellites is used as a tool for estimating regional precipitation, particularly where surface data are sparse. Precipitation data are summarized on a weekly and monthly basis.

Anomalous weather events such as extreme wind and precipitation totals are summarized on a daily basis to provide a real-time, episodic event data base. These data are used to modify assessments to account for unusual weather events.

B. Early Warning Crop Condition Assessments: (1981-1982)

Statistical climate/crop yield forecast models and agroclimatic/crop condition indices proposed by Steyaert, Achutuni and Todorov (1981) are the primary basis for the assessment of drought impact and potential for abnormal food shortages.

Countries experiencing drought are identified and are provided assessments in both qualitative and quantitative form. These early warning crop condition assessments are designed to provide decision makers with timely and reliable information on the potential for drought impact including the potential for abnormal food shortages in these countries. Confirmation of these assessments is accomplished by both press reports and user feedback (FAO field visits, US/AID missions, and USDA attaches).

Statistical Climate/Crop Yield Models

Linear regression type climate/crop yield models were developed by Steyaert, Achutuni and Todorov (1981) for selected countries in South and Southeast Asia. Models for rice, maize, wheat and sorghum were developed at the regional and

national level depending upon the availability of reliable yield data. These models have the form:

$$\hat{Y} = a_0 + a_1 \text{ (Trend)} + \sum_{i=2}^{N} a_i X_i$$

where:

$\hat{Y}$ = the predicted yield (qu/ha),

a_0 = the regression constant (intercept),

a_1 = the estimated regression coefficient for the linear time "trend" variable defined, for example as (1951 = 1..., 1981 = 31) and acting as a surrogate for technology trend in the yield data,

a_i = the ith estimated regression coefficient, and

X_i = the ith meteorological predictor variable, i = 1, 2....N.

Agroclimatic/Crop Condition Assessment Indices

The agroclimatic/crop condition indices provide relative information on the potential for drought-related food shortages. They are related to the crop water demand, and based on monthly precipitation data. These indices are expressed in meteorological units, percentiles and percent of normal depending on the available historical data. Regional normals were defined using Wernstedt (1977) data. Information from the following indices is used in providing the monthly crop condition assessments.

1) Yield Moisture Index (CEAS, 1979)

The Yield Moisture Index (YMI) is defined as follows:

$$YMI_j = \Sigma P_i KC_{ij}$$

where:

YMI_j is the Yield Moisture Index for the jth crop (rice, maize, wheat, etc.),

P_i is the precipitation during the ith crop stage (1 = planting or transplanting, 2 = vegetative, 3 = flowering/reproductive, etc.) and,

KC_{ij} is the appropriate crop coefficient for the ith crop stage and jth crop (Doorenbos and Pruitt, 1977).

The YMI is a drought index and represents an improvement over cumulative rainfall because the weights (KC_{ij}) are a function of the crop water requirement at each crop stage of the individual crops. For example, the water requirement at the reproductive stage is much higher than at earlier crop stages.

2) Generalized Monsoon Index: Southwest

The Generalized Monsoon Index for the southwest monsoon season (GMI_{SW}) is obtained by weighting June-September rainfall as follows:

$$GMI_{SW} = .125\ P_6 + .125\ P_7 + .50\ P_8 + .25\ P9$$

This index is analogous to the YMI but keys on the monsoon by attaching more weight to August and September rainfall. Large-scale drought studies, conducted by Bhalme and Mooley (1980) in India, suggest the importance of August and September rainfall to crops.

3) Generalized Monsoon Index: Northeast

The Generalized Northeast Monsoon Index (GMI_{NE}) for regions with October through January as the northeast monsoon period is defined as:

$$GMI_{NE} = .125\ P_{10} + .125\ P_{11} + .50\ P_{12} + .25\ P_1$$

An examination of the rainfall distribution with time establishes whether GMI_{NE} will include October-January or September-December rainfall.

The index values are also expressed either in percentiles or as a percentage of normals for agroclimatic regions. The generalized Monsoon Index provides information on rainfall conditions during the monsoon season and serves as a good indicator of potential irrigation supplies.

4) Palmer Drought Index (Palmer, 1965)

The Palmer Drought Index (PDI) provides information on the duration and intensity of drought. The index is based on monthly fluctuations in soil moisture conditions obtained from a hydrological accounting system. The required input data includes the water holding capacity of the soil, monthly precipitation and mean monthly temperature.

The PDI is designed to monitor both dry and wet periods. The index values are scaled such that negative values indicate drought and positive values indicate wet conditions; an index value of zero indicates normal conditions. Table 2.1 shows the index categories for the wet and dry periods.

C. Special Assessments

The potential for abnormal food shortages increases with the severity of drought, particularly if drought persists through two or more consecutive crop seasons. Agencies and organizations involved in providing disaster relief need early warning on the magnitude and extent of drought impact. Timeliness in providing this information to them is of utmost importance when providing assessments.

Special assessments were issued for those countries that experienced severe drought impact, in some cases creating the potential for abnormal food shortages. For example, Bangladesh, Sri Lanka and Malaysia experienced severe drought conditions during the 1981-82 growing season. The main rice and secondary food crops were adversely affected. The potential for food shortages in

TABLE 2.1

PALMER DROUGHT INDEX (PDI)

CLASSES FOR WET AND DRY PERIODS

PDI			CLASS
	≥	4.00	Extremely wet
3.00	to	3.99	Very wet
2.00	to	2.99	Moderately wet
1.00	to	1.99	Slightly wet
0.50	to	0.99	Incipient wet spell
0.49	to	-0.49	Near normal
-0.50	to	-0.99	Incipient drought
-1.00	to	-1.99	Mild drought
-2.00	to	-2.99	Moderate drought
-3.00	to	-3.99	Severe drought
	≤	-4.00	Extreme drought

Sri Lanka and Bangladesh was very high while the potential for increased imports resulted in Malaysia. Consequently, CEAS provided special assessments to AID/OFDA, AID/Food for Peace and US/AID Missions.

D. Evaluation of Crop Yield Models and Crop Condition Assessment Indices

The steps involved in the Test and Evaluation of the crop yield models and crop condition indices are discussed below.

Crop Yield Models

The meteorological and yield data required to independently test yield models for South and Southeast Asia are not yet available, except for India and Thailand. Models for other countries will be tested at a later date. Crop Yield Models are independently tested as follows. If the model was developed on data through 1975, the 1976-81 data are used for testing. The model estimates ($\hat{Y}$) for the test years are obtained by substituting the 1976-81 data into the original model: The difference between the predicted and observed yield is given by $d = \hat{Y} - Y$.

The following discussion on yield model reliability is based on a review by Sebaugh (1981). Bias in a model is given by $d = 1/n \Sigma d_i$. A positive bias indicates that the model is, on the average, overestimating yield and vice-versa. The root mean square error (RMSE) and standard deviation (SD) indicate the accuracy and precision of the model. Model accuracy is indicated by a small RMSE value. For an unbiased model the SD and RMSE will be very close in value; for a biased model the RMSE is always greater than the SD.

Agroclimatic Crop Condition Assessment Indices

Crop condition assessment indices (GMI and YMI) were calibrated to establish "benchmark criteria" for the proper interpretation of the index values. For example, it is important to know the critical threshold for crop failure.

Historic yield data and episodic data provide useful information in establishing threshold values for the indices. The historic index values for a region are plotted and the drought impact years identified from episodic information. The index value at or below which drought impact is observed is then defined as the threshold value. The threshold index values have been established for all regions and crops in South and Southeast Asia.

CHAPTER III

TEST AND EVALUATION RESULTS

The Early Warning Program for assessing drought related food shortages in South and Southeast Asia has been fully implemented and tested during the 1981-82 growing season. Some of the assessments have been confirmed through user verification. The assessments issued by NOAA/CEAS during the 1981-82 growing season are presented in Section A. Results from the evaluation of crop yield models and calibration of the agroclimatic crop condition indices are discussed in Sections B and C, respectively.

A. Early Warning Assessments for South and Southeast Asia 1981-82

Crop Condition Assessments were provided to the Climate Assessment Branch (CAB) each month (July 1981-May 1982) by the Models Branch of CEAS/CIAD. These assessments were incorporated into the biweekly weather assessment cables issued by the Climate Assessment Branch of NOAA/CEAS during the same test period. Special Assessments were also issued for Bangladesh, Sri Lanka and Malaysia to summarize previous reports and expand analysis on climatic impact (Appendix A). The monthly Crop condition assessments issued during the 1981-82 growing season are provided in Appendix B while the CEAS assessments are shown in Appendix C. These biweekly weather assessments and their updates were provided to the users, such as the US/AID missions and the FAO, in the form of cables.

1) South Asia

Bangladesh

The CEAS Early Warning Program assessed drought impact on rice in Bangladesh for the 1981-82 growing season (CEAS Monthly Crop Assessment February 8, 1982). Erratic rainfall during the 1981 southwest monsoon season

(June-September) affected the aus (September harvest) and the aman (December harvest) rice crops. These two crops account for almost 85 percent of the national rice production. Population pressure along with inadequate food reserves in Bangladesh increase the potential for abnormal food shortages. Consequently, a special summary assessment on Bangladesh was provided by CEAS to AID/OFDA on March 26, 1982.

The Generalized Southwest Monsoon Index (GMI_{SW}) and Yield Moisture Index (YMI) values for each assessment month in 1981 are shown in Table 3.1. The final truncation values for these indices are shown plotted in Figure 3.1. The aus rice crop was damaged throughout Bangladesh. The damage was most severe in the Northeast, Coastal and Highlands regions. The aman rice crop was adversely affected in the Coastal and Highlands regions. Damage to the crop was less severe in the Northeast and West regions of Bangladesh. Index values in the lower 10th percentile range have historically been associated with crop failures in Bangladesh.

Below normal rainfall conditions during June-July adversely impacted the aus rice crop. Erratic rainfall during the 1981 southwest monsoon season (June-September) adversely impacted the aman rice crop in the Coastal and Highlands regions of Bangladesh.

Problems with the southwest monsoon in Bangladesh were first reported by CEAS in the biweekly assessment issued on July 2, 1981. Problems for the 1981 aus and aman rice crops were reported in the September 15, 1981 CEAS monthly crop condition assessment. Drought impact on the 1981-82 wheat and boro rice crops was reported during September-December. These assessments were verified by the following State Department Cable (Dacca 0095) of February 3, 1982:

Table 3.1 Bangladesh: 1981 Generalized Monsoon Index (Southwest) and Yield Moisture Index Analysis.

	Southwest Monsoon Index (Percentiles)				Aus Rice Crop Index (Percentiles)					Aman Rice Crop Index (Percentiles)				
REGION	Jun	Jun-Jul	Jun-Aug	Jun-Sep	Mar	Mar-Apr	Mar-May	Mar-Jun	Mar-Jul	Jul	Jul-Aug	Jul-Sep	Jul-Oct	Jul-Nov
COASTAL	3	3	9	9	87	93	81	19	6	16	12	19	3	3
HIGHLANDS	5	5	5	10	77	77	68	20	10	28	15	25	10	10
NORTHEAST	3	3	59	46	51	49	16	3	3	16	66	53	33	26
NORTHWEST	3	3	93	86	59	53	43	6	27	83	93	86	79	79
WEST	12	17	48	50	70	86	79	34	27	49	56	59	39	33
NATIONAL	3	3	40	38	78	75	56	3	6	32	61	58	19	12

BANGLADESH: 1981 GENERALIZED MONSOON INDEX (SOUTHWEST) AND YIELD MOISTURE INDEX ANALYSIS

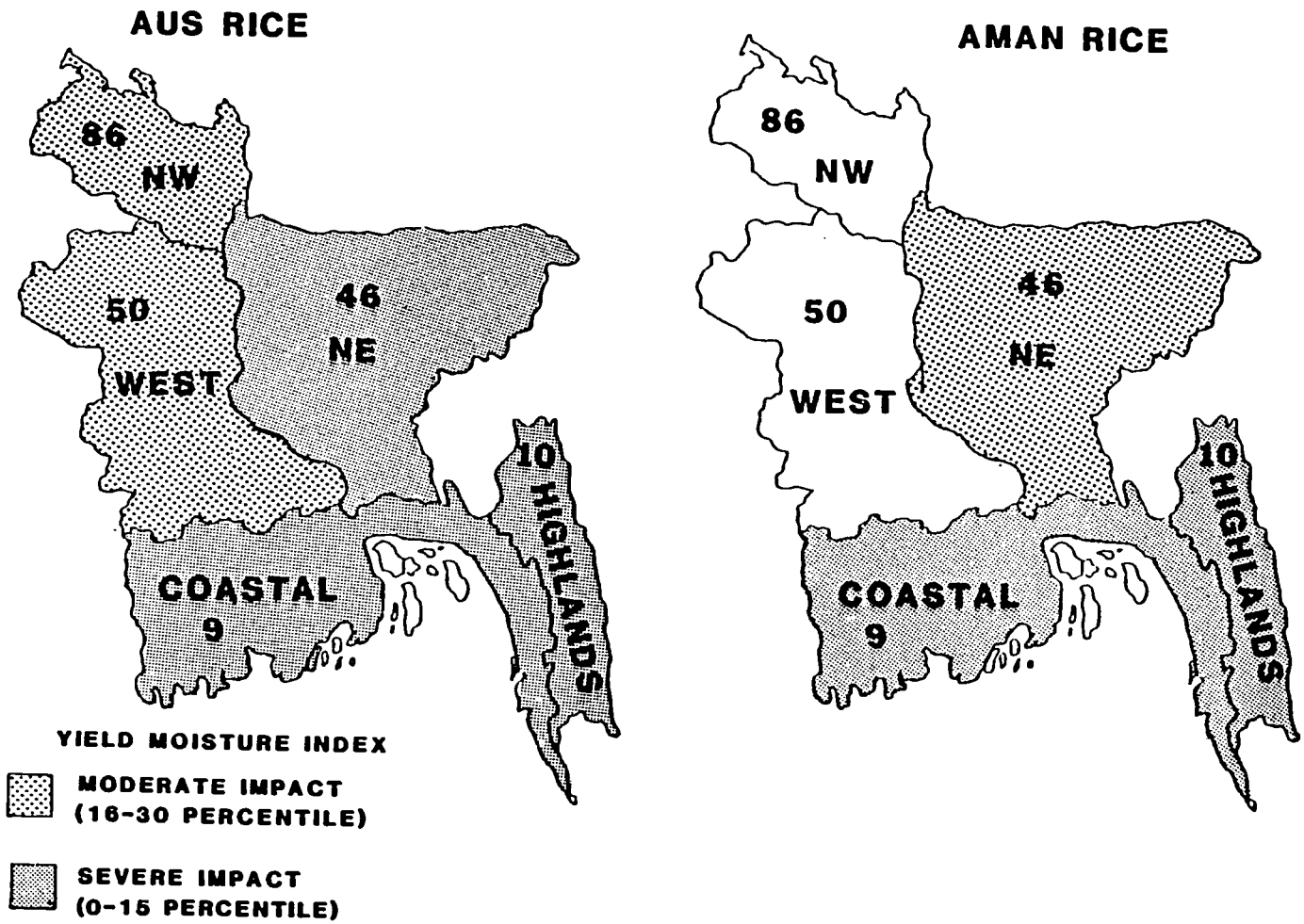


Fig. 3-1 1981 Generalized Monsoon Index (Southwest) and Yield Moisture Index Analysis for Bangladesh showing the drought impacted (a) Aus rice and (b) Aman rice crop regions. Southwest Monsoon Index values are shown numerically.

"... Although the combined rice and wheat production for FY82 may be down only 4 percent from the record of 1981, the anticipated government stock levels on June 30 will be less than half of those held on the same date last year and well below the level the donor countries consider adequate. The situation will be far more serious if the spring harvest is reduced by drought....If the drought continues, the government could well have a real food crisis on its hands."

Sri Lanka

The 1981 yala (secondary) rice crop, planted during April-May and harvested in August-September, was adversely affected by erratic rainfall during the southwest monsoon season (June-September). There were also inadequate irrigation water reserves in tanks at that time. The 1981-82 maha (main) rice crop, planted during September-October and harvested in February-March, was also affected by drought during the northeast monsoon season (October-January). The failure of two consecutive rice crops resulted in the potential food shortages in Sri Lanka.

The Generalized Monsoon Index (GMI) and Yield Moisture Index (YMI) for the yala and maha rice crops are shown in Figure 3.2. The yala rice crop was adversely affected in the Wet Zone and Hills regions of Sri Lanka while the maha rice crop was adversely affected throughout the island.

The GMI and YMI values for each assessment month for the 1981-82 yala and maha rice crops are shown in Tables 3.2a and 3.2b, respectively. Conditions for the yala rice crop in the Hills and Wet zone remained unfavorable from June until harvesting in September. Conditions for the maha rice crop remained extremely unfavorable throughout the growing season. Rainfall during the monsoon seasons is stored in tanks and reservoirs for subsequent use in irrigation of rice. However, severe drought conditions during 1980-82 depleted the water levels in these tanks and reservoirs (State Dept. Cable of March 10, 1982 Colombo 1419).

SRI LANKA: DROUGHT AFFECTED CROPS AND REGIONS (1981/82)

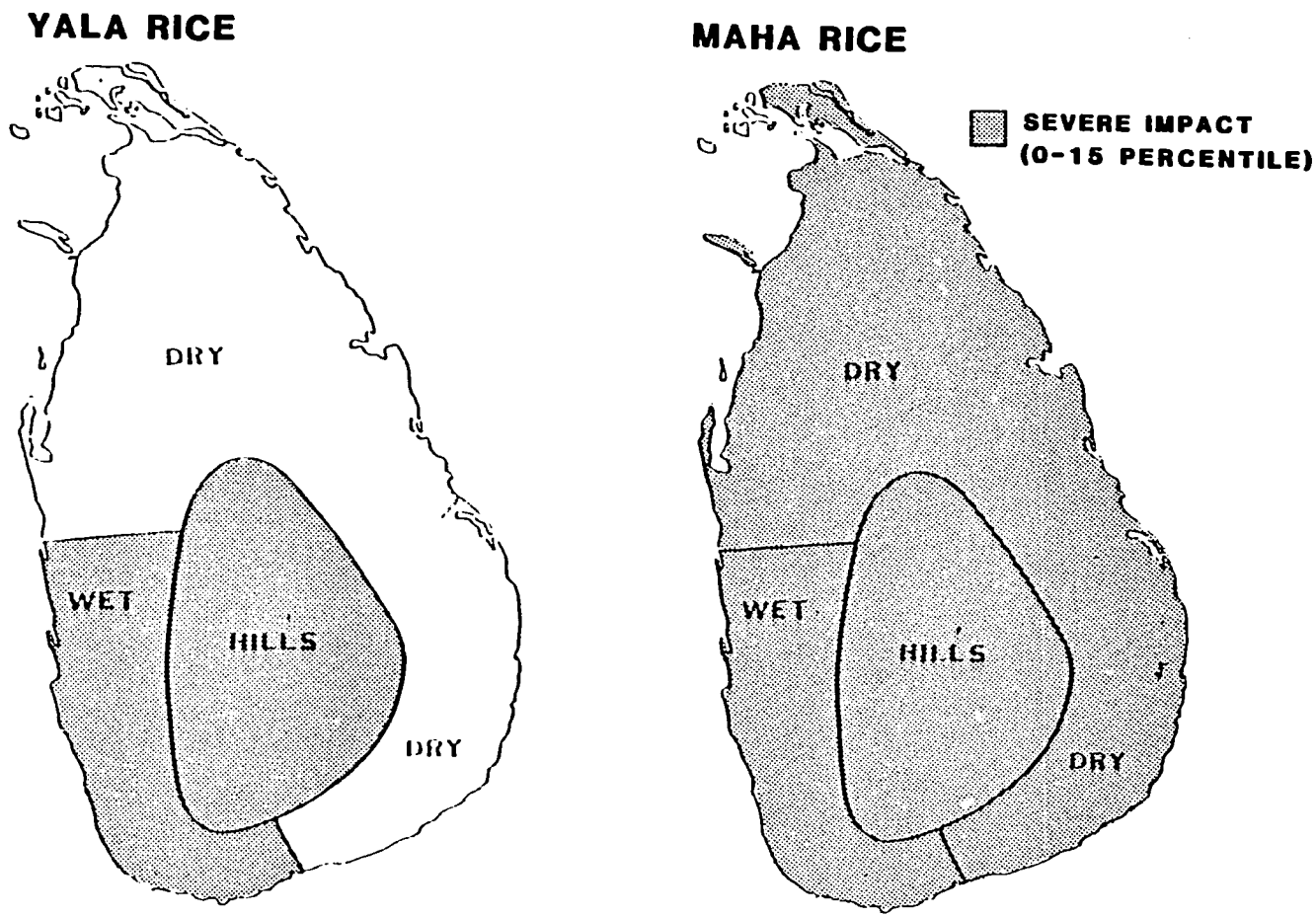


Fig. 3-2 Yield Moisture Index Analysis for the drought affected regions in Sri Lanka for (a) the 1981 Yala rice and (b) the 1981-82 Maha rice crops.

Table 3.2a Sri Lanka: 1981 Generalized Monsoon Index (Southwest) and Yield Moisture Index (Yala Rice) Analysis.

REGION	GMI (Southwest) (Percentiles)				YMI for Yala Rice (Percentiles)			
	Jun	Jun-Jul	Jun-Aug	Jun-Sep	Apr	Apr-May	Apr-Jun	Apr-Jul
HILLS	3	4	4	4	39	35	11	8
WET ZONE	16	6	16	13	18	25	9	6
DRY ZONE	73	83	46	63	46	75	76	83
NATIONAL	18	16	3	10	31	25	16	9

Table 3.2b Sri Lanka: 1981-82 Generalized Monsoon Index (Northeast) and Yield Moisture Index (Maha Rice) Analysis.

REGION	GMI (Northeast) (Percentiles)				YMI for Maha Rice (Percentiles)			
	Oct	Oct-Nov	Oct-Dec	Oct-Jan	Sep	Sep-Oct	Sep-Nov	Sep-Dec
HILLS	8	8	4	4	32	8	12	8
WET ZONE	6	6	3	3	36	3	9	6
DRY ZONE	46	19	3	3	86	53	26	13
NATIONAL	6	6	3	3	39	9	9	6

The CEAS weekly weather assessments in July of 1981 indicated serious problems for the yala (August-September harvest) rice crop, thereby providing a lead time of nearly two months prior to harvesting. Quantitative estimates on the extent of damage to the maha (February-March harvest) rice crop were provided in the January 21, 1982 monthly crop assessment. The lead time in this case was about two months prior to crop harvest.

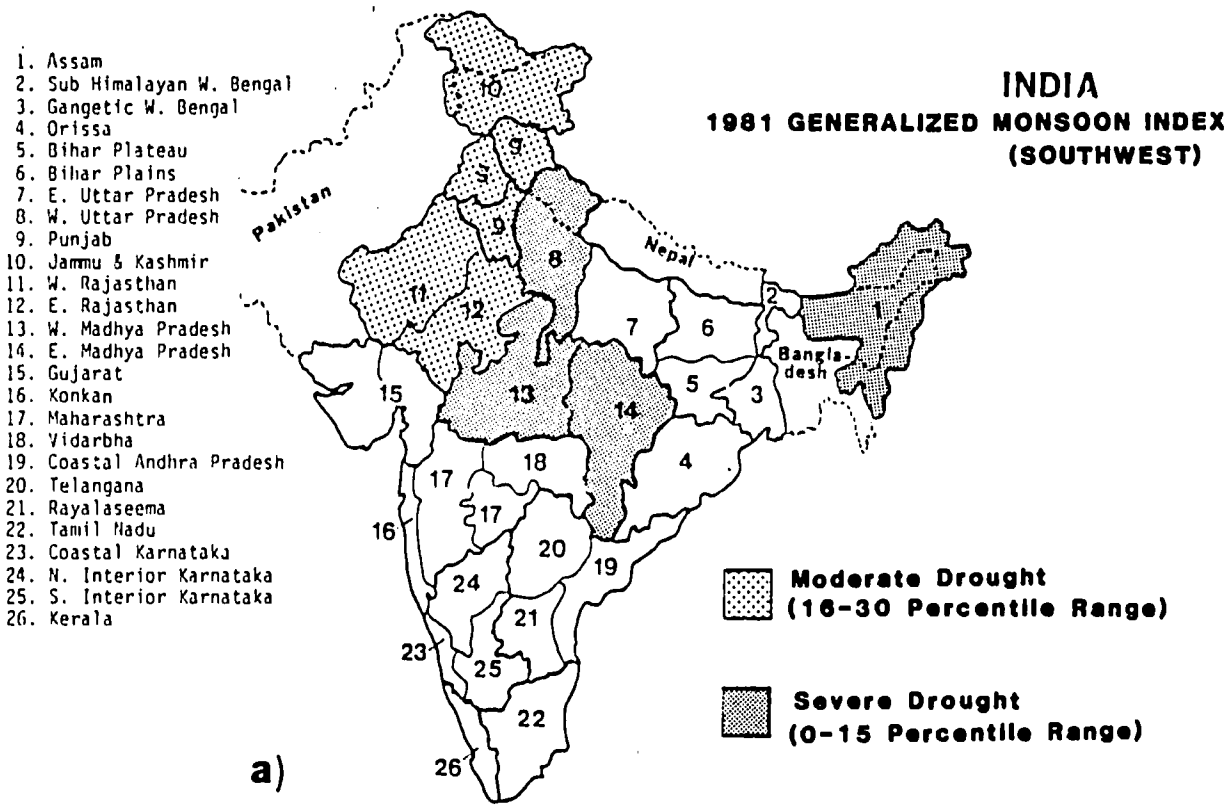
A special summary assessment on the impact of the 1981-82 drought on the national rice production in Sri Lanka was provided to AID/OFDA on March 16, 1982 (Appendix A). The agroclimatic/crop condition index values during the yala and maha rice crop seasons were found comparable to those during 1975-76 when emergency food relief was provided to Sri Lanka. This example shows the use of historic episodic data for assessing the severity of the current drought situations.

Confirmation of the CEAS assessment on Sri Lanka was received on April 6, 1982 from the following State Department Cable (Rome 08477):

> "....Sri Lanka government now confirms that 17 districts out of 24 affected by serious drought. Several districts experiencing drought for 2nd/3rd successive years. Maha paddy production currently estimated at 1.3 million tons against target of 1.74 million tons. Lack of irrigation water and continuing drought likely to reduce 1982 yala crop planting...."

India

The 1981-82 autumn and winter rice crops as well as the winter wheat crop in parts of India were forecasted to be below normal. The Southwest Monsoon Index and the YMI values for the affected regions and crops in India are shown in Figures 3.3a-d. An early retreat of the southwest monsoon affected crops in several northwestern states and Assam in northeastern India (Figure 3.3a).



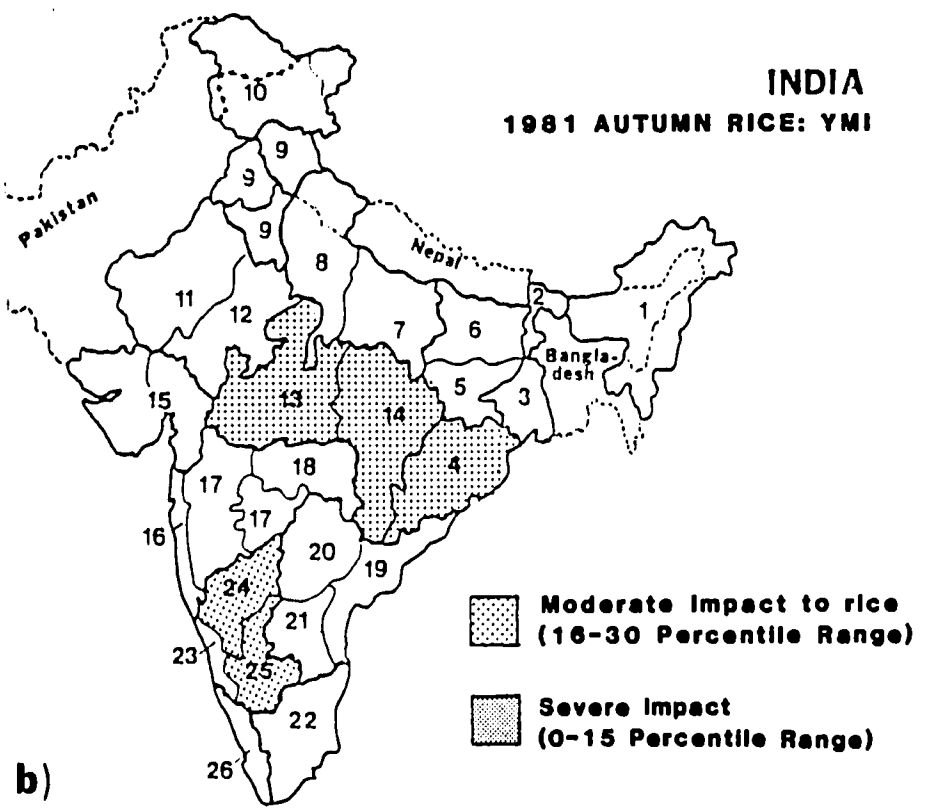
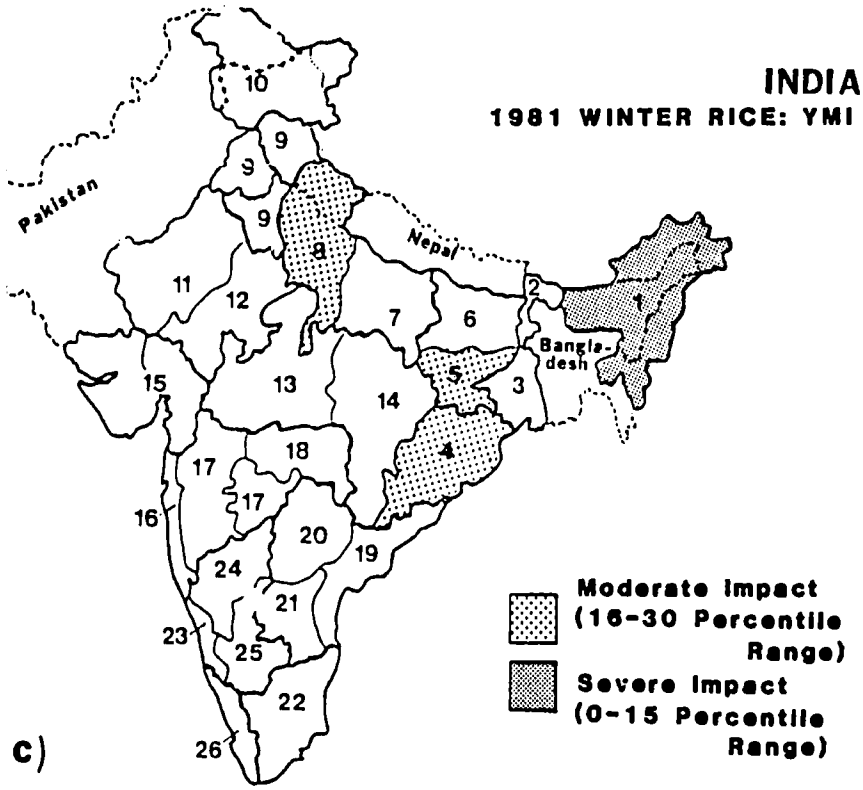


Fig. 3-3 a) 1981 Generalized Monsoon Index (Southwest) values for drought affected regions in India. (b) YMI values for affected autumn rice regions.



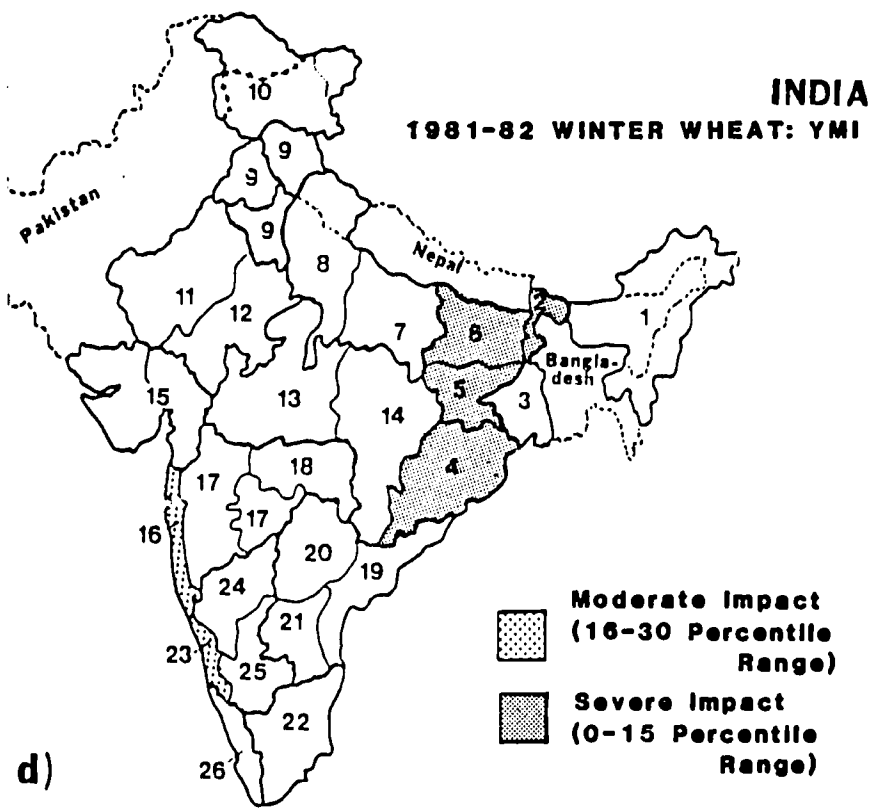


Fig. 3-3 (cont'd). (c) YMI values for affected winter rice regions and (d) YMI for affected winter wheat regions in India.

The autumn rice crop in India is generally planted prior to the onset of the southwest monsoon in June and harvested in early September. Therefore the early retreat of the monsoon had only a moderate impact on autumn rice in Madhya Pradesh, Orissa and parts of Karnataka (Figure 3.3b).

The winter rice season coincides with the southwest monsoon season (June-September), but very little winter rice is cultivated in the wheat belt of northwestern India. However, the winter rice crop in Assam was adversely impacted by drought during the southwest monsoon season (Figure 3.3c).

The winter wheat crop in India is generally cultivated during October-April. Unseasonal rains during the growing season generally helped the wheat crop in northwestern India. However, heavy rains in northern India, during harvesting time, resulted in some damage to the wheat crop. On the other hand, the wheat crops in Bihar, Orissa and Sub-Himalayan West Bengal were adversely affected by dry conditions during the growing season (Figure 3.3d).

Yield reduction for the rice crops in northern and central sections of India, due to an early retreat of the southwest monsoon, was reported by CEAS in the assessment of August 30, 1981. Potential problems for the winter wheat crop in Madhya Pradesh, Bihar Plateau, Orissa and West Bengal were first reported in the CEAS Assessment of December 8, 1981. In both these instances, the lead-time provided by the Early Warning Assessments ranged from 2 to 3 months.

The New York Times reported on May 31, 1982 that a combination of drought and an unusually wet spell had severely damaged the wheat crop in northern India. The government was considering importing wheat in order to make up for the 1.5 to 2 million tons of damaged wheat. CEAS assessments on the 1981 rice crop have not yet been confirmed.

Burma

The 1981 main rice crop in Burma was forecasted to be below normal. Pegu and Karen experienced dry conditions during July-August (Figure 3.4). excessively wet conditions during November in Arakan and Irrawaddy damaged the main rice crop prior to harvesting (CEAS Weekly Weather Assessments July 3, August 24 and December 12, 1981).

Nepal

Torrential rains associated with a tropical disturbance that originated in the Bay of Bengal caused extensive damage to life, property and crops. Excessively wet conditions during August-September (Figure 3.5) further affected the main rice crop (CEAS Weekly Weather Assessments of August 14 and October 15, 1981).

Pakistan

The 1981 main rice crop in Pakistan was forecasted to be above normal due to favorable weather conditions during the Southwest Monsoon season. The 1981-82 winter wheat crop also experienced favorable weather during the growing season. However, moderate to heavy rains during harvesting in the Punjab and Northwest regions (Figure 3.6) resulted in some yield losses (CEAS Weekly Weather Assessment, March 25, 1982).

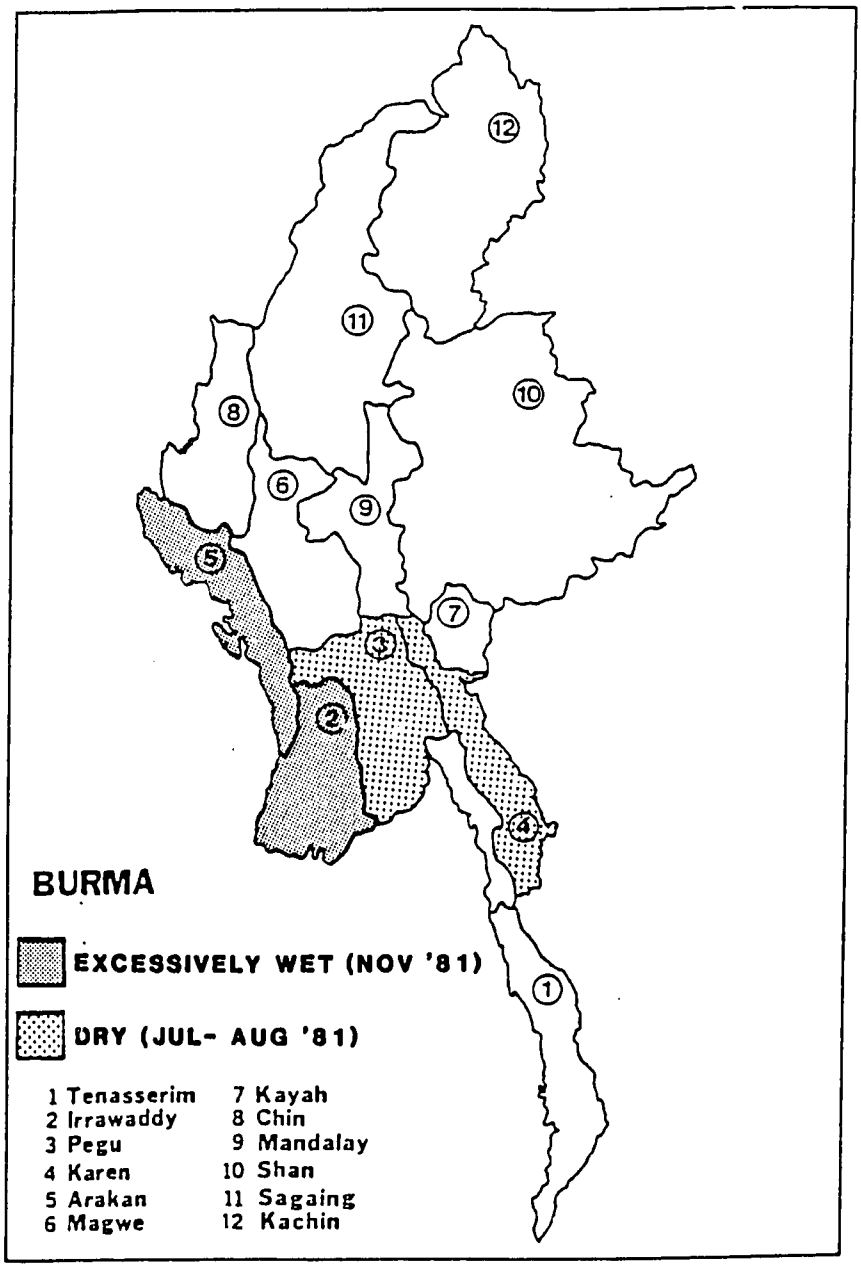


Fig. 3-4 Dry conditions during July-August 1981 followed by excessively wet conditions at harvesting adversely affected the main rice crop in Burma.

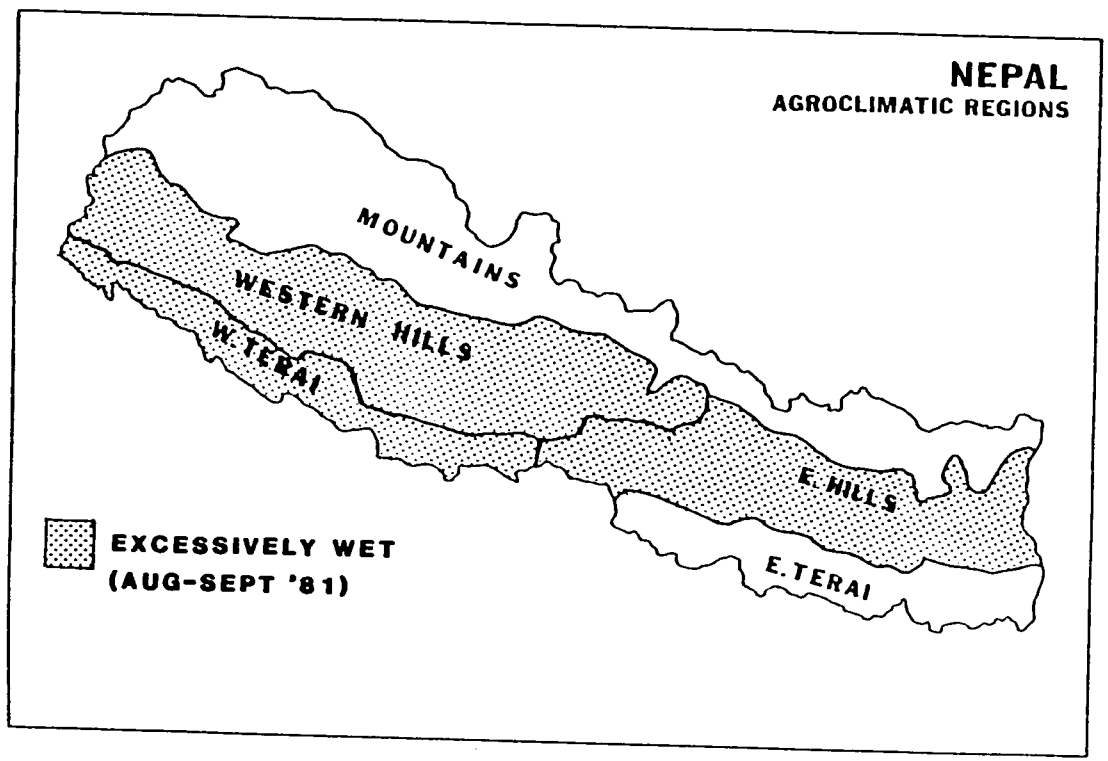


Fig. 3-5 Regions in Nepal affected by heavy rainfall during August-September 1981.

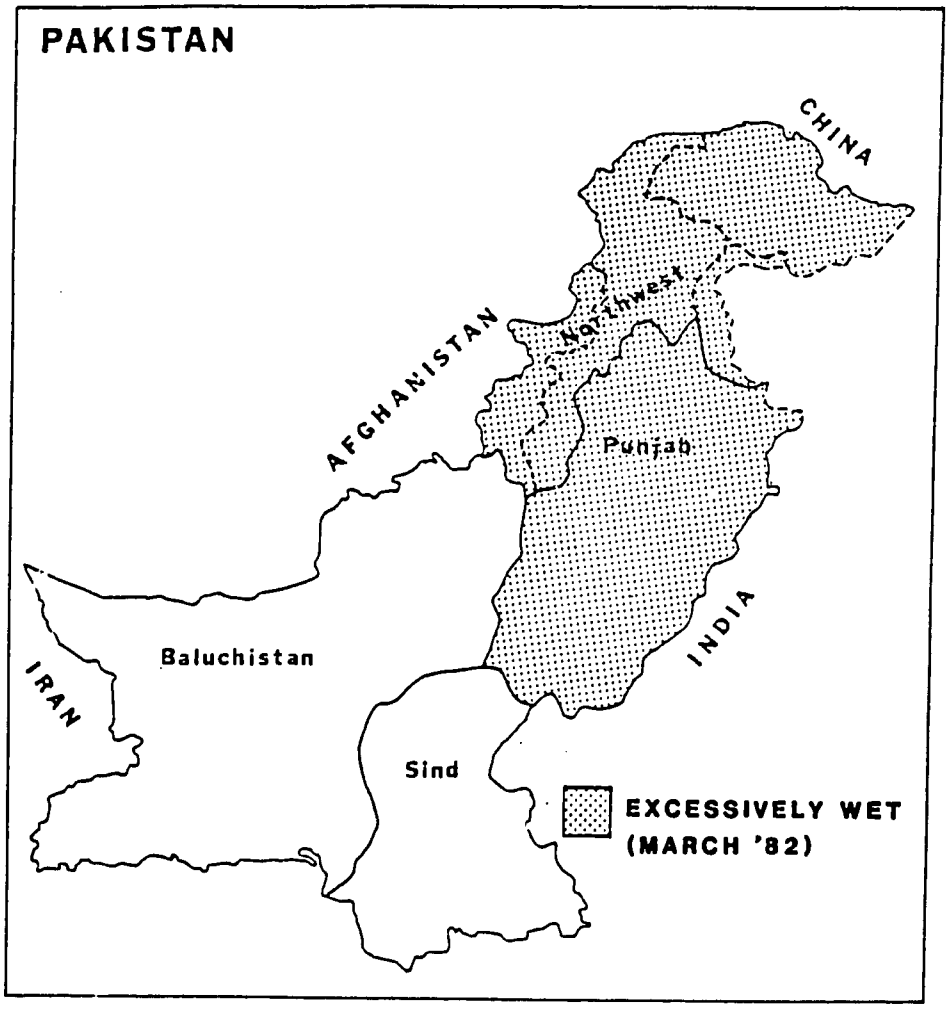


Fig. 3-6 Excessively wet conditions during March 1982 adversely affected the wheat crop prior to harvesting.

2. Southeast Asia

Malaysia

The 1981-82 national rice production was forecasted to be below normal. Severe drought conditions in Peninsular Malaysia during the southwest monsoon-season (April-July) adversely impacted the "off-season" rice crop (August'81 harvest and 24% of all rice). This drought also affected the "dry-upland" rice (February'82 harvest and 1% of all rice) and the 'main' rice (March'82 harvest and 75% of all rice) crops.

Statistical climate/rice yield models for the main rice crop indicated reductions in the key states of Kedah, Kelantan and Trengganu in Peninsular Malaysia (Figure 3.7). Severe drought conditions during March-July, 1981 adversely impacted the rice crop in Kedah, Perak and Selangor. Irrigation supplies in these states are highly dependent on rainfall during the March-July period. In contrast, rice grown in the east coast states of Kelantan and Trengganu was affected by drought during the critical flowering and reproductive stages (December 1981 to February 1982).

Regional Yield Moisture Index values for the off-season, main and dry-upland rice crops in Malaysia are shown in Figure 3.8. The entire off-season rice crop was adversely affected by drought (this crop is not cultivated in East Malaysia). Damage to the main and dry-upland rice crops was more severe in Peninsular Malaysia than in East Malaysia.

The Southwest and Northeast Monsoon Index values for 1981-82 are shown in Table 3.3. The southwest monsoon failed in most regions of Malaysia. The northeast monsoon performed well in all regions except the East Coast and West Sarawak. However, severe drought conditions during the southwest monsoon season affected normal irrigation water supplies.

WEST MALAYSIA

1981-82 MAIN RICE MODEL YIELDS BY STATE

(AS PERCENT OF NORMAL YIELD)

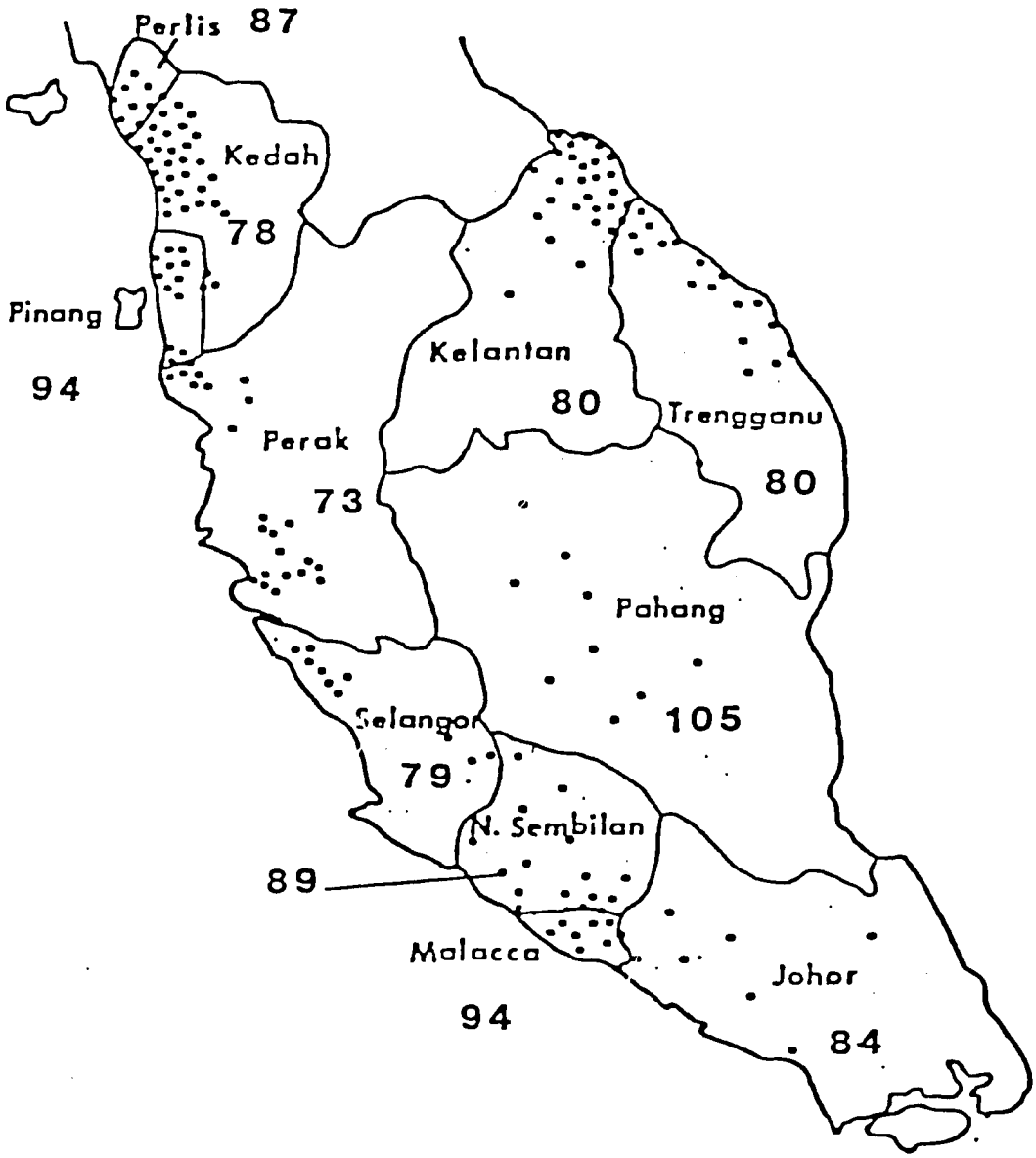


Fig. 3-7 Yield Model Estimates for the 1981-82 main rice crops in Peninsular Malaysia.

MALAYSIA: 1981-82 YIELD MOISTURE INDEX ANALYSIS

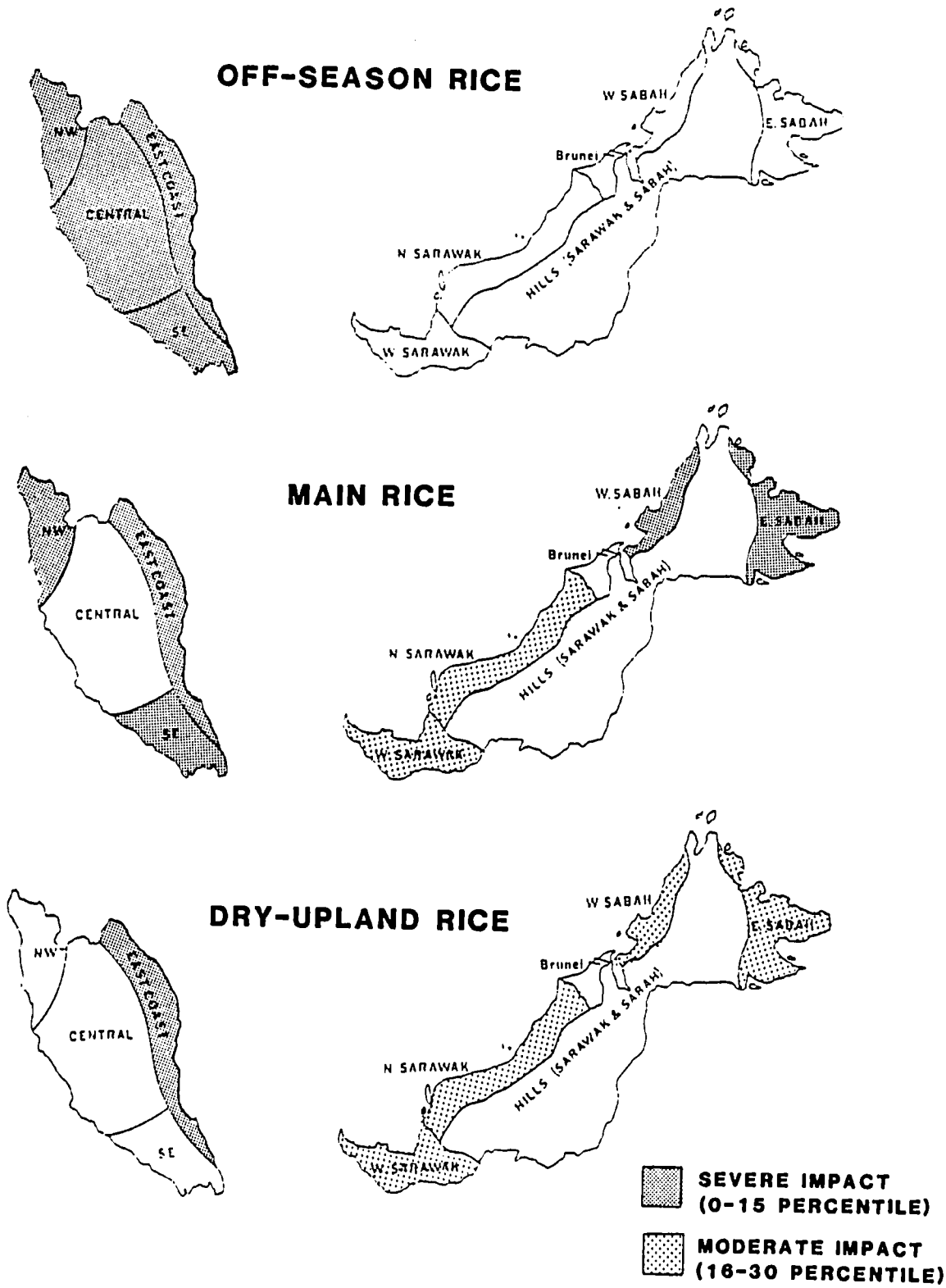


Fig. 3-8 Yield Moisture Index Analysis for the 1981-82 off-season main and dry-upland rice crops in Malaysia.

Table 3.3

Malaysia: Generalized Monson Indices (Southwest and Northeast)

1981/82 Season

Region	GMI (Southwest) (1981)			GMI (Northeast) (1981-82)		
	Months	Percentile	Percent Normal	Months	Percentile	Percent Normal
Northwest	Mar-Jun	7	68	Sep-Dec	85	108
Central	Mar-Jun	3	55	Sep-Dec	96	112
East Coast	Mar-Jun	10	65	Oct-Jan	14	80
Southeast	Mar-Jun	3	63	Sep-Dec	60	89
W. Sarawak	Mar-Jun	28	91	Oct-Jan	10	80
N. Sarawak	Mar-Jun	21	88	Sep-Dec	32	99
W. Sabah	Mar-Jun	3	43	Sep-Dec	64	91
E. Sabah	Mar-Jun	3	63	Sep-Dec	71	127
Hills	Mar-Jun	8	80	Sep-Dec	80	115

Problems for the rice crops in Malaysia were detected fairly early in the season by the CEAS Early Warning Program. The Crop Condition Assessment of September 15, 1981, indicated delays in planting of the main rice crop in Malaysia. Crop yield estimates for selected states in Malaysia were first provided in the Monthly Crop Condition Assessment of December 8, 1982. The lead-time provided by these assessments is between 1-2 months prior to harvest. A special assessment on the 1981-82 rice crop in Malaysia was forwarded to AID/OFDA on April 15, 1982. The impact of the 1981-82 drought on the national rice production was analyzed in this report (Appendix A).

Verification of the CEAS assessments for Malaysia was made possible by the State Department cable of April 2, 1982 (Kuala Lumpur 2297),

> "Sustained drought conditions since December are seriously affecting Malaysia's rice growing areas. The Malaysian National Padi and Rice Board indicated today that about 400,000 tons of rice will have to be imported this year in view of these drought conditions...The drought centers on the northern Malaysian states of Perlis, Kedah and Kelantan and extends into Penang and Trengganu."

The Philippines

The primary maize and rice crops in the Philipines were adversely affected by severe drought during the southwest monsoon season. Erratic rainfall during the northeast monsoon season adversely impacted the secondary rice crop as well. There were also reports of flood damage due to tropical hurricanes in Southern Philippines.

Rainfall during the southwest monsoon season was below normal over most of the Philippines (Figure 3.9a). The worst affected regions included Mindanao and the Visayas. The primary maize and rice crops depend on the southwest monsoon season rainfall and were consequently affected (CEAS November 2, 1981 Crop Condition Assessment). In September, typhoon "Clara" caused some damage to the rice crop prior to harvesting in Luzon.

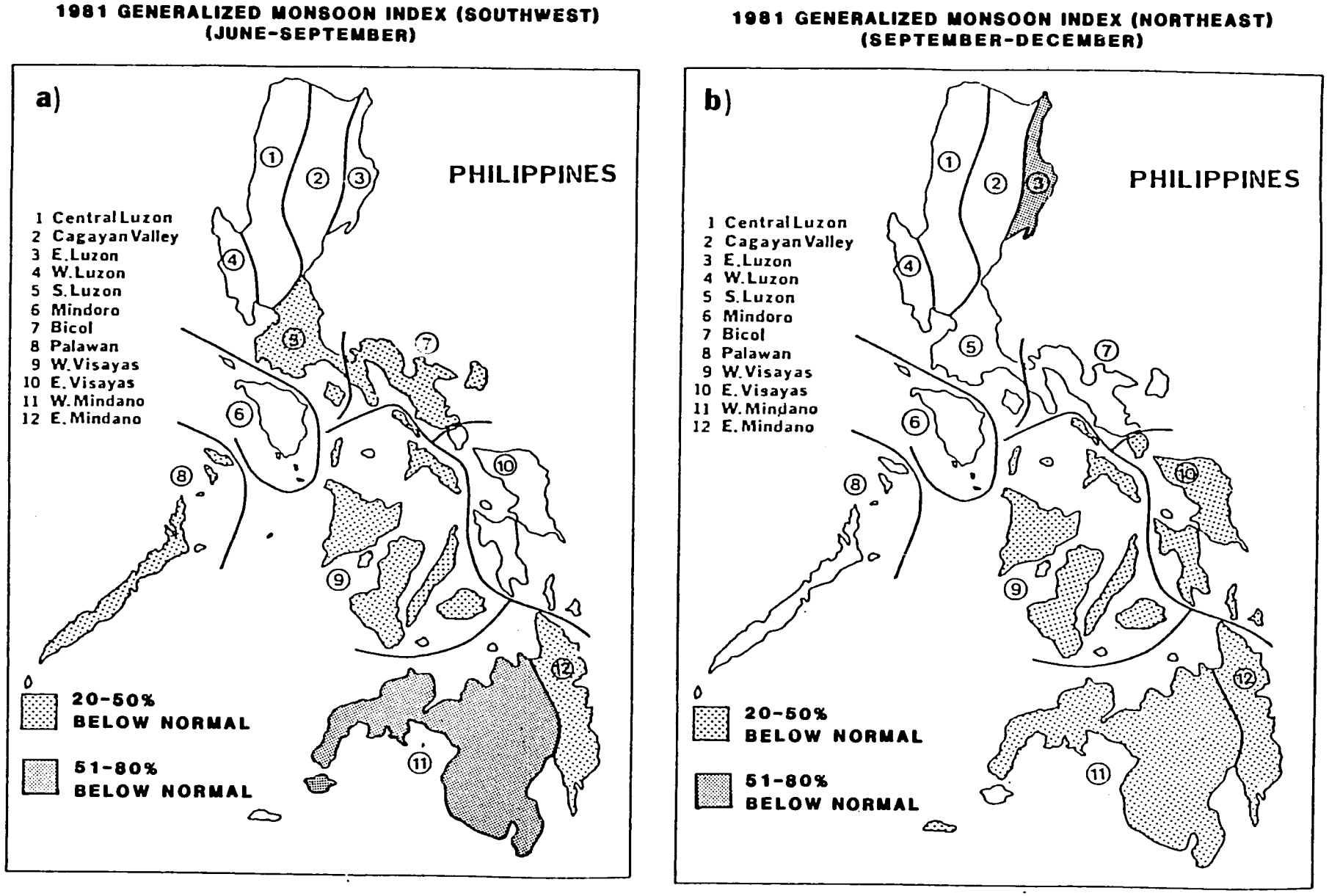


Fig. 3-9 Drought affected regions in the Philippines during (a) the 1981 southwest monsoon season and (b) the northeast monsoon season.

Rainfall during the northeast monsoon season was also very erratic (Figure 3.9b). Problems for the secondary maize and secondary rice crops in East and West Visayas, East and West Mindanao, Bicol and Mindoro were reported in the CEAS Monthly Crop Condition Assessment of February 23, 1982. There were also reports of flood damage due to typhoons "Irma" (November 23-29), "Lee" (December 26-27) and "Nelson" (late March) in northern and central Philippines (CEAS Weekly Weather Assessments of November 29, December 3, December 31, 1981, and April 9, 1982).

Indonesia

Indonesia experienced below normal rainfall conditions in some regions during the 1981-82 growing season. Rainfall during the monsoon seasons was scanty and erratic. Climatic impact on the secondary rice and maize crops were reported by NOAA/CEAS as early as September 15, 1981. The Southwest Monsoon Index was typically 30-40 percent below normal over most of Indonesia.

The main rice (April-June harvest) and the dry-upland rice (March-May harvest) crops were assessed to be below normal (May 10, 1982 Crop Condition Assessment). Rainfall during the 1981-82 northeast monsoon season (October-January) as well as that during the period February-April was very erratic. Agroclimatic/crop condition indices, expressed in percentiles, were found to be in the lower 10th percentile range over most of Indonesia (Figure 3.10). Such index values have been historically associated with crop failure or the inability to cultivate multiple rice crops during the same season. The main maize crop (February-March harvest) was also adversely impacted by the drought in East and West Sumatra, Java and Nusa Tenggara (Figure 3.11).

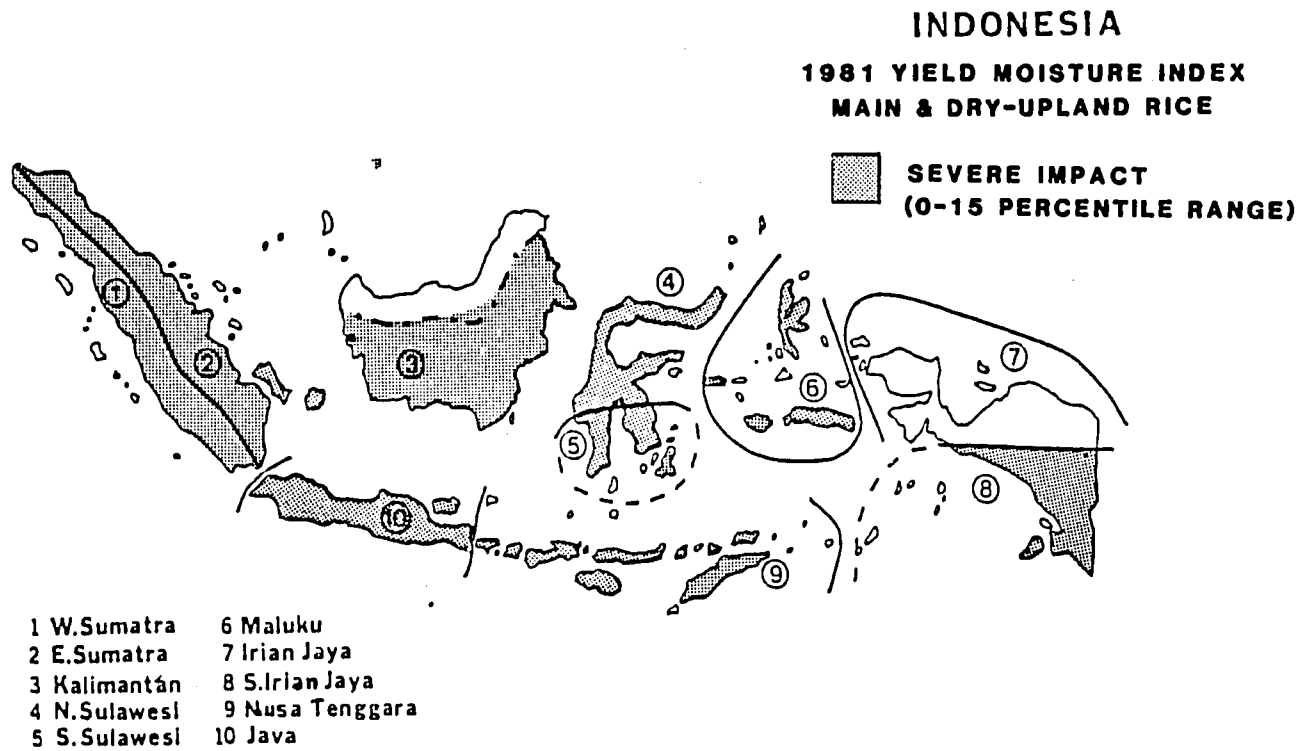


Fig. 3.10 The drought affected dry-upland and main rice regions in Indonesia.

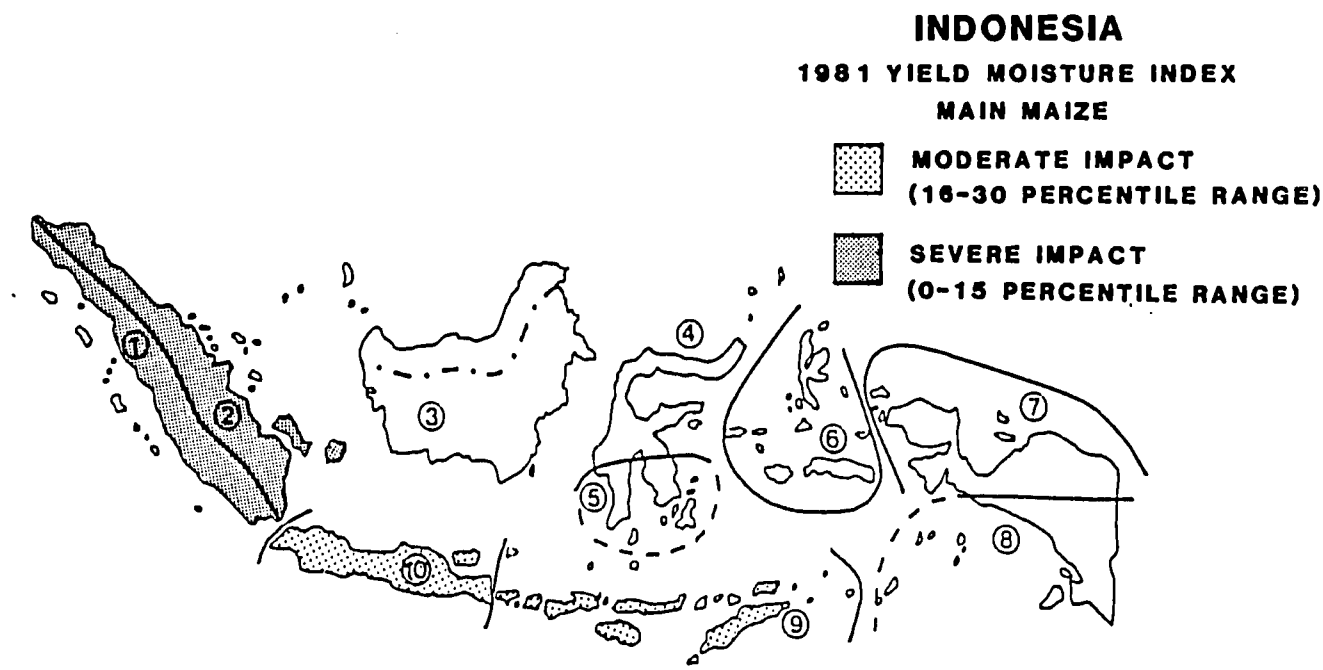


Fig 3.11 The drought affected main maize region in Indonesia.

Thailand

The main rice crop (January-February harvest) in Peninsular Thailand was adversely affected by drought during the southwest and northeast monsoon seasons. The affected regions include the Southeast, Southcentral and Southwest as indicated in Figure 3.12 (Monthly Crop Condition Assessment, February 23, 1982). Crop conditions in other regions of Thailand were favorable during the growing season.

Vietnam

The first main rice crop (November 1981 harvest) in the Annam region (Figure 3.13) was adversely affected by below normal rainfall during the southwest monsoon season. Agroclimatic crop condition index values for the Annam region were 30-40 percent below normal (Monthly Crop Condition Assessment November 2, 1981).

Poor rainfall conditions during the southwest monsoon season followed by a failure of the northeast monsoon season also adversely affected the second main ri crop (May '82 harvest) in the Annam region (Figure 3.13). Agroclimatic/crop condition indices were only 38 percent of normal indicating crop failure (Monthly Crop Condition Assessment, February 23, 1982).

Laos

The main rice crop (November-December 81 harvest) in the South and Vientiane regions of Laos (Figure 3.14) was adversely impacted by drought during the southwest monsoon season. Agroclimatic/crop condition indices were 30 percent below normal for these regions as stated in the Crop Condition Assessment of November 2, 1981.

THAILAND: YIELD MOISTURE INDEX
1981 MAIN RICE

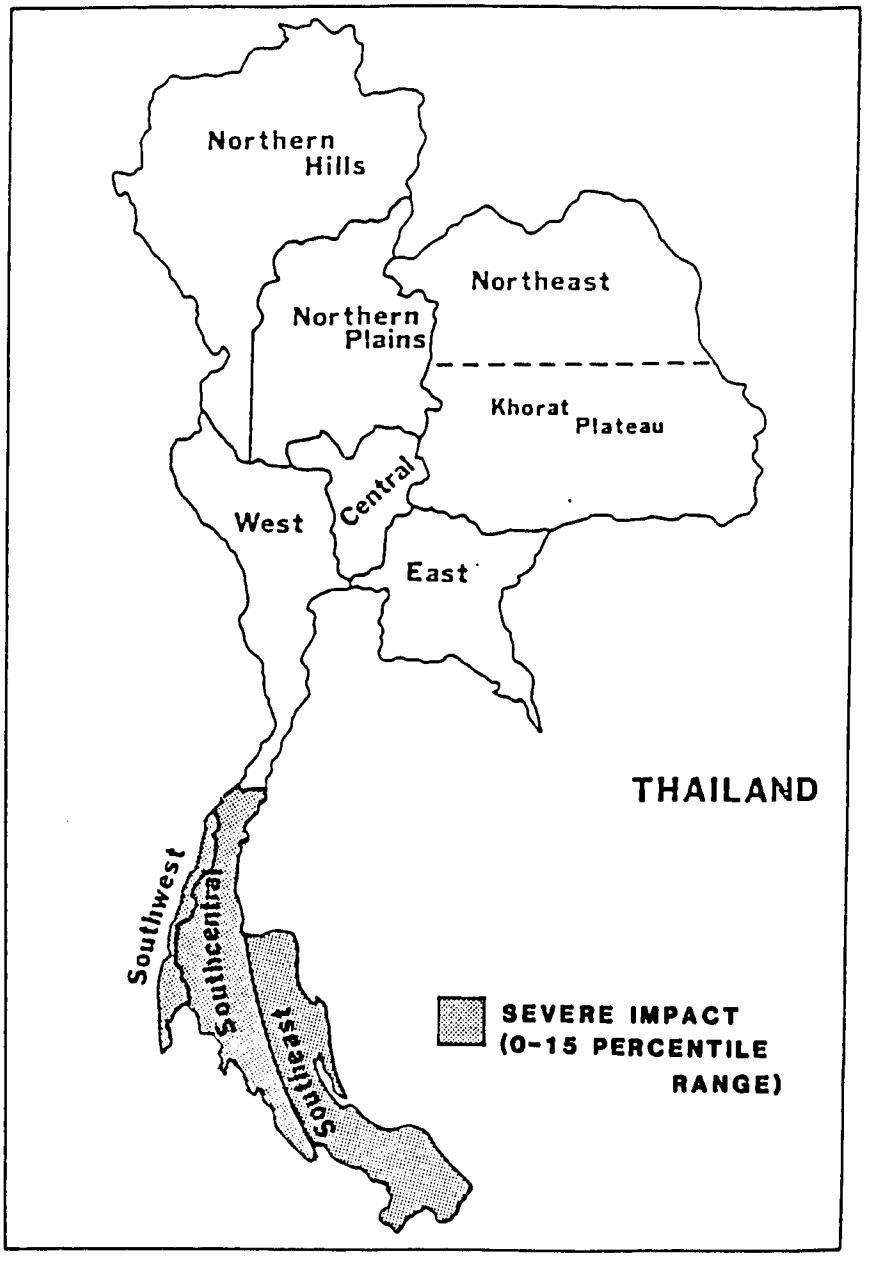


Fig. 3-12 Yield Moisture Index showing the drought affected main rice regions in Peninsular Thailand.

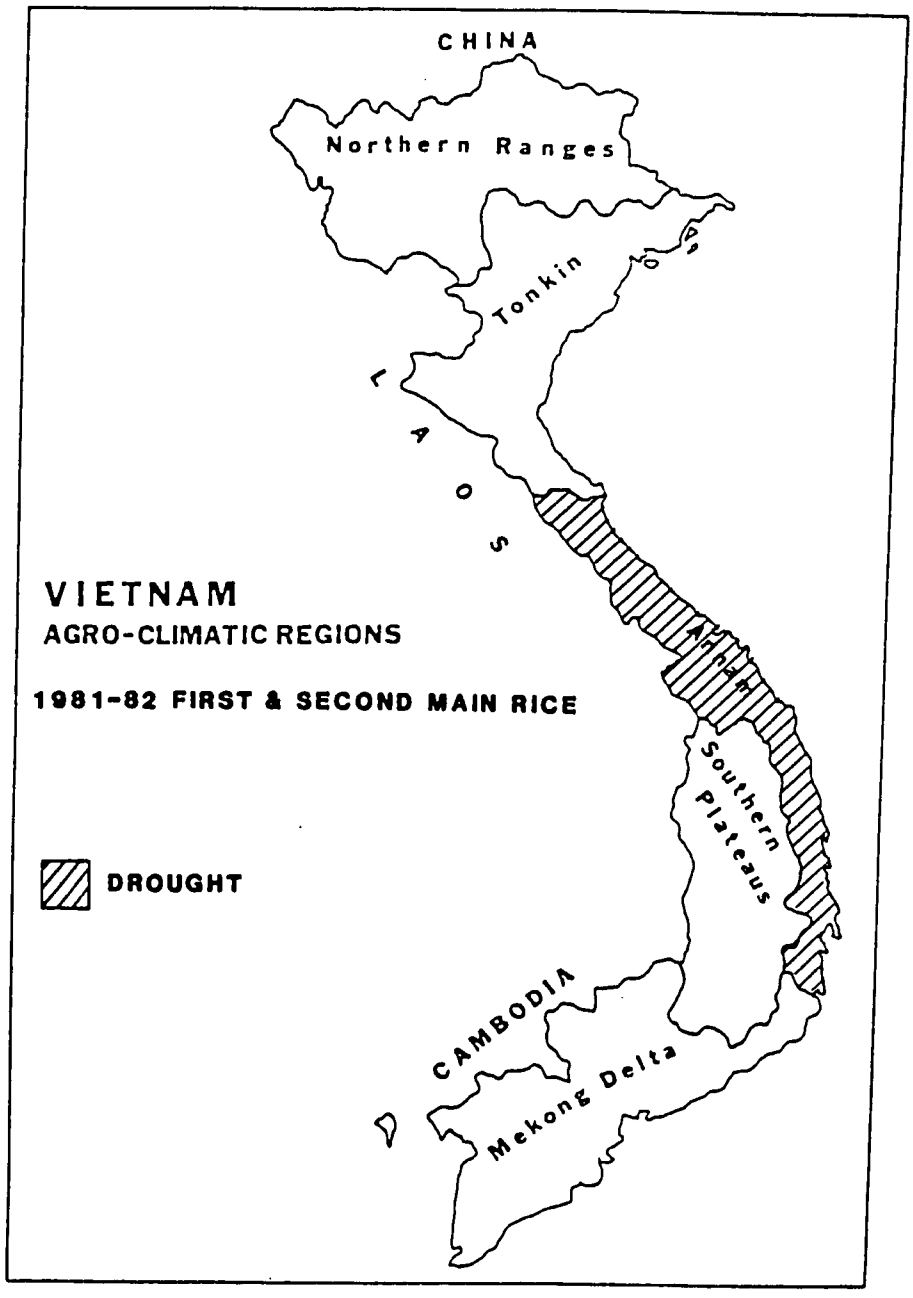


Fig. 3-13 The drought affected first and second main rice regions in Vietnam.

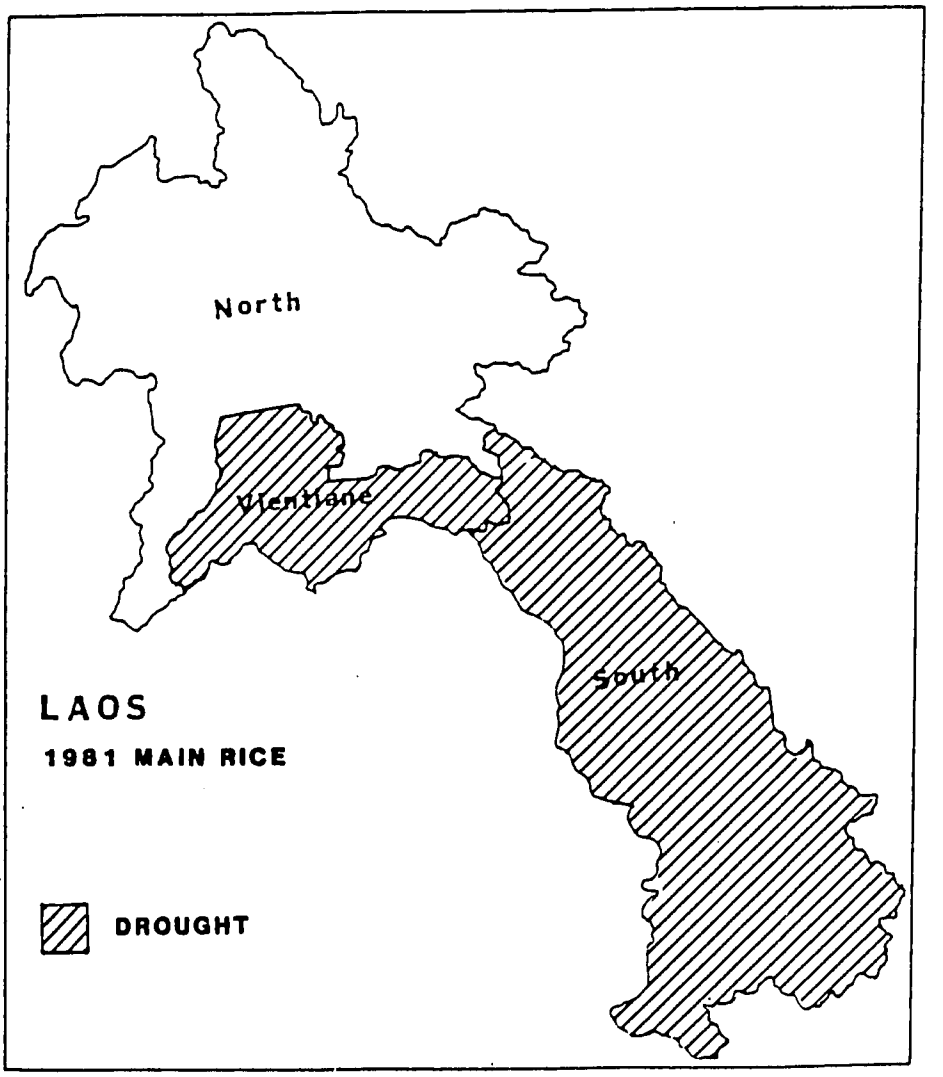


Fig. 3-14 The drought affected main rice regions in Laos.

Kampuchea

Transplanting of the main rice crop was delayed over most of Kampuchea as a result of below normal rainfall conditions (NOAA/CEAS cable September 11, 1981). Scattered food shortages were reported in northern and southern sections of Kampuchea in part due to erratic monsoon rainfall (NOAA/CEAS cable September 24, 1981).

B. Crop Yield Models

The statistical climate/crop yield models developed by Steyaert, Achutuni and Todorov (1982) for several countries in South and Southeast Asia were tested during the 1981-82 growing season.

The forecasted yields for 1981-82 by country, crop, season and region are shown in Table 3.4. Only one assessment is provided for each model during the growing season. The forecasted yield is then expressed as a percentage of normal yield. Normal yield refers to the trend value. For models without a trend term, normal yield refers to the average yield for the most recent three year period having reliable yield data.

The crop yield models for India and Thailand were independently tested as part of the model evaluation procedure. Meteorological data required to independently test models for other countries is not readily available. A model can be independently tested as follows. Assume that the model was developed on agronomic and meteorological data for the period 1950-1975. Yield estimates for the next five years (1976-1980) can then be computed by substituting 1976-1980 meteorological data into the original model equation (developed on 1950-1975 data). Results from performing independent tests on models for India and Thailand are discussed below.

Table 3.4

NOAA/EDIS/CEAS*
Early Warning Program
Southern Asia Yield Forecasts (1981-1982)
Test and Evaluation of Statistical Models

COUNTRY	CROP	SEASON	REGION	ASSMT. MONTH (7/81 - 6/82) After:	Normal Yield 81-82	Forecast Yield 81-82	Forecast Yield as % of Normal
BURMA	RICE	MAIN	NATIONAL	JUNE 30	12.9	11.3	88
BANGLADESH	RICE	AUS	NATIONAL	JULY 31	10.0	9.0	90
		AMAN	NATIONAL	JULY 31	11.5	10.3	90
		BORO	NATIONAL	FEBRUARY 28	20.5	20.4	99
SRI LANKA	RICE	YALA	NATIONAL	JULY 31	21.7	21.8	101
INDIA	RICE	AUTUMN	BIHAR	AUGUST 31	6.3	6.6	105
			GUJARAT	SEPTEMBER 30	11.7	13.7	117
			MADHYA PRADESH	SEPTEMBER 30	7.6	5.7	75
			MAHARASHTRA	SEPTEMBER 30	14.6	16.1	110
			ORISSA	AUGUST 31	6.6	6.2	94
			PUNJAB	AUGUST 31	30.9	29.6	96
			TAMIL NADU	AUGUST 31	22.8	24.6	108
			UTTAR PRADESH	AUGUST 31	10.6	10.8	102
			WEST BENGAL	AUGUST 31	10.3	9.7	94
		WINTER	BIHAR	OCTOBER 31	10.2	10.3	101
			GUJARAT	OCTOBER 31	15.8	12.7	80
			KERALA	NOVEMBER 30	16.3	16.5	101
			TAMIL NADU	NOVEMBER 30	21.0	20.8	99
			UTTAR PRADESH	SEPTEMBER 30	11.4	11.9	104
			WEST BENGAL	JULY 31	12.0	13.2	110
		SUMMER	ANDHRA PRADESH	DECEMBER 31	18.7	18.4	98

*Yields in quintals per hectare
Normal Yield refers to the Trend value

Table 3.4 Continued:

CONTINUED:

COUNTRY	CROP	SEASON	REGION	ASSMT. MONTH (7/81-6/82) After:	Normal Yield 81-82	Forecast Yield 81-82	Forec Yield as % Norma
			KARNATAKA	DECEMBER 31	29.9	29.2	98
			KERALA	OCTOBER 31	18.9	19.9	105
			WEST BENGAL	FEBRUARY 28	27.2	31.3	115
	WHEAT	WINTER	ANDHRA PRADESH	JANUARY 31	7.1	7.5	106
			BIHAR	APRIL 30	13.2	10.9	83
			GUJARAT	MARCH 31	16.2	16.2	100
			MADHYA PRADESH	FEBRUARY 38	7.8	8.1	104
			MAHARASHTRA	JANUARY	9.7	8.5	88
			RAJASTHAN	AUGUST 31	12.7	12.4	98
			UTTAR PRADESH	AUGUST 31	12.8	14.1	110
			WEST BENGAL	NOVEMBER 30	20.7	16.7	81
INDIA	SORGHUM	KHARIF	GUJARAT	SEPTEMBER 30	6.8	6.2	91
			KARNATAKA	AUGUST 31	11.2	11.5	103
			MAHARASHTRA	JULY 31	16.5	17.3	105
			TAMIL NADU	SEPTEMBER 30	10.5	11.6	111
		RABI	GUJARAT	OCTOBER 31	8.0	8.2	103
			KARNATAKA	JANUARY 31	5.5	6.0	109
MALAYSIA	RICE	MAIN	PERLIS	AUGUST 31	34.0	29.5	87
			KEDAH	JULY 31	33.5	26.2	78
			PINANG	JANUARY 31	32.5	30.5	94
			PERAK	SEPTEMBER 30	26.2	19.0	73
			PERAK	SEPTEMBER 30	26.2	23.9	91

Table 3.4 Continued:

COUNTRY	CROP	SEASON	REGION	ASST. MONTH (7/81-6/82) After:	Normal Yield 81/82	Forecast Yield 81/82	Forecast Yield as % of Normal
			PERAK	MARCH 31	26.2	22.8	87
			SELANGOR	JANUARY 31	32.8	26.0	79
			SELANGOR	JANUARY 31	32.8	31.5	96
			SELANGOR	JANUARY 31	32.8	32.8	100
			N. SEMBILAN	DECEMBER 31	25.5	22.6	89
			MALACCA	SEPTEMBER 30	22.2	20.8	94
			JOHOR	SEPTEMBER 30	25.2	21.0	83
			KELANTAN	MARCH 31	23.9	19.0	80
			TRENGGANU	MARCH 31	23.0	18.3	80
			PAHANG	JANUARY 31	18.5	19.5	105
THAILAND	RICE	MAIN	NORTH	SEPTEMBER 30	23.2	24.0	104
			NORTHEAST	SEPTEMBER 30	14.3	13.4	94
			CENTRAL	SEPTEMBER 30	20.9	20.8	100
			CENTRAL	SEPTEMBER 30	20.9	19.8	95
			SOUTH	SEPTEMBER 30	14.5	15.5	107
	MAIZE	MAIN	CENTRAL	JULY 31	21.0	20.3	97

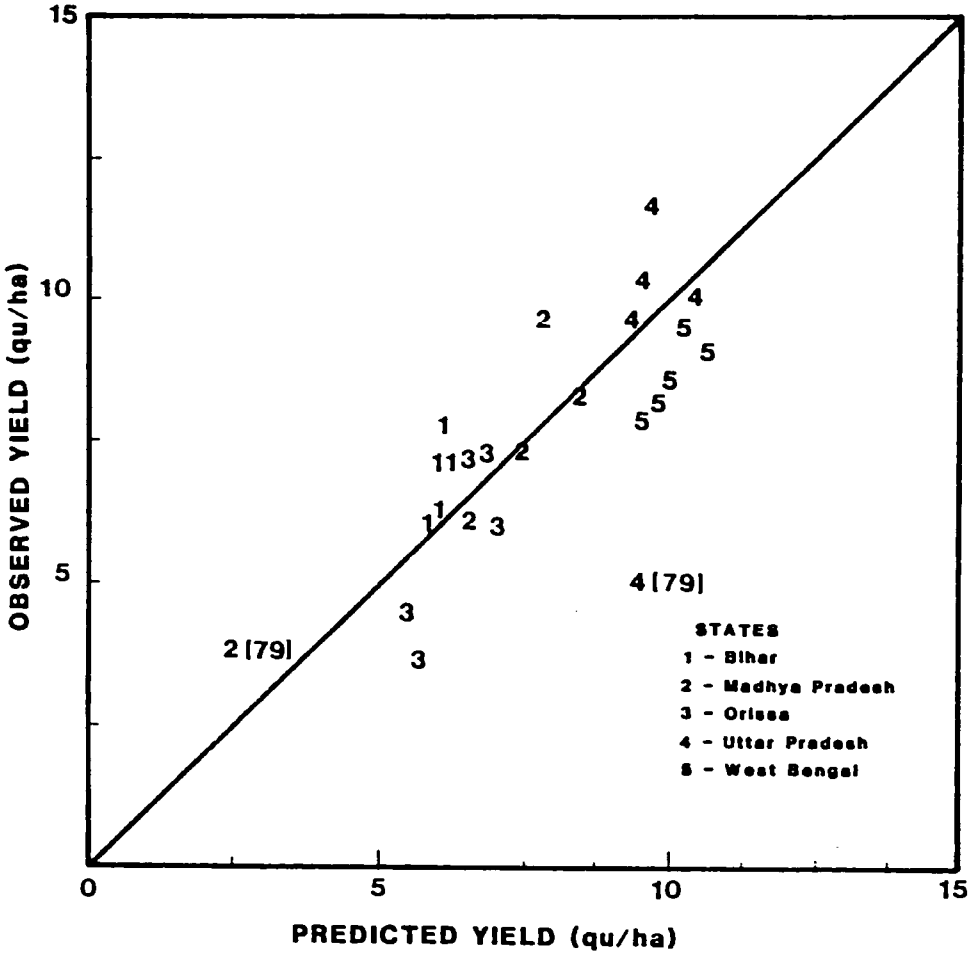
1. India Rice Models

The Indian autumn, winter and summer rice models were independently tested as part of the evaluation process. Results from this analysis must be interpreted with caution as most models were tested on only 3 to 4 years of independent data.

Results from independently testing the Indian Autumn rice models are shown in Figure 3.15. The diagonal line represents 1:1 correspondence between the observed and predicted yield. If a sample point falls above this line, it implies the model is underestimating yield (negative bias) for that year and vice-versa. However, if a model consistently underestimates or overestimates the observed yield then it is said to be biased.

The autumn rice models performed quite well during the independent test years (1976-1980). Episodic data for 1979 were used as part of the evaluation process. Model statistics for the autumn, winter and summer rice models are shown in Table 3.5. The autumn rice models have a small root mean square error (RMSE). Results from independently testing the autumn rice models are shown in Figure 3.15. Episodic event data for 1979 confirms severe drought impact on the rice crops in Madh Pradesh and Uttar Pradesh. The autumn rice model for West Bengal overestimated yield during the test period (1976-1980). A time-series plot of the weather variable in th model did not indicate any significant trend. Consequently, the trend term in this model has to be respecified for the 1976-1980 period.

INDIA: AUTUMN RICE MODELS
INDEPENDENT TESTS (1976 - 1980)



INDIA: AUTUMN RICE MODELS (cont'd)
INDEPENDENT TESTS (1976-1980)

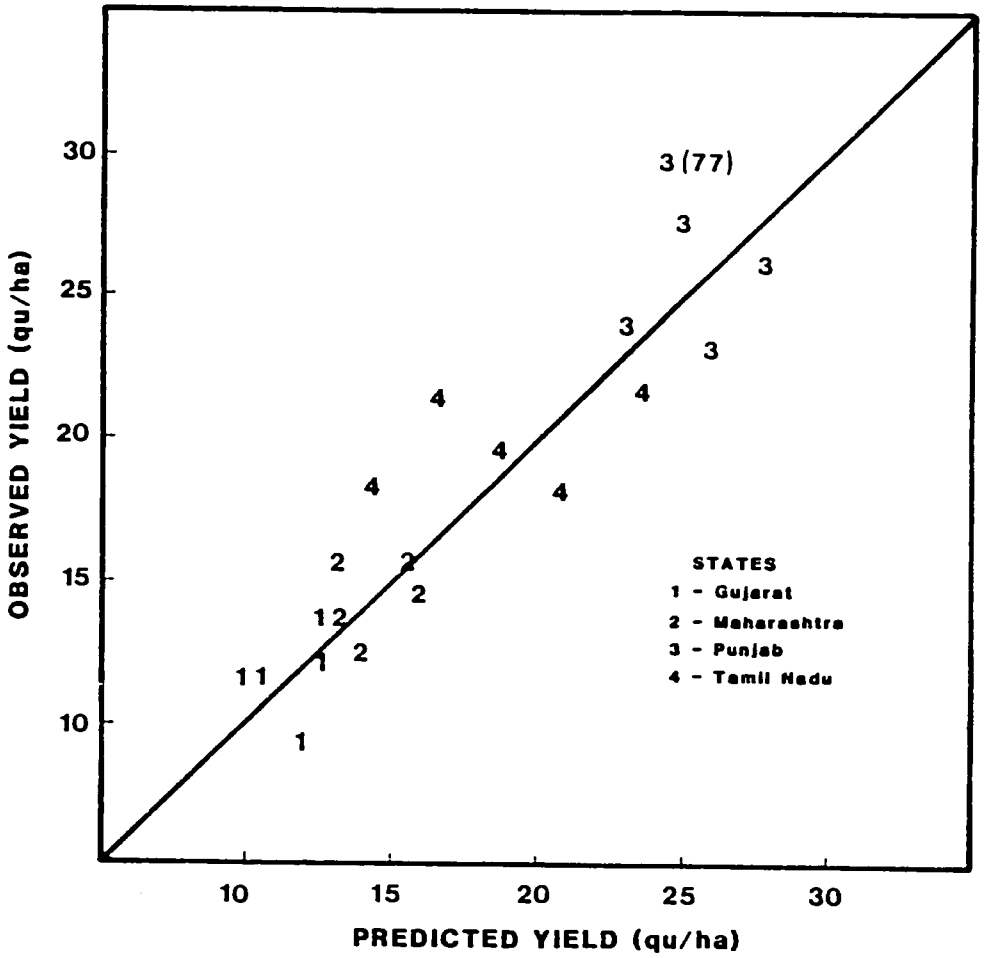


Fig. 3-15 India: Autumn rice model independent tests.

Table 3.5: Independent Test Results for India Rice Models

REGION	MODEL	Bias $\bar{d}$	RMSE (qu/ha)	SD (qu/ha)
Bihar	Autumn Rice	-.80	1.02	.63
Gujarat	Autumn Rice	-.20	1.60	1.59
Madhya Pradesh	Autumn Rice	-.08	.74	.74
Maharashtra	Autumn Rice	-.16	1.51	1.50
Orissa	Autumn Rice	.60	1.32	1.18
Punjab	Autumn Rice	-.76	3.23	3.14
Tamil Nadu	Autumn Rice	-.88	3.12	2.99
Uttar Pradesh	Autumn Rice	.22	2.00	1.99
West Bengal	Autumn Rice	1.16	1.22	0.39
Bihar	Winter Rice	.93	1.35	.97
Gujarat	Winter Rice	-2.07	2.20	.75
Tamil Nadu	Winter Rice	-.60	1.16	.99
Uttar Pradesh	Winter Rice	.80	2.01	1.85
West Bengal	Winter Rice	-.67	1.36	1.18
Andhra Pradesh	Summer Rice	-2.3	2.41	.60
Karnataka	Summer Rice	2.83	2.89	.54

Results of independent tests (1978-1980) on the Indian winter rice models are shown in Figure 3.16. Episodic event data for 1979 indicated flood damage to the winter rice crop in Bihar and Uttar Pradesh. Generally, the winter rice models have a small bias (Table 3.5) and are capable of providing useful assessment information. However, the Gujarat winter rice model has a large negative bias.

The summer rice model evaluation results for the test period 1978/79-1980/81 are shown in Figure 3.17. The Kerala summer rice model performed well during the test period; however, the Andhra Pradesh model underestimated yield during the test years, while the Karnataka and West Bengal summer rice models consistently overestimated yield. No significant trend in the weather data was evident in either of these states. The summer rice model for West Bengal is very marginal and has a root mean square error of 7.8 quintals per hectare. This model is not recommended for operational use.

2. India Wheat Models

The winter wheat model results for India are shown in Figure 3.18. The models for Maharashtra, Andhra Pradesh, Rajasthan and Madhya Pradesh can provide useful assessment information. However, the wheat models for the states of Gujarat and Bihar are less reliable due to the large bias (Table 3.6). The West Bengal wheat model has a large variance and is not reliable.

3. India Sorghum Models

Model results for the kharif and rabi sorghum models are shown in Figure 3.19. All of the sorghum models, with the exception of the kharif model for Maharashtra, performed exceptionally well on the independent tests. In Maharashtra, severe drought during the 1979 southwest monsoon season adversely

INDIA: WINTER RICE MODELS
INDEPENDENT TESTS 1978-1980

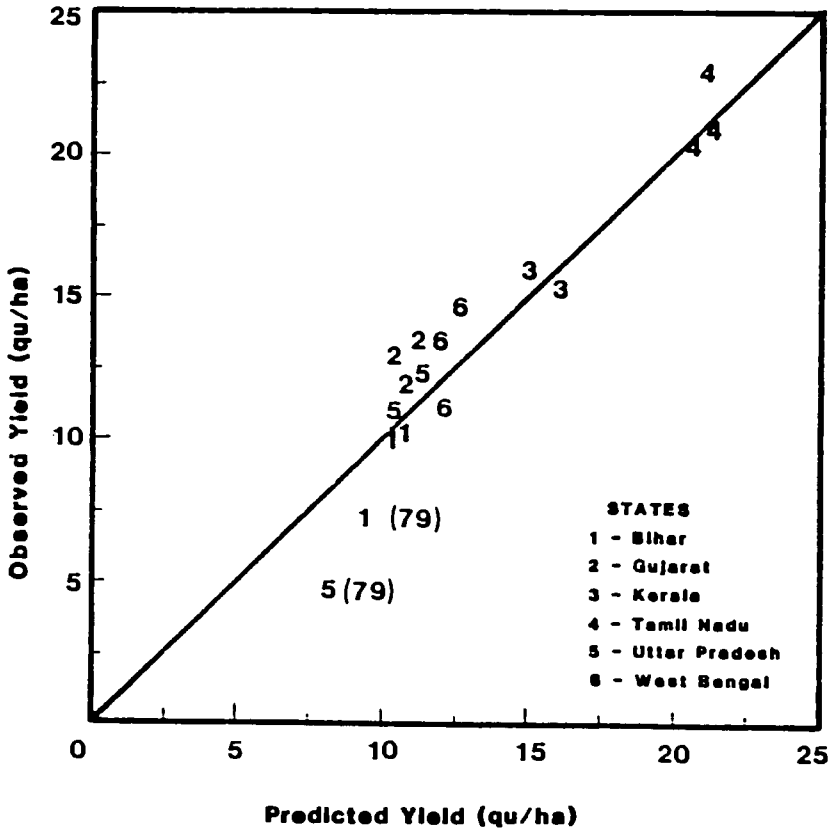


Fig. 3-16 India: Winter rice model independent tests.

INDIA: SUMMER RICE MODELS
INDEPENDENT TEST 1978/79 - 1980/81

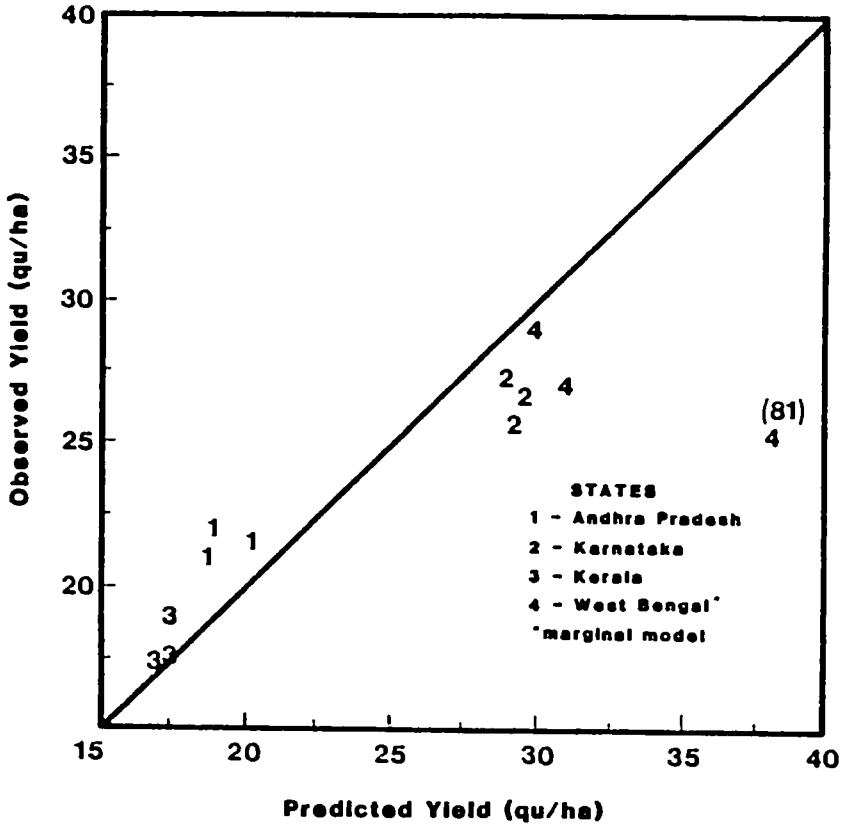


Fig. 3-17 India: Summer rice model independent tests.

INDIA: WINTER WHEAT MODELS INDEPENDENT TESTS

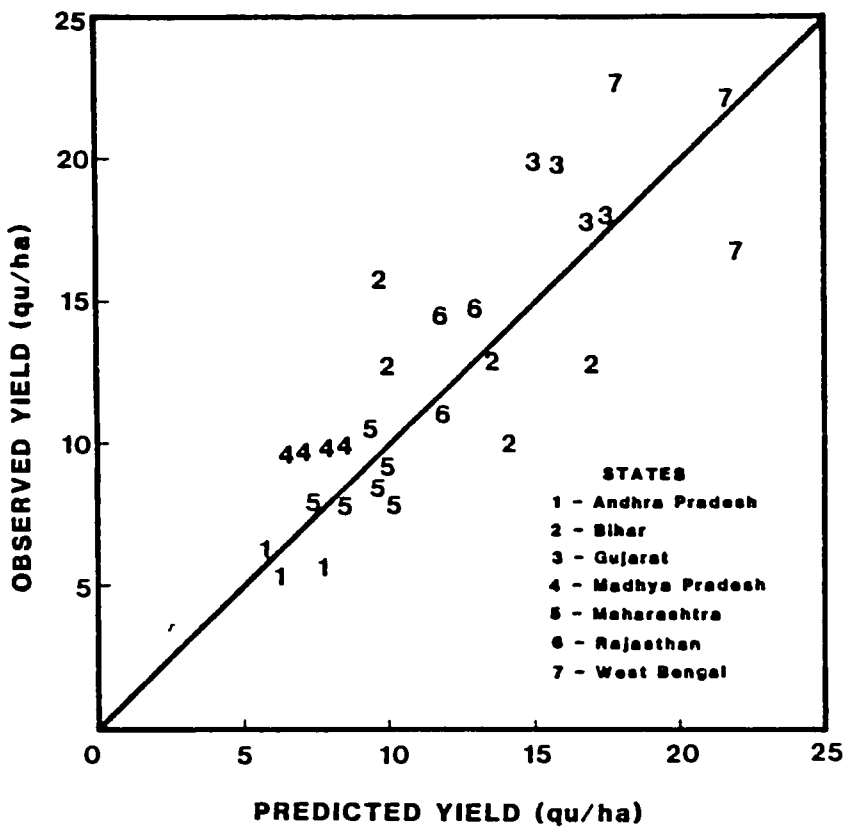


Fig. 3-18 India: Winter wheat model independent tests.

INDIA: KHARIF & RABI SORGHUM MODELS INDEPENDENT TESTS

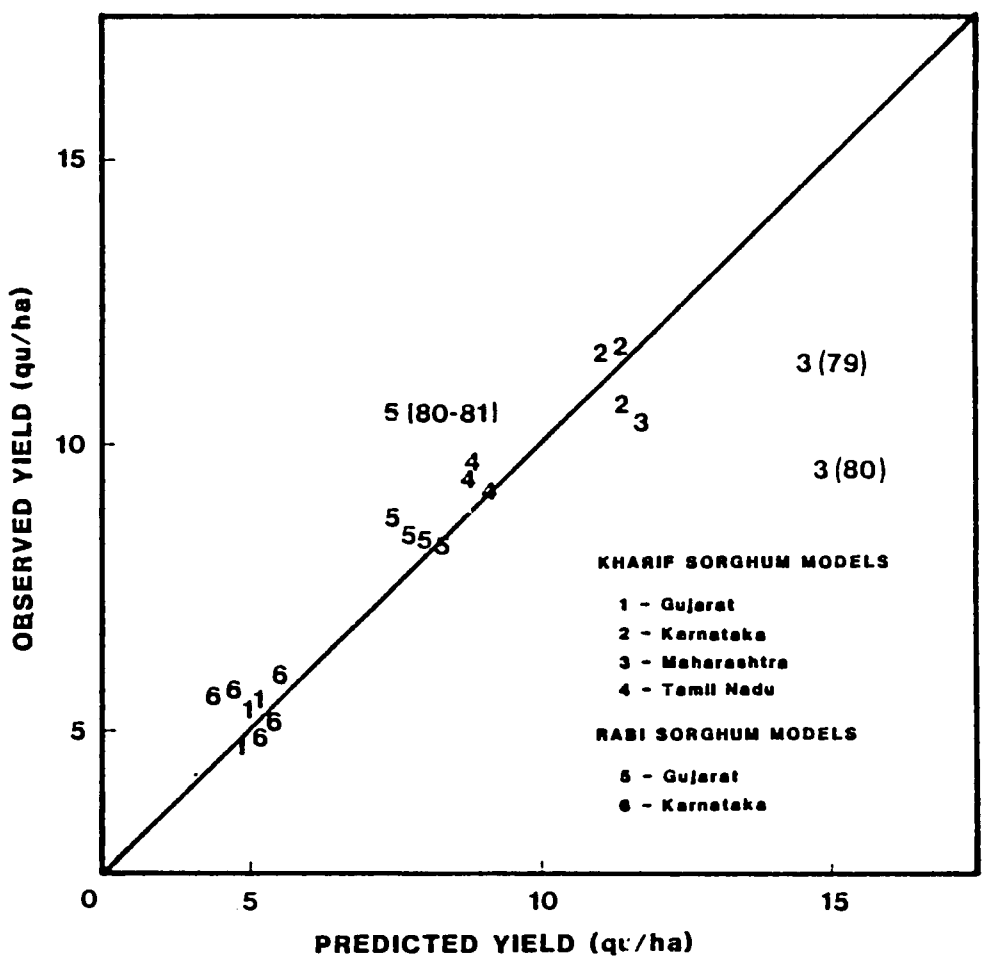


Fig. 3-19 India: Kharif and rabi sorghum model independent tests.

Table 3.6: Independent Test Results for India Wheat and Sorghum Models

REGION	MODEL	BIAS $\bar{d}$	RMSE (qu/ha)	SD (qu/ha
Andhra Pradesh	Wheat	1.1	1.54	1.07
Bihar	Wheat	.04	3.99	3.99
Gujarat	Wheat	-2.55	3.24	2.00
Madhya Pradesh	Wheat	-2.28	2.42	.82
Maharashtra	Wheat	.60	1.29	1.14
Rajasthan	Wheat	-1.17	1.87	1.46
West Bengal	Wheat	-.33	4.43	4.41
Gujarat	Kharif Sorghum	-.23	.25	.10
Karnataka	Kharif Sorghum	-.10	.52	.51
Maharashtra	Kharif Sorghum	3.37	3.69	1.52
Tamil Nadu	Kharif Sorghum	-1.13	1.53	1.03
Gujarat	Rabi Sorghum	-1.16	1.67	1.21
Karnataka	Rabi Sorghum	-.44	.75	.61

affected the kharif sorghum crop. In 1980, extremely unfavorable conditions around planting adversely impacted the kharif sorghum crop. Both these events contributed to the high root mean square error of the model (Table 3.6).

Thailand Main Rice and Maize Models

Independent test results for the Thai main rice and main maize models are shown in Table 3.7. The rice models were independently tested on 1975-1981 data, while the maize model was tested on 1978-1981 data.

Table 3.7: Thailand Rice and Maize Model Test Results

REGION	MODEL	BIAS $\bar{d}$	RMSE (qu/ha)
North	Main Rice	0.50	2.30
Northeast	Main Rice	2.99	3.29
Central	Main Rice	1.20	1.60
South	Main Rice	-2.07	2.21
National	Main Maize	-3.83	4.65

The best rice model is for the North region (see Figures 3-12). Rice models for the Northeast and Central regions overestimate yield (positive bias) whereas the South model underestimates yield (negative bias). The Thai maize model has a large root mean square error due to the severe drought of 1979. The model results are graphically presented in Figure 3.20.

Bias in these models may be associated with shifts in technology during the test years. The weather variables in the models are not exhibiting any significant trend over time.

THAILAND: RICE AND MAIZE MODELS

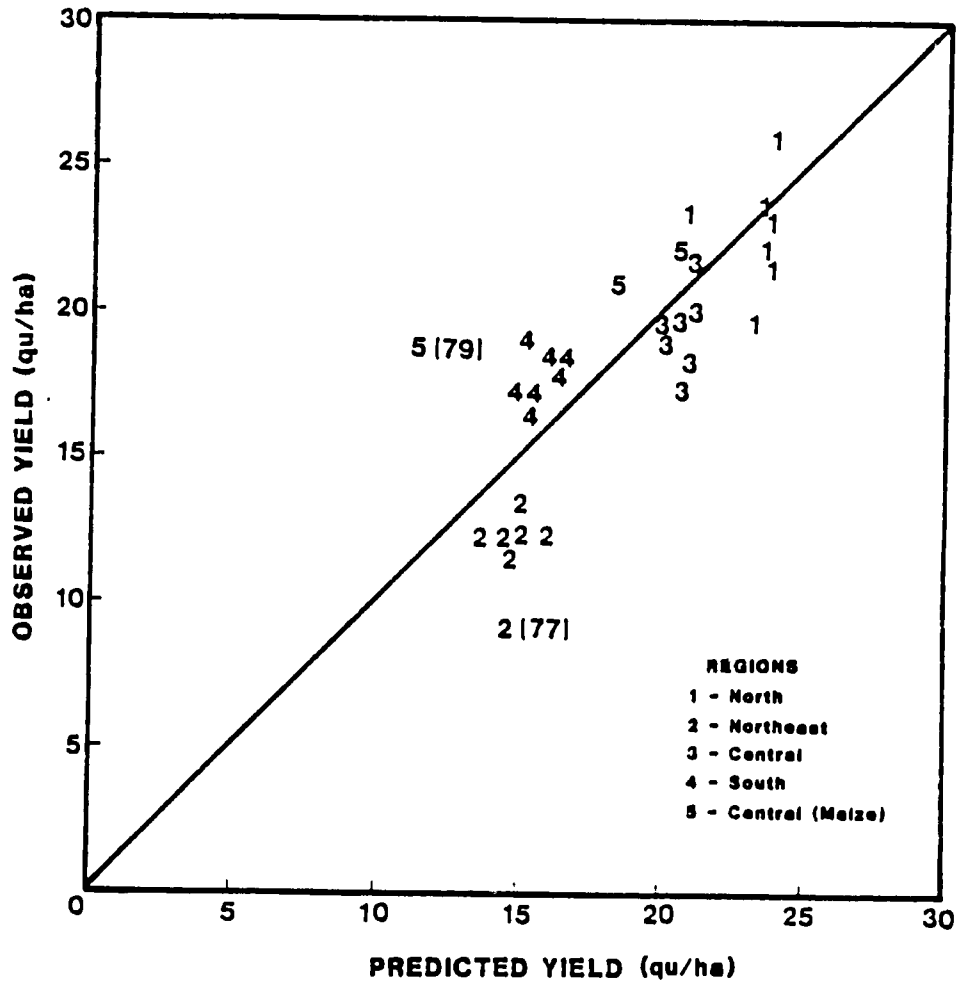


Fig. 3-20 Thailand: Main rice and main maize model independent tests.

C. Agroclimatic/Crop Condition Indices

The episodic event data base was used to calibrate the crop condition indices (GMI and YMI) for South and Southeast Asia. "Benchmark" criteria were established for proper interpretation of each regional index.

1. Generalized Monsoon Index (GMI)

The GMI can be used to assess rainfall conditions during the southwest or northeast monsoon seasons. Because rainfall during the monsoon is collected in storage tanks and reservoirs for irrigation during the subsequent dry season, the index also provides some guidance for secondary crops.

Recommended categories for assessing drought impact on crops using the GMI are shown in Table 3.8 and include: 1) moderate drought impact for index values in the 16-30th percentile range and 2) severe drought impact for index values in the 0-15th percentile range. Index values above the 30th percentile are indicative of good crop conditions. Categories have also been established for the index expressed as a percent of the normal. The percentage thresholds differ from country to country because of spatial variations in seasonal rainfall amount. Therefore, it is desirable to express the index in percentiles if adequate historic data are available.

2. Yield Moisture Index (YMI)

The YMI for rice, maize, wheat and sorghum was calibrated at the regional and national levels. The recommended "benchmark" categories for assessing the drought impact on crops using the YMI include: 1) moderate drought impact (16-30th percentile) and 2) severe drought impact (0-15th percentile). Categories differ from region to region, even for the same crop if the index

Table 3.8: Drought Categories for the Generalized Monsoon Index (Southwest and Northeast Monsoon Seasons)

COUNTRY	Generalized Monsoon Index Drought Impact			
	Moderate		Severe	
	Percentile Range	Percent of Normal	Percentile Range	Percent of Normal
Pakistan	16-30	61-70	0-15	≤ 60
Nepal	NA*	61-70	NA	≤ 60
Bangladesh	16-30	71-80	0-15	≤ 70
India	16-30	61-70	0-15	≤ 60
Sri Lanka	16-30	51-60	0-15	≤ 50
Burma	NA	61-70	NA	≤ 60
Thailand	16-30	71-80	0-15	≤ 70
Malaysia	16-30	71-80	0-15	≤ 70
Laos	NA	51-60	NA	≤ 50
Kampuchea	NA	71-80	NA	≤ 70
Vietnam	NA	71-80	NA	≤ 70
Indonesia	16-30	61-70	0-15	≤ 60
Philippines	NA	61-70	NA	≤ 60

*NA - Percentiles "not applicable" for this country.

is expressed as a percent of normal, which is necessary for countries for which sufficient historic meteorological data are not available. The YMI is calculated at the end of each crop stage and used in monthly crop condition assessments. Index values are compared with the "benchmark" values to assess climatic impact. Index values in the 0-15th percentile range indicate severe drought impact on crops.

The CEAS monthly crop condition assessments for the 1981-82 growing season were based on the "benchmark" criteria established from these calibration results. The 1981-82 drought in Bangladesh, Sri Lanka and Malaysia was successfully identified in CEAS crop condition assessments.

Chapter IV

Summary and Conclusions

The Early Warning Program proposed in the joint NOAA/EDIS/CEAS-UMC report, Agroclimatic Assessment Methods for Drought/Food Shortages in South and Southeast Asia (Steyaert, Achutuni and Todorov, 1981) has been successfully tested and evaluated. It is designed to provide decision makers with timely, reliable information on the potential for drought related food shortages in developing countries of South and Southeast Asia. Some of the major accomplishments during the Test and Evaluation phase of the project are presented below.

AID/OFDA and other users (US/AID Missions and U.S. Embassies in Southern Asia, United Nations/Food and Agriculture Organization - Rome, United Nations/Disaster Relief Organization and the U.S. Department of Agriculture) were provided with biweekly weather assessments and monthly assessments of climatic impact on subsistence food crops. AID/Food for Peace and AID/OFDA were provided with special assessments on the 1981-82 drought in Bangladesh, Sri Lanka and Malaysia.

The crop yield models for India and Thailand were independently tested and evaluated. Generally, these models can contribute useful information for assessing climatic impact. However, the time trend terms in the rice and maize models for Thailand must be re-specified to remove consistent bias.

The "benchmark" criteria established for assessing drought impact on crops using the Generalized Monsoon Index (GMI) and the Yield Moisture Index (YMI) are as follows: 1) moderate drought impact (16-30th percentile) and 2) severe drought impact (0-15th percentile). Index values above the 30th percentile

generally indicate favorable crop conditions. Below normal crop conditions are associated with index values in the moderate drought category. Index values in the severe drought category indicate crop failures and the potential for abnormal food shortages in countries where food security is marginal. The vulnerability to potential food shortages is significantly increased if drought impacts crops in two successive growing seasons.

The Early Warning Program for South and Southeast Asia was successfully implemented and tested during the 1981-82 growing season and will provide AID/OFDA with the following:

1) Cost-effective, timely and reliable early warning assessments of the potential for drought-related food shortages. The lead-time provided by the CEAS assessments is between 30-60 days prior to crop harvest. This may represent as much as a 3-6 month lead-time before food shortages occur in a particular country.
2) Biweekly weather assessments and monthly crop condition assessments for 107 agroclimatic regions.
3) Special assessments during the growing season for those countries that experience severe climatic impact.
4) A resource to base the transfer of climatic impact assessment technology to developing countries.

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APPENDIX A

SPECIAL REPORTS

- Bangladesh
- Malaysia
- Sri Lanka

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administratio
ENVIRONMENTAL DATA AND INFORMATION SERVICE
CENTER FOR ENVIRONMENTAL ASSESSMENT SERVIC
CIAD/Models Branch
Room 200 Federal Building, 600 E. Cherry
Columbia Missouri 65201

DATE: March 26, 1982

TO: Malcolm Reid OA/D242

FROM: Lou Steyaert OA/D241

THRU: Clarence Sakamoto OA/D241

SUBJECT: Climate Impact Assessment: Bangladesh Rice and Wheat, 1981/82 Season

This supplements the CEAS special assessment provided to AID/OFDA on February 8, 1982.

Bangladesh national rice production for the 1981/82 season is estimated at 10 percent below normal production (based on the average production for 1978, 1979 and 1980). This could represent an 18 percent reduction relative to the 1980 national rice production. The Boro rice and wheat crops are expected to be below normal.

Agroclimatic/crop condition indices and statistical climate/crop yield models indicate that drought damaged the Aus (September harvest) and Aman (December harvest) rice crops. National level rice indices, expressed in percentiles on a scale of 0 to 100, are at the 6th percentile for Aus rice and at the 12th percentile for Aman rice (Attachment 1). At the regional level, these indices suggest severe drought impact in the Coastal, Highlands and Northeast regions for Aus rice and Coastal and Highlands regions for Aman rice (Attachment 2). Agroclimatic indices for Aus rice are: 1) Coastal, 6th percentile 2) Northeast, 3rd percentile, 3) Northwest, 27th percentile, 4) West, 27th percentile, and 5) Highlands, 15th percentile. Regional indices for Aman rice are: 1) Coastal, 3rd percentile, 2) Northeast, 26th percentile, 3) Northwest, 79th percentile, 4) West, 33rd percentile, and 5) Highlands, 15th percentile. The Coastal and Highlands regions experienced drought conditions throughout the Southwest Monsoon season (attachment 3). Below normal rainfall throughout the country during June affected the Aus crop at the critical flowering stage and reduced preseason moisture for the transplanted Aman crop. Drought conditions throughout the country during October affected the Aman crop during the critical flowering period. In addition to the drought impact assessed by these models, there were reported yield reductions due to localized heavy rains and pest outbreaks during July. The December 10, 1981 cyclone probably resulted in additional losses to Aman rice in the southern two-thirds of the country.

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Yields for the Boro rice crop, grown primarily in the Northeast region (transplanted during October-January and harvested March-May), will probably range from "moderately below normal" to "normal" depending on local irrigation supplies. The Southwest Monsoon Index for total seasonal rainfall was essentially normal due to favorable rainfall during July-September (Attachment 3). However, October rainfall of only 31 mm (17 percent normal) had an adverse affect on boro rice grown in those locations where shallow tanks, ponds and streams are used for irrigation. Rainfall during the seasonally dry period of November-February (monthly normal rainfall of 10-30 mm) is usually not important to the crop because the monthly rice water requirement is 200-250 mm. March rainfall (normal 76 mm) and April rainfall (normal 192 mm) can still benefit the crop during the late stages of development.

Yields for the wheat crop, grown primarily in the West and Northwest regions (planted during October-November and harvested during February-March), will probably be slightly "below normal". The Southwest Monsoon was normal to above normal and provided water for irrigation except during October (10-15 percent normal rainfall). Above normal rainfall during February benefitted the wheat crop.

cc: Rao Achutuni
Paul Krumpe

Bangladesh: 1981/82

Agroclimatic/Rice Indices
and SW Monsoon Index

Attachment 1.a

Region	Monsoon Index June - September		Aus Rice Yield Index March - July		Aman Rice Yield Index July - November	
	Percentile	Percent Normal	Percentile	Percent Normal	Percentile	Percent Normal
Coastal	12	75	6	71	3	71
Highlands	18	71	15	66	15	73
Northeast	48	102	3	64	26	90
Northwest	87	119	27	79	79	106
West	50	98	27	91	33	89
National	40	91	6	73	12	84

Bangladesh

Monthly Rainfall as a Percentage of Normal
April, 1981-February, 1982

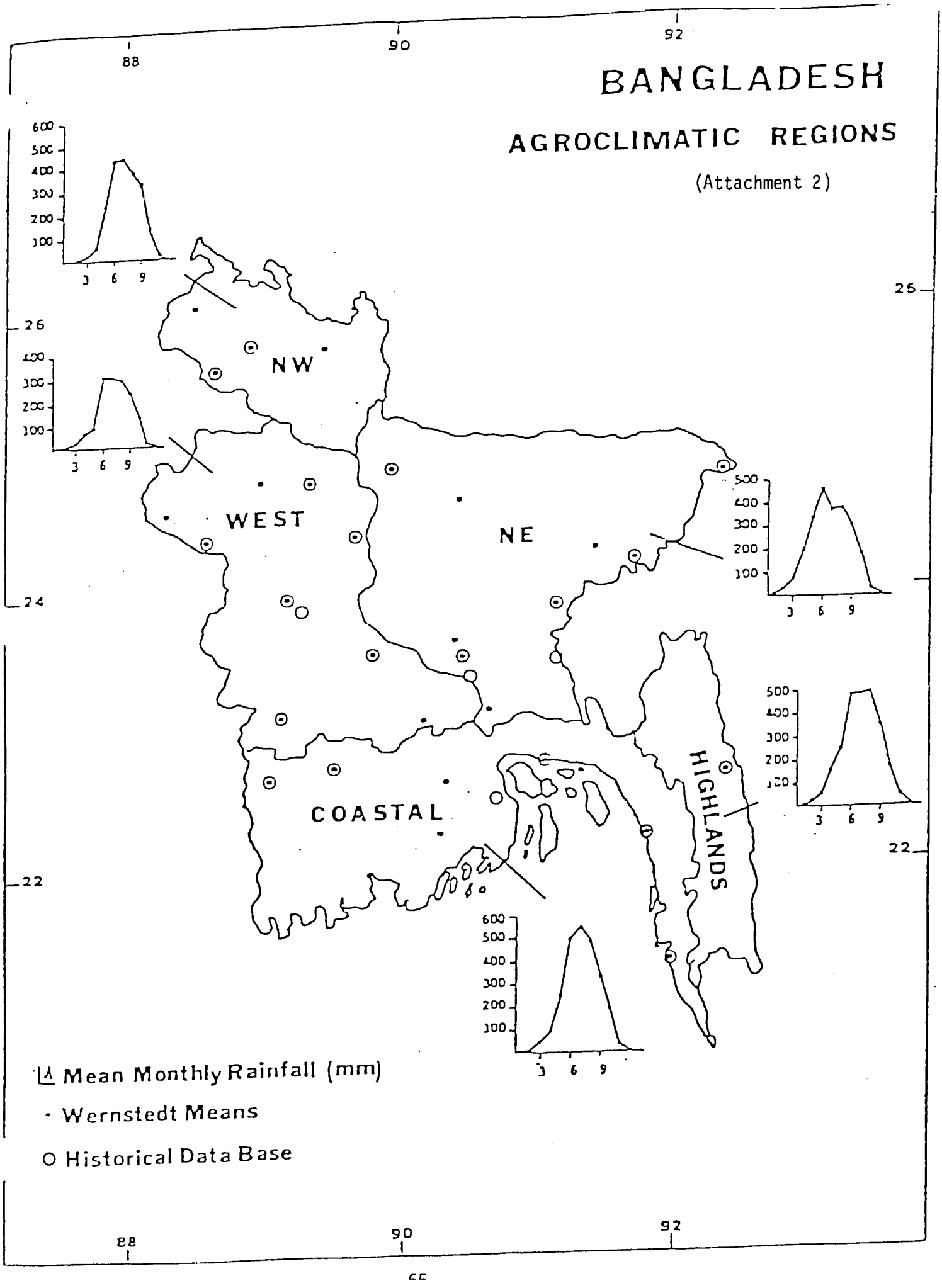
Attachment 3

Region	April	May	June	July	August	Sept	October	Nov.	Dec.	Jan.	Feb.
Coastal	202	75	36	73	81	88	19	9	1122	0	95
Highlands	93	72	37	83	72	86	23	130	309	0	20
Northeast	80	64	39	93	130	88	17	7	1850	0	20
Northwest	119	84	28	127	162	76	15	0	1750	0	240
West	153	98	50	115	100	110	11	16	3750	0	119

BANGLADESH

AGROCLIMATIC REGIONS

(Attachment 2)



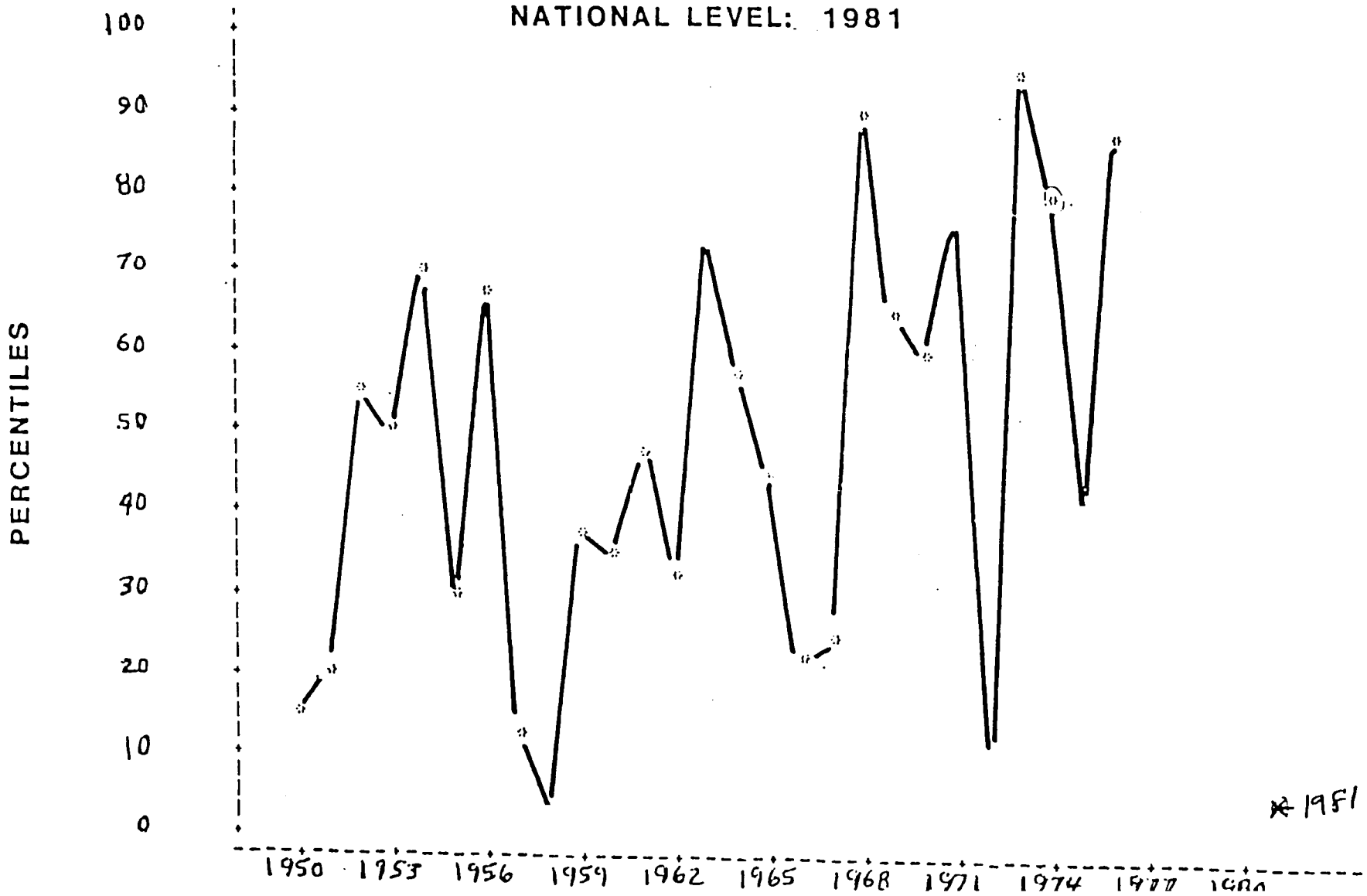
BANGLADESH

Attachment 1.b

AGROCLIMATIC/CROP INDEX

AUS RICE

NATIONAL LEVEL: 1981



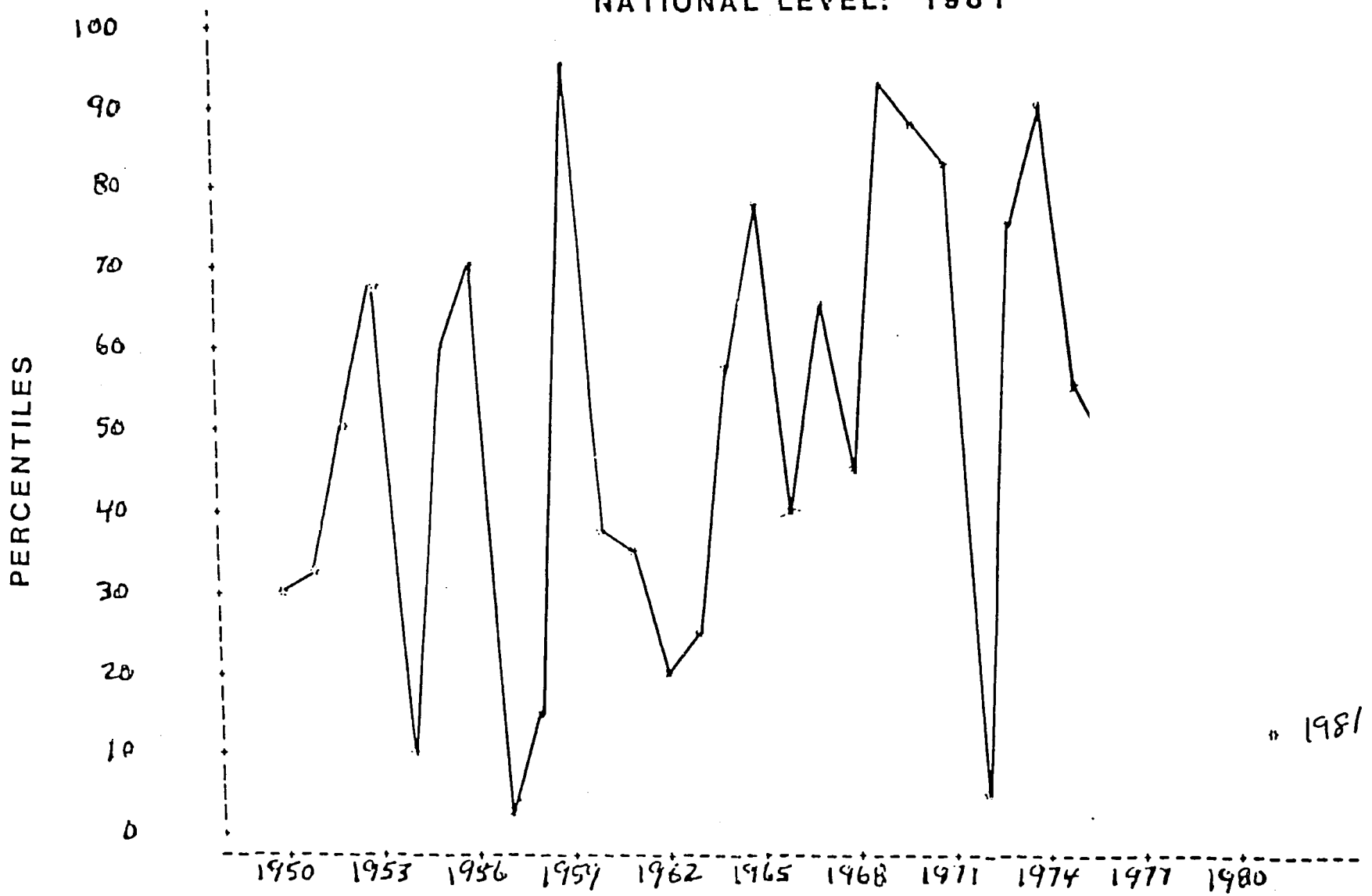
BANGLADESH

Attachment 1.c

AGROCLIMATIC/CROP INDEX

AMAN RICE

NATIONAL LEVEL: 1981



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National Oceanic and Atmospheric Administr
ENVIRONMENTAL DATA AND INFORMATION SER
CENTER FOR ENVIRONMENTAL ASSESSMENT SE
CIAD/Models Branch
Room 200 Federal Building, 600 E. Cherry
Columbia Missouri 65201

DATE: March 16, 1982

TO: Russell Ambroziak OA/D24

FROM: Lou Steyaert OA/D241

SUBJECT: Sri Lanka Drought Impact, 1979-1981

Attachment 1 contains relevant quotes from NOAA/DOC cables and crop condition assessments used in these cables. Attachment 2 is a brief summary of FAO reports. These should be used in conjunction with our latest assessment forwarded to CAB on March 11.

Crop index summary in percentiles for 1981 as follows:

Region	SW Monsoon Index	Yala Rice Index	NE Monsoon Index	Maha Rice Index
Dry zone	66	83	3	7
Wet zone	16	6	3	3
Hills	11	8	4	4

The early warning system worked well, especially during the past four months. CEAS assessments in January, 1982 probably led everyone else. Available water in reserviors is the key factor in early season assessment. The NOAA 7 data will help us in this area.

cc: Paul Krumpe
Clarence Sakamoto
Rao Achutuni

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Attachment 1

Sri Lanka: 1981/1982
Excerpts from NOAA/EDIS/CEAS
Early Warning Assessments

June 4, 1981: NOAA Cable

Preparations for planting of rice in parts of Sri Lanka and Burma will be expedited by the timely arrival of the summer monsoon this period, as the rains will boost soil moisture levels in most areas. Satellite imagery, synoptic reports and upper-level winds suggest that the monsoon began on schedule around May 30-31 in western sections of Sri Lanka and southern Burma. Rainfall amounts topping 160 mm were observed during the second week in the Wet Zone of Sri Lanka. However, significantly more moisture is needed across much of Sri Lanka especially the Hills region, to boost final planting and initial development of the secondary yala rice crop.

Wet Zone	Wet	
Hills	Dry	Drought 40-60% 26 wks.

July 2, 1981: NOAA Cable

Prospects for normal sowing of the "yala" rice crop remain mixed over parts of Sri Lanka, despite pre-monsoonal rains of early May. Conditions are most unfavorable in the inland Hills district, where moderate-to-severe drought has persisted for over six months. Substantial moisture is needed in most areas to promote the final planting of the rice crop, currently projected at 510,000 tons, versus a previous goal of 720,000 tons (FAO, June, 1981).

July 16, 1981: NOAA Cable

Hills	Dry	Drought 25-45% 32 wks.

July 31, 1981: NOAA Cable

Development of Sri Lanka's secondary yala rice crop may be threatened by the return of drought conditions to the Wet Zone region, where rainfall has been occurring at less than one-third of the long-term average for the preceding two months. Elsewhere, long-term drought persists in the Hills district, which has experienced 34 weeks of deficient moisture.

Wet Zone	Dry	Drought 20-40% 8 wks.

August 11, 1981: Crop Condition Assessment

Below normal rainfall conditions in the range of 50-70 percent of normal for the period May-July, 1981, probably had an adverse affect on early season crops such as rice . . . in Sri Lanka. These rainfall conditions may have also affected planting and transplanting of the main rice crop. Timely rainfall during August and September is essential to the final outcome of the main season crops planted at the beginning of the southwest monsoon season.

August 14, 1981: NOAA Cable

The outlook remains poor for late summer harvesting of Sri Lanka's yala rice crop. Moderate to severe drought continues to plague the Hills district and to worsen in the Wet Zone. Cumulative precipitation since last December has been only 20 to 40 percent of the long term average.

Wet Zone	Dry	Drought 20-40% 10 wks.

August 24, 1981: NOAA Cable

The outlook for September's harvest of "yala", the secondary rice crop in the central Sri Lanka Hills district, grows bleak. The district's drought has worsened because precipitation amounts have been less than one-third of normal.

Hills	Dry	Drought 20-40% 38 wks.

September 15, 1981: Crop Condition Assessment

The yala (secondary) rice crop is being adversely affected by a severe drought in the regions of the Hills and Wet Zone.

September 16, 1981: NOAA Cable

Moisture reserves were likely replenished across much of Sri Lanka, which received the first significant rains since mid-May. However, the major rice producing area of Wet Zone which has been plagued by recurrent drought since last December, will not benefit substantially from the precipitation due to the upcoming harvest later this month.

September 24, 1981: NOAA Cable

Drought conditions have likely been eradicated over most of Sri Lanka, due to several weeks of moderate-to-heavy rains that ranged from 100 to 200 mm. However, the moisture has arrived too late to benefit the "yala" secondary rice crop, which is normally harvested in late September or early October.

November 2, 1981: Crop Condition Assessment

Weather analysis and agroclimatic/crop condition indices suggest at least moderate drought impact to crops in some regions of South and Southeast Asia. The southeast monsoon was erratic during the 1981 season. There were alternating wet and dry spells, particularly late in the season and associated with an early retreat of the monsoon during September. The monsoon index for drought affected regions is typically 30-40 percent below normal (June - September period). Agroclimatic/crop condition indices also in the same range reflect the adverse impact of below normal precipitation during August and September. Drought affected crops and regions in South Asia include, yala rice in Sri Lanka (Wet and Hills).

November 19, 1981: NOAA Cable

...Torrential rains occurred, ... over western Sri Lanka on November 9-10th. Hardest hit was the capital city of Colombo, which received approximately 200 mm in a 24 hour period. Conditions were slowly returing to normal as drier weather replaced the tropical disturbance towards the end of the week.

Wet Zone	Floods			
Hills	Dry	Drought	24-45%	52 wks.

December 3, 1981: NOAA Cable

Development of the "maha" main rice crop may be slowed in parts of Sri Lanka this fall and winter due to erratic rains since this summer. A steady northeast monsoon is crucial for a good "maha" crops, which generally constitutes 65 percent of annual rice production. The Hills regions has been vulnerable to crop shortfalls during much of 1981 due to recurrent drought. Rainfall has amounted to 30-40 percent of the long-term mean since January.

December 8, 1981: Crop Condition Assessment

Rainfall during the current northeast monsoon season is normal to above normal over most of the Southern Asia regions. However, cumulative rainfall has been deficient in parts of... Sri Lanka. The prolonged drought indicated by the 15 to 20th percentile for the crop condition indices in Sri Lanka is impacting the maha (main) rice crop.

January 21, 1982: NOAA Cable

Development of the principal "maha" rice crop likely remains hampered over the northern two thirds of Sri Lanka due to the recent return of moderate-to-severe drought. The Dry Zone and Hills regions have been experiencing approximately 25 percent of normal moisture since early November, 1981. In the latter region drought appears to have become re-established. This pattern is similar to early 1981, when the northeast monsoon also withdrew prematurely. A successful spring harvest of the crop is contingent on a normal monsoon during the growing season.

Hills	Dry	Drought 20-30% 11 wks.

January 21, 1982: Crop Condition Assessment

The maha (main) rice crop in Sri Lanka, transplanted during October - November of 1981 and to be harvested in March - May, was adversely affected by below normal rainfall during the northeast monsoon season. Agroclimatic crop indices, on a scale from 0 to 100 percentile range, are in the 5 - 10 percentile range. Historically, such low index values have been associated with crop failures.

January 29, 1982: NOAA Cable

Growth of the principal "maha" rice crop has been further threatened by the continuation and expansion of drought conditions across Sri Lanka. Moderate-to-severe drought presently encompasses the entire island, which has experienced below-average rainfall since last November. On a percentile scale ranging from 0-100, agro-climatic crop indices are in the 5-10 range. Historically, such low index values have been correlated with major crop failures during the current season. Prospects for a good harvest this spring are poor, unless substantial rains materialize by February.

Entire Area	Dry	Drought 20-30% 10 wks.

February 11, 1982: NOAA Cable

The flowering stage of Sri Lanka's primary "maha" rice crop has likely been hampered by a long-term moderate-to-severe drought which continues to grip the island. Although the upcoming harvest of the crop has probably started early, prospects for a successful yield this spring remains poor.

Entire Area	Dry	Drought 20-30% 12 wks.

February 23, 1982: Crop Condition Assessment

Continued dry conditions during the northeast monsoon period has adversely affected the maha (main) rice crop which is normally transplanted during October-November and harvested in March-May. Agroclimatic indices (expressed in percentiles on a scale from 0 to 100) are below the 10th percentile. These values have been historically associated with crop failure.

Attachment 2

FAO REPORTS:
A Brief Summary

Date	Comment
4 May/79	16% 78/79 maha crop drought affected. Rice situation good due to excellent crops in past two years.
20-27 Apr/79	Maha crop prospects good. Record maha crop harvested.
15 Jun/79	Pre monsoon and first 14 days June rainfall very deficient.
29 July/79	Yala rice impacted due to deficient and erratic rainfall.
.....missing reports	
24 Dec/80	Yala crop at 290,000 tons against 383,000 tons in 1978 due to 1979 drought.
24 Jan/80	Maha crop (79/80) benefitting from good rains Nov-Jan.
23 Feb/80	Prospects for maha crop (79/80) remain satisfactory.
Note:	Drought statement comes out of nowhere. Also, yala production levels adjusted.
21 Mar/80	Current drought has not affected 79/80 maha crop-forecast at 980,000 tons against 934,000 tons 78/79. Recent yala crop production 299,000 tons for 1979 against 410,000 tons in 1978. DESPITE DROUGHT, IRRIGATION RESERVIORS IN MAIN PADDY AREA ARE FULL AND AVAIALBLE FOR 1980 YALA CROP.

Note:	NOAA 7 data should be used to assess water in reserviors and crop conditions below the reserviors.
28 May/80	Severe drought impact on main export crops including tea, rubber and coconuts. Yala rice plantings affected. Reserviors feeding hydroelectric power grid almost dried up. Yala plantings dependent on SW monsoon rainfall. Although good maha crop reported - procurement by marketing board are 50% lower than last year. Lower export earnings will limit government capacity to import food grains in 1981.
26 Jun/80	Rains started. Weeds a problem in paddy fields. Yala conditions normal.
24 Jul/80	Although partial failure of SW monsoon, yala plantings not affected.
19 Aug/80	Sporadic brown hopper reports. Despite partial failure SW monsoon, yala plantings not affected.
5 Sep/80	August 80 rainfall well below normal. Yala crop not affected.
5 Sep/80	Report in Nov/80. August rains significantly below normal. Yala crop not seriously affected.
17 Dec/80	Sep/80 rains normal in 14 of 22 stations. 1980 rice at 1.39 mmt (418,000 tons yala) against 1.23 mmt in 1979.

7 Jan/81	Drought has affected 80/81 maha crop in North and Eastern areas. Rains good in other areas.
7 Apr/81	Prospects for 80/81 maha crop uncertain . . . large imports of good grains required in 1981.
Note:	If our system was totally in operation, we should have reported this. However, we were still in the development stage.
11 May/81	Drought affected 80/81 maha crop in 5 northern districts - yields higher than expected in other areas. Good rains during early May.
1 Jun/81	Same as above on Maha - 1.5 mmt maha production, same as last year. Irrigation reserviors are almost dry. Good pre-monsoon rains during early May. EMERGENCY FOOD ASSISTANCE (FAO) consisting of 6,700 tons wh[illegible] for drought areas.
14 Jun/81	Heavy rains in May.
30 Jun/81	June rainfall below normal in most regions. Substantial rains needed in most areas for yala crop.
9 Aug/81	Severe drought persisting in Southern and Western districts could lead to reduced yala crop.
30 Sep/81	Moderate to heavy rains late August and September relieved drought but too late to benefit yala rice crop. Yala production forecasted at 390,000 tons against 356,000 tons in 1980.

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ENVIRONMENTAL DATA AND INFORMATION SERVICE
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CIAD/Models Branch
Room 200 Federal Building, 600 E. Cherry
Columbia Missouri 65201

DATE: April 15, 1982

TO: Malcolm Reid OA/D242
Attn: Mike Chusmir

FROM: Lou Steyaert OA/D241

THRU: Clarence Sakamoto OA/D241

SUBJECT: Malaysia 1981/82 Rice Season: Climatic Impact Assessment

The 1981/82 Malaysian rice crop will probably be about 15-20 percent below normal. Severe drought in Peninsular Malaysia during the 1981 Southwest Monsoon period (Apr-Jul) and 1981/82 Northeast Monsoon period (Oct-Feb) impacted rice crops including "off-season" rice (Aug/81 harvest and 24% all rice), dry "Upland" rice (Feb/82 harvest and 1% all rice) and "Main season" rice (Mar/82 harvest and 75% all rice). Statistical climate/rice yield models indicate 20 percent reductions in the main rice crop for the key states of Kedah, Kelantan and Trengganu (Table 1 and Figure 1). Drought conditions during March-July 1981 impacted rice grown in Perlis, Kedah, Pinang and to a lesser degree other states along the west coast. Irrigation supplies in these states are highly dependent on preseason rainfall (Mar-Jul) before transplanting. In contrast, rice grown in east coastal states, particularly Kelantan and Trengganu, was impacted by drought during the flowering/reproductive rice stage in the period Dec/81-Feb/82. Table 1 shows the critical months for which rainfall data are used in the rice forecast models.

The SW and NE Monsoon rainfall indices, expressed in both percentiles (scale ranging from 0 to 100 percentiles) and as a percent of normal, are provided in Table 2 for each CEAS agroclimatic/weather assessment region (Figure 2) for Malaysia. The SW Monsoon was well below normal throughout Malaysia while the NE monsoon performed well except in the East Coast, West Sarawak and North Sarawak agroclimatic regions.

The regional severity of the drought during 1981 can also be seen in the Palmer Drought Index (PDI) analysis for each agroclimatic region (Figure 3). Table 3 shows the regional duration of drought (in months) for moderate, severe and extreme drought classifications. The PDI was run on data for 1950-1975 plus 1981 and indicates that 1981 was one of the worst drought years since 1950. The monthly rainfall data used in this assessment are provided in Table 4. Attachment 1 contains the PDI plots by region for all years and agroclimatic background information on Malaysia.

The statistical models, monsoon indices and PDI are currently being tested and evaluated as part of a NOAA/AID PASA which includes similar climate impact analysis and models for all of Southern Asia. The Early Warning System is scheduled to be fully operational by July 1, 1982. This climate impact assessment was prepared with assistance of Dr. Rao Achutuni, Project Leader, Southern Asia.

cc: Russ Ambroziak
Paul Krumpe
Rao Achutuni

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Table 1

Malaysia: Main Rice Yield Model Forecasts

1981-1982 Season

State	Critical Months for Main Rice	Model Forecasted Yield as Percent of Normal
Johor	August - September	84
Kedah	March - July	78
Kelantan	December - March	80
Malacca	June - September	94
N. Sembilan	Jan - December	89
Pahang	September - January	105
Perak	May - September	73
Perlis	June - July	87
Pinang	April - June, Aug - Jan	94
Selangor	July - Sept, Nov - Jan	79
Trengganu	December - March	80

Figure 1

WEST MALAYSIA

1981-82 MAIN RICE MODEL YIELDS BY STATE

(AS PERCENT OF NORMAL YIELD)

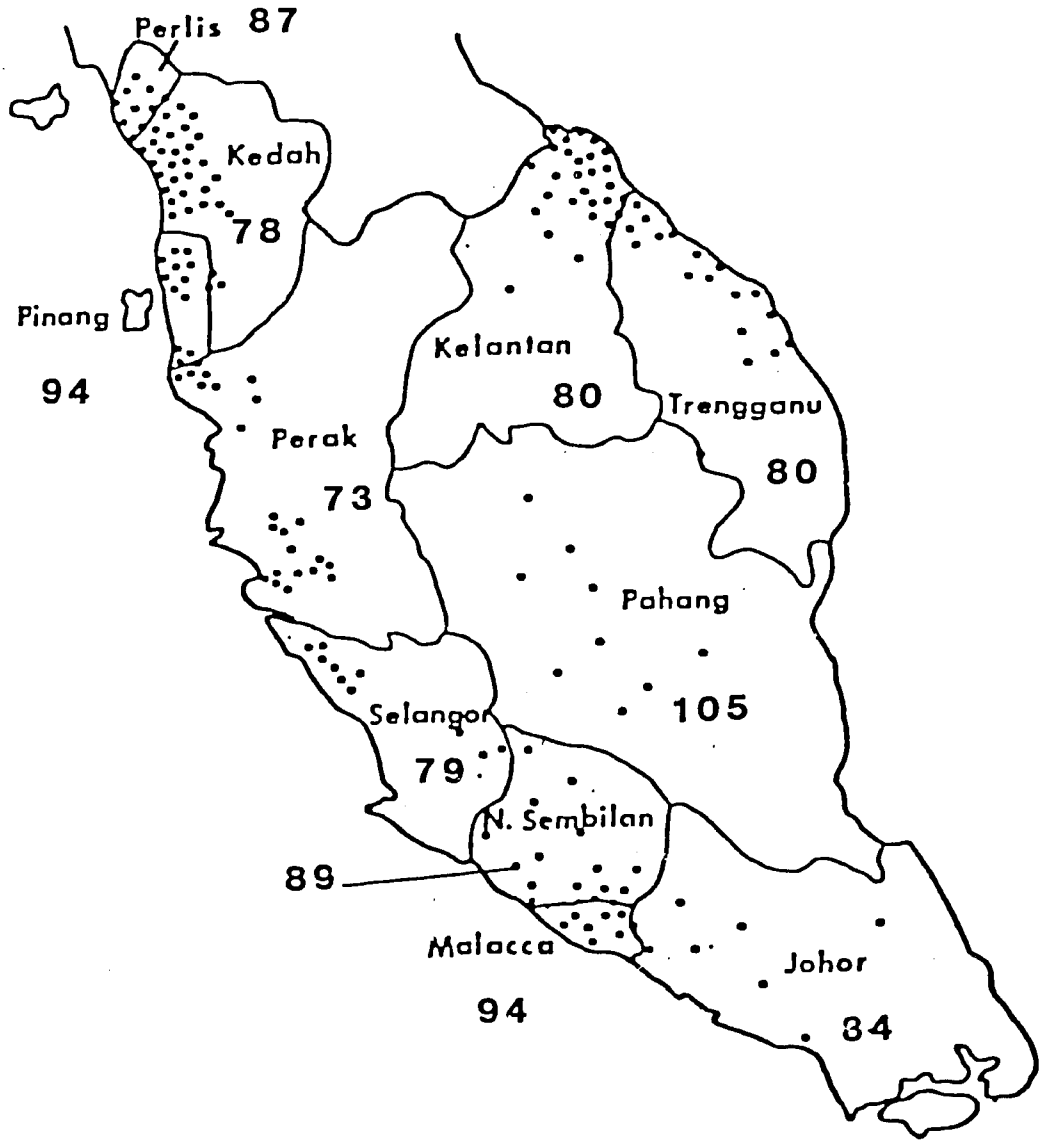


Table 2

Malaysia: Southwest and Northeast Monsoon Indices

1981/82 Season

Region	S.W. Monsoon Index (1981)			N.E. Monsoon Index (1981/82)		
	Months	Percentile	Percent Normal	Months	Percentile	Percent Normal
Northwest	Mar-Jun	7	68	Sep-Dec	85	108
Central	Mar-Jun	3	55	Sep-Dec	96	112
East Coast	Mar-Jun	10	65	Oct-Jan	14	80
Southeast	Mar-Jun	3	63	Sep-Dec	60	89
W. Sarawak	Mar-Jun	28	91	Oct-Jan	10	80
N. Sarawak	Mar-Jun	21	88	Sep-Dec	32	99
W. Sabah	Mar-Jun	3	43	Sep-Dec	64	91
E. Sabah	Mar-Jun	3	63	Sep-Dec	71	127
Hills	Mar-Jun	8	80	Sep-Dec	80	115

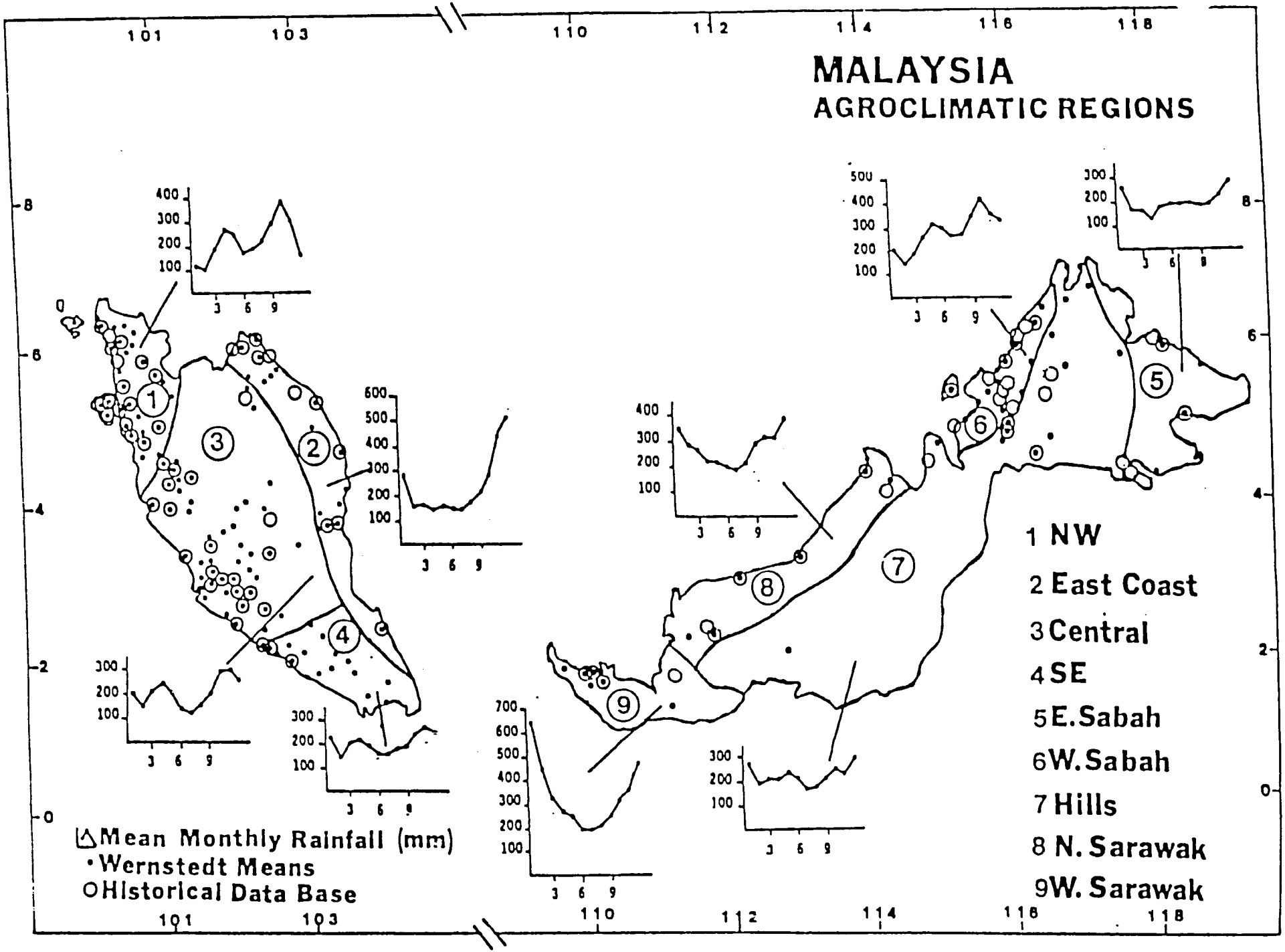

MALAYSIA
AGROCLIMATIC REGIONS
1 NW
2 East Coast
3 Central
4 SE
5 E.Sabah
6 W.Sabah
7 Hills
8 N. Sarawak
9 W. Sarawak
Mean Monthly Rainfall (mm)
• Wernstedt Means
O Historical Data Base

Figure 2

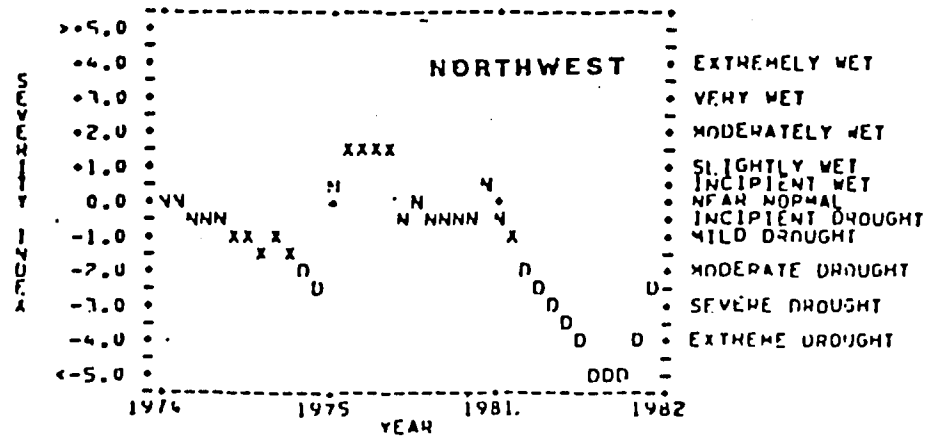
Table 3

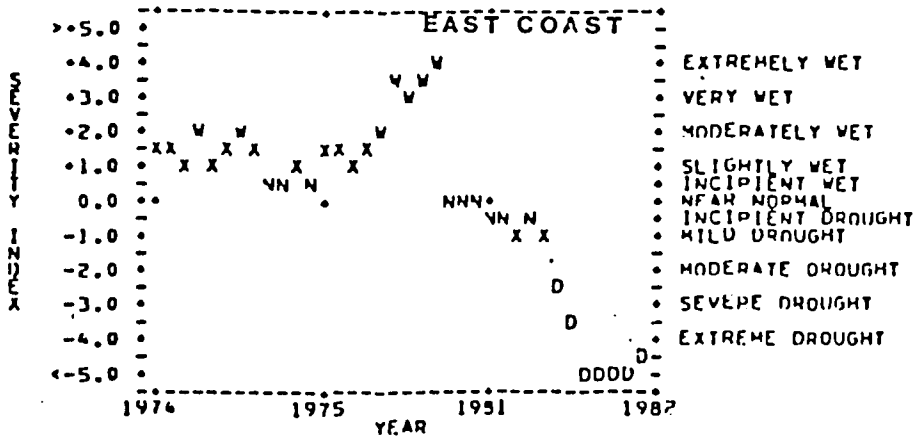
Malaysia: 1981 Palmer Drought Index Analysis

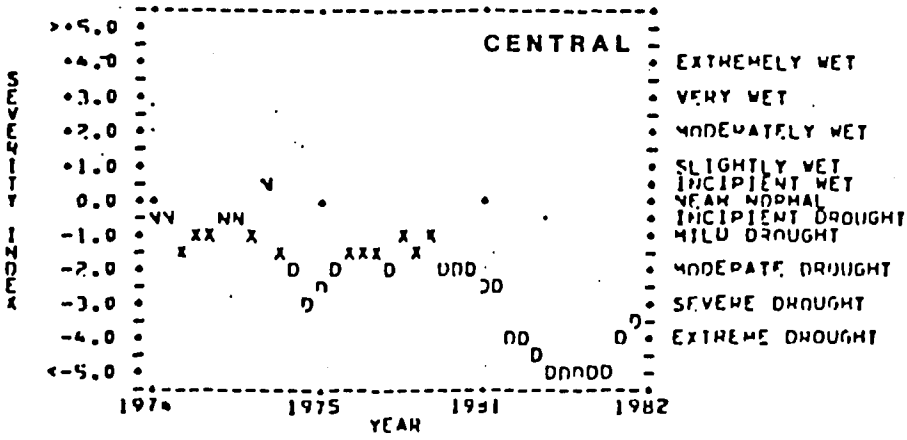
Region	Moderate Drought		Severe Drought		Extreme Drought	
	Period	# of Months	Period	# of Months	Period	# of Months
Northwest	Mar-Dec	10	May-Nov	7	Jul-Nov	5
Central	Jan-Dec	12	Mar-Dec	10	Mar-Nov	9
East Coast	Jun-Dec	7	Jul-Dec	6	Aug-Dec	5
Southeast	Jan-Dec	12	May-Dec	8	Apr-Sep	6
W. Sarawak	–	–	–	–	–	–
N. Sarawak	–	–	–	–	–	–
W. Sabah	May-Dec	8	–	–	–	–
E. Sabah	Mar-Oct	8	–	–	–	–

Figure 3

MALAYSIA: REGIONAL PALMER DROUGHT INDEX 1981







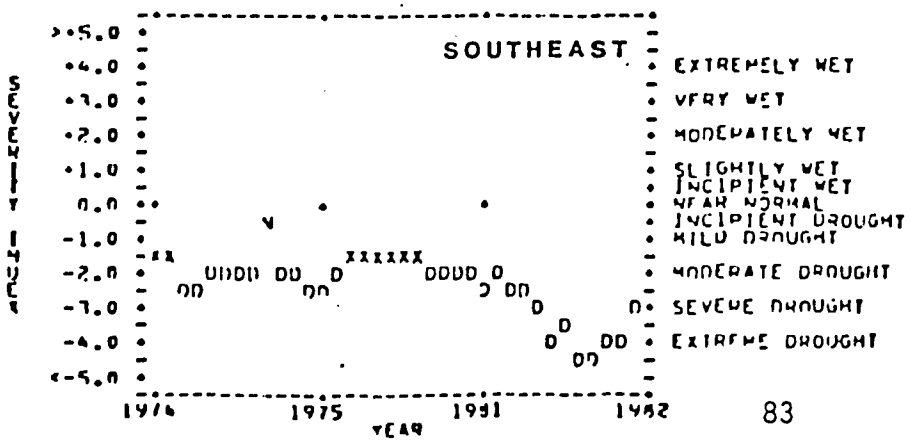
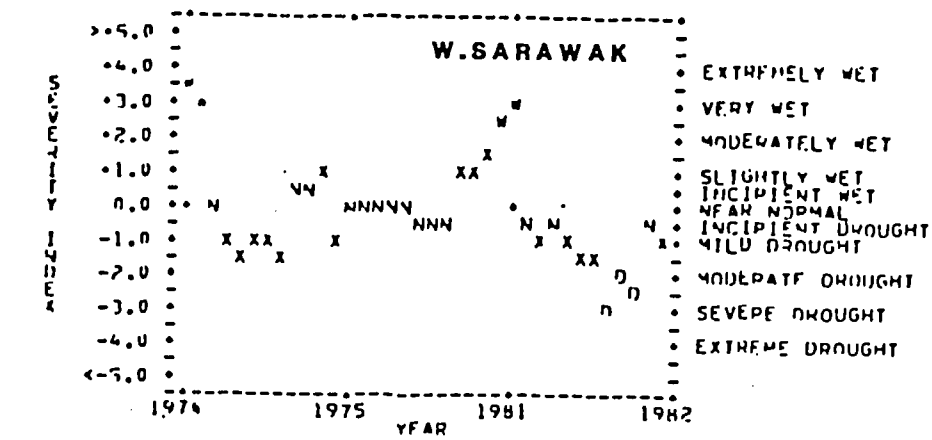


Figure 3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+1.0
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1974
1975
1981
1982
YEAR
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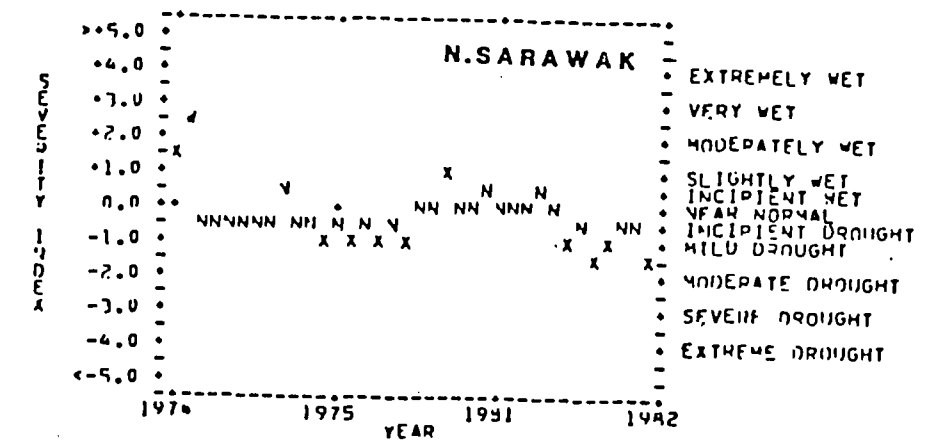
VERY WET
MODERATELY WET
SLIGHTLY WET
INCIPIENT WET
NEAR NORMAL
INCIPIENT DROUGHT
MILD DROUGHT
MODERATE DROUGHT
SEVERE DROUGHT
EXTREME DROUGHT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SEVERITY INDEX
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1974
1975
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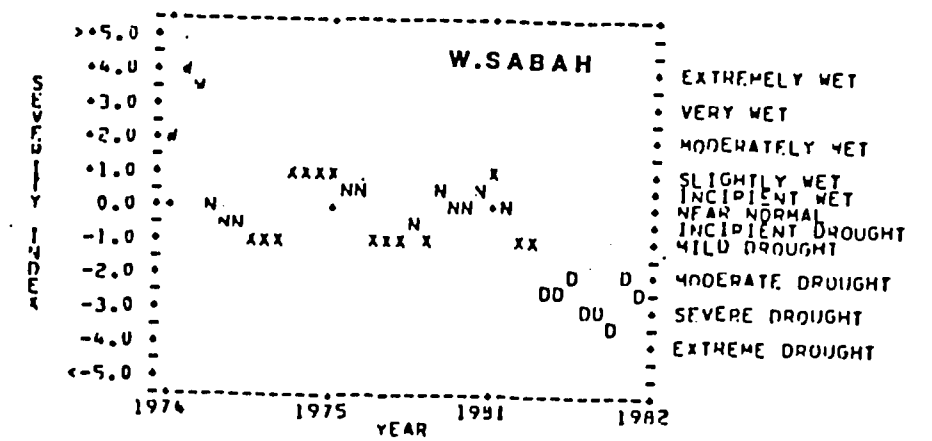
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SEVERITY INDEX
>+5.0
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1974
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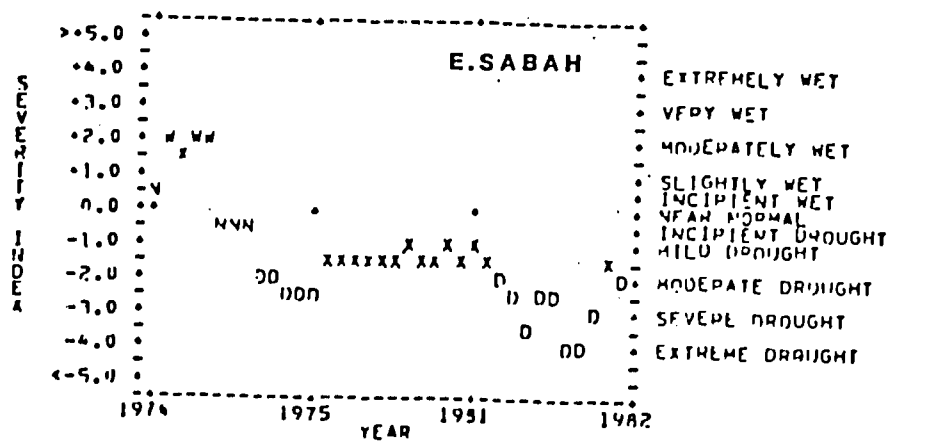
E.SABAH
SEVERITY INDEX
>+5.0
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1974
1975
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YEAR
EXTREMELY WET
VERY WET
MODERATELY WET
SLIGHTLY WET
INCIPIENT WET
NEAR NORMAL
INCIPIENT DROUGHT
MILD DROUGHT
MODERATE DROUGHT
SEVERE DROUGHT
EXTREME DROUGHT

Table 4

Malaysia: Monthly Rainfall

March 1981 - March 1982

Region	Monthly Rainfall as a Percentage of the Normal												
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Northwest	18	58	79	74	54	30	75	65	118	149	9	18	52
Central	19	72	70	25	87	43	102	94	128	88	20	43	88
East Coast	21	97	84	32	76	50	83	85	100	94	12	22	54
Southeast	29	80	81	30	107	37	83	101	77	112	26	41	73
W. Sarawak	81	122	95	71	104	13	134	82	130	88	54	60	80
N. Sarawak	75	135	99	49	141	29	117	102	118	60	102	58	63
W. Sabah	24	81	26	68	103	33	74	52	135	31	49	98	16
E. Sabah	51	42	39	121	85	42	120	130	165	68	106	144	18
Hills	82	106	76	72	151	39	114	99	141	80	81	112	72

APPENDIX B

Monthly Crop Condition Assessments for South and Southeast Asia

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ROOM 200 FEDERAL BLDG 600 E CHERRY
COLUMBIA, MISSOURI 65201

DATE: July 2, 1981

TO: Malcolm Reid, OA/D242

FROM: Clarence Sakamoto, OA/D241

SUBJECT: Early Warning Crop Condition Assessments for Sub-Saharan Africa and Southern Asia: June 1981

Sub-Saharan Africa

Sowing of grain crops normally planted in June was probably delayed in some areas due to low rainfall which was quite unevenly distributed throughout the entire region. Rainfall amounts were in the 10-20 percentile range for regions in north and eastern Sengal, southwest Mali, and central Niger. Station/percentile values include: Boutilimit 15, Podor/3, Matam/6, Tambacounda/6, Kedongan/15, Kiffa/7, Kayes/18, Bamako/15, San/6, Gaoua/9, Tillabery/5, Maradi/20.

Southern Asia

Planting and transplanting of rice in South Asia was hampered due to below normal June rainfall which was only about 30 percent of normal. However, it is much too early in the season to assess crop conditions.

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CENTER FOR ENVIRONMENTAL ASSESSMENT SERV
CIAD/Models Branch
Room 200 Federal Building, 600 E Cherry
Columbia Missouri 65201

DATE: August 11, 1981

TO: Malcolm Reid OA/D242

FROM: Clarence Sakamoto OA/D241

SUBJECT: Early Warning Crop Condition Assessment for Sub-Saharan Africa and Southern Asia: July 1981.

Sub-Saharan Africa

Crop condition indices based on June and July meteorological data suggest normal to above normal crops throughout Sub-Saharan Africa except for isolated locations in southern Senegal and southern ~~Mali.~~ These isolated Station/percentile ranks include: Diourbel/12, Yundum/6, and Tambacounda/12 in Senegal; Boromo/3 and Bobodioulasso/6 in Mali. Propects for the 1981 growing season can be more reliably assessed at the end of August.

Southern Asia

Below normal rainfall conditions in the range of 50-70 percent of normal for the period May-July, 1981, probably had an adverse affect on early season crops such as upland rice and maize in Mindoro, Western Visayas and Western/Eastern Mindanao in the Philippines; Southern Plateau and Mekong Delta in Vietnam; Vietiane in Laos; Northwest, Central, East Wet and Hill regions in Sri Lanka; all of Nepal except Western Terai; and Northeast and Coastal regions of Bangladesh. These rainfall conditions may have also affected planting and transplanting of the main rice crop. Timely rainfall during August and September is essential to the final outcome of those main season crops planted at the beginning of the Southwest Monsoon season.

cc: Lou Steyaert

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CIAD/Models Branch
Room 200 Federal Building, 600 E. Cherry
Columbia, Missouri 65201

DATE: September 15, 1981

TO: Malcolm Reid OA/D242

FROM: Clarence Sakamoto OA/D241

SUBJECT: Early Warning Crop Condition Assessments for Southern Asia: June - August 1981

The generalized Monsoon/crop condition index based on June through August rainfall suggests drought affected crops in both South and Southeast Asia. Crop index values for primary growing season crops are in the below normal range for regions of Bangladesh, Nepal, Burma, Sri Lanka, Malaysia, Laos, Vietnam and the Philippines. Similar values exist for secondary season crops in Indonesia. Regional crop conditions in each country include:

Bangladesh

Drought affected the kharif maize crop in the Highlands and Northeast regions as well as the aus and broadcast aman rice in the Coastal Highlands and Northeast regions.

Burma

Drought probably affected the main rice crop, now in the early vegetative stage, in the states of Arakan, Chin, Kachin, Karen and Pegu.

India

Possibly mild drought conditions exist in East Rajasthan, East Uttar Pradesh ~~and Sub-Himalayan West Bengal~~. Conditions are generally good throughout the country except where flood damage occurred.

Nepal

Drought conditions in the Western Hills are possibly affecting the main maize crop. The main rice crop is also being affected by unfavorable conditions in the Terai regions.

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Sri Lanka

The Yala (secondary) rice crop is being adversely affected by a severe drought in the regions of the Hills and Wet Zone.

Malaysia

Planting of the main rice crop is likely to be delayed due to drought conditions in seven out of the eight regions.

Laos

Crop conditions in South Laos and Vientiane are extremely unfavorable. The main rice crop is likely to be adversely affected.

Vietnam

Severe drought conditions in the Mekong Delta and the South Plateaus regions may have delayed planting of rice.

Philippines

The main maize and rice crops are likely to have been affected by severe drought conditions in South Luzon, East Mindanao, Palawan, East and West Visayas.

Indonesia

Severe drought conditions over most of Indonesia, except in Java and Irian Jaya, are likely to adversely affect the secondary rice crop.

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CENTER FOR ENVIRONMENTAL ASSESSMENT SERVIC
CIAD/Models Branch
Room 200 Federal Building, 600 E. Cherry
Columbia, Missouri 65201

DATE: November 2, 1981

TO: Malcolm Reid, OA/D242

FROM: Clarence Sakamoto OA/D241

SUBJECT: Early Warning Crop Condition Assessments for Southern Asia: June - September 1981

Weather analysis and agroclimatic/crop condition indices suggest at least moderate drought impact to crops in some regions of South and Southeast Asia. The Southwest Monsoon was erratic during the 1981 season. There were alternating wet and dry spells particularly late in the season and associated with an early retreat of the monsoon during September. The monsoon index for drought affected regions is typically 30-40 percent below normal (June - September period). Agroclimatic/crop condition indices also in this range reflect the adverse impact of below normal precipitation during August and September. Drought affected crops and regions in South Asia include autumn rice in Northern India (Himachal Pradesh, Haryana, Punjab, West Uttar Pradesh, Rajasthan, Madhya Pradesh, Jammu and Kashmir) and yala rice in Sri Lanka (Wet and Hills). There is also the possibility of drought impact on both aus and aman rice plus maize in Bangladesh (Coastal and Highlands), main rice in Nepal (Terai) and main rice in Burma (Arakan and Kachin). Drought affected crops and regions in Southeast Asia include the main rice crop in Cambodia (Central and Southwest), Laos (Vientiane and South), Vietnam (Mekong Delta and South Plateau), and the Philippines (Mindanao and Visayas). The main rice crop in the Northwest and Central regions of Malaysia probably suffered due to dry conditions. Drought affected regions in Indonesia include Irian Jaya, Maluku, Sulawesi, and Sumatra.

Note: NOAA/CEAS recently began test and evaluation of developed agroclimatic/crop condition assessment models for southern Asia. AID Mission evaluation and comments on the 1981 Southwest Monsoon/Crop Season would be appreciated. NOAA/CEAS will use these field reports to verify and upgrade existing procedures for early warning of climate impact on agriculture/food security, e.g., to enhance weather analysis and quantification of indices.

cc: L. Steyaert
P. Krumpe
R. Achutuni

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Room 200 Federal Building, 600 E. Cherry
Columbia, Missouri 65201

DATE: ~~November~~ December 8, 1981

TO: Malcolm Reid OA/D242

FROM: Clarence Sakamoto OA/D241

SUBJECT: Early Warning Assessments for Southern Asia:
October - November 1981

Rainfall during the current northeast monsoon season is normal to above normal over most of the Southern Asia regions. However, cumulative rainfall has been deficient in parts of India, Sri Lanka and Central Vietnam.

In Bangladesh below normal rainfall in October and November delayed the transplanting of boro rice and planting of winter wheat. Crop models and indices indicate near normal yields for the aus and aman rice crops. In India below normal agroclimatic/crop condition indices in the 10 to 20th percentile range during October - November indicate potential problems to winter wheat in its early vegetative stage. These conditions exist in parts of Madhya Pradesh, Bihar Plateau, Orissa and West Bengal. The prolonged drought indicated by the 15 to 20th percentile for the crop condition indices in Sri Lanka is impacting the maha (main) rice crop. Potential problems also exist in parts of Malaysia. Previous data indicate that when rainfall during the first one to two months of the growing season plus the period prior to the growing season is low, yield is expected to be adversely affected. In the Annam region of Vietnam, the secondary rice crop is being affected by below normal rainfall during October - November.

cc: Lou Steyaert
Rao Achutuni
Paul Krumpe

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Columbia, Missouri 65201

DATE: January 21, 1982

TO: Malcolm Reid OA/D242

FROM: Clarence Sakamoto OA/D241

SUBJECT: Early Warning Assessments for Southern Asia:
November - December

Maha rice yields in Sri Lanka will be well below normal. Winter wheat yields for regions in central and northeastern India are forecasted to be below normal. Irrigation supplies for the secondary rice crop in Vietnam (Annam region) are below normal. The secondary rice crop in the Philippines (Mindoro region) has been affected by flooding.

The maha (main) rice crop in Sri Lanka, transplanted during October - November of 1981 and to be harvested in March - May, was adversely affected by below normal rainfall during the northeast monsoon season. Agroclimatic crop indices, on a scale from 0 to 100 percentile range, are in the 5 - 10 percentile range. Historically, such low index values have been associated with crop failures.

Winter wheat yields in parts of central and northeastern India will probably be below normal due to dry conditions since planting in October. Agroclimatic/crop condition index values for the affected regions are : Sub-Himalayan West Bengal (3rd percentile), Bihar Plateau (9th), East Madhya Pradesh (15th) and Orissa (19th). The wheat yield model for West Bengal indicates that the yield will be 19 percent below normal. Yield estimates from crop yield models will be available February and March 1982.

Irrigation supplies for the secondary rice crop currently being transplanted in the Annam region of Vietnam were reduced by below normal rainfall during the northeast monsoon.

Transplanting of the secondary rice crop in the Mindoro region of the Philippines is likely to have been delayed by flooding.

Conditions for the winter wheat crop in Pakistan, planted during October and to be harvested in March, are excellent following a successful southwest monsoon and also above normal rainfall during the current growing season.

cc: Lou Steyaert
Rao Achutuni
Paul Krumpe

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Room 200 Federal Building, 600 E. Cherry
Columbia Missouri 65201

DATE: February 8, 1982

TO: Paul Krumpe, AID/OFDA

FROM: Lou Steyaert OA/D241

THRU: Clarence Sakamoto OA/D241

SUBJECT: Climate Impact Assessment: Bangladesh Rice Production (1981)

Bangladesh rice production from the 1981 aus (September harvest) and aman (December harvest) crops was probably 10 percent below normal. As indicated in the monthly rainfall data in attachment 1, the 1981 southwest monsoon was erratic. June and October were dry throughout the entire country. Coastal and Highland regions (attachment 2) experienced dry conditions throughout the entire rainy season. Statistical climate/rice yield models indicate that aus and aman rice yields were 10 percent below normal. Regional agroclimatic/crop condition index values expressed as a percent of normal for the aus crop include: Coastal 56%, Northeast 71%, Northwest 89%, West 83% and Highlands 54%. Similar indices for the 1981 aman crop include: Coastal 66%, Northeast 89%, Northwest 101%, West 88% and Highlands 58%. In addition to the drought impact assessed by these models, there were reported yield reductions due to localized heavy rains and pest outbreaks during July. The December 10, 1981 cyclone probably resulted in additional losses to aman rice in the southern two-thirds of the country. Most of these production losses had been previously reported during early November.

Drought conditions during the period of September through December have probably affected 1981 wheat and boro rice crops. Statistical analysis indicates that boro rice yield is significantly related to January-February rainfall. Because January was quite dry, adequate February precipitation will be essential for the 1981 boro crop. Climate impact on these crops will be provided by CEAS at the end of February, 1982.

cc: Russ Ambroziak
Malcolm Reid
Mike Chusmir

Attachments (2)

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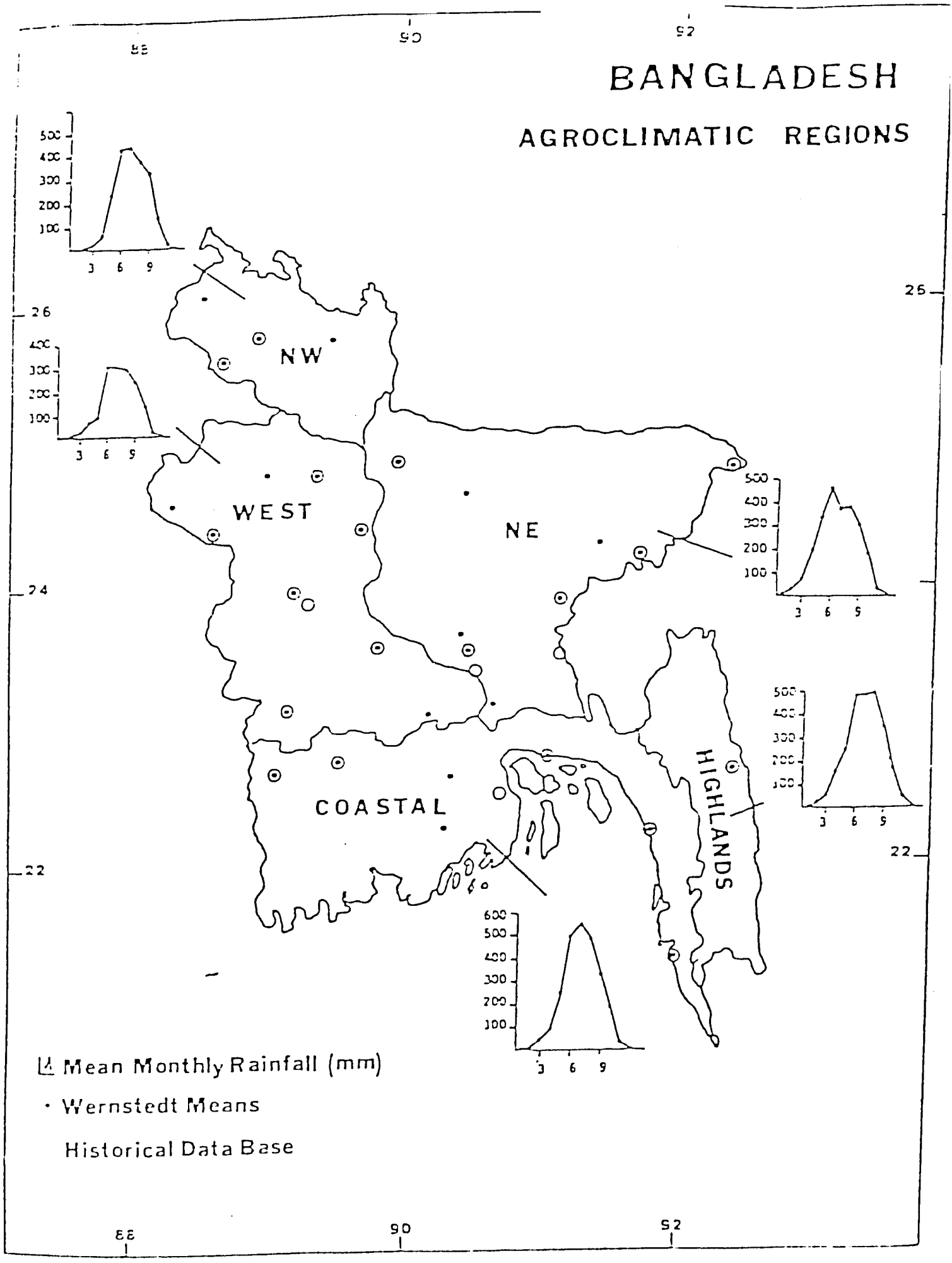
BANGLADESH: Estimated Monthly Rainfall Expressed as a Percentage of Normal for Indicated Regions

REGION	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
COASTAL	36%	26%	67%	82%	72%	19%	9%
NORTHEAST	64%	28%	87%	130%	87%	17%	7%
NORTHWEST	84%	28%	104%	162%	73%	15%	0%
WEST	98%	34%	106%	100%	110%	11%	16%
HIGHLANDS	33%	37%	79%	55%	58%	23%	130%


BANGLADESH
AGROCLIMATIC REGIONS
NW
WEST
NE
COASTAL
HIGHLANDS
26
24
22
88
90
92
Mean Monthly Rainfall (mm)
Wernstedt Means
Historical Data Base

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Columbia, Missouri 65201

DATE: February 23, 1982

TO: Malcolm Reid OA/D242

THRU: Clarence Sakamoto OA/D241

FROM: Louis Steyaert OA/D241 LTS

SUBJECT: Early Warning Assessment for Southern Asia: October-February, 1982 (Prepared by V.R. Achutuni) VCA

Summary:

Maha rice yields in Sri Lanka and the boro rice yields in coastal regions of Bangladesh will probably be below normal. The main rice crops in Peninsular Thailand and the Annam region of Vietnam were affected by below normal rainfall. Yields for the main and dry upland rice crops in Malaysia (West Sarawak and East Coast of Peninsular Malaysia) are expected to be below normal. The secondary rice crop in Burma may have been affected by reduced irrigation supplies. The secondary maize and rice crops in the Philippines (West Visayas, West Mindanao, Bicol, Mindoro, East Visayas and East Mindanao) are expected to be below normal. The main maize and rice crops in Indonesia (East Sumatra, North Sulawesi, West Sumatra and Kalimantan) have been affected by persistant dry conditions. Winter wheat yields in India (East Madhya Pradesh, West and East Rajasthan, Jammu and Kashmir) are expected to be below normal.

Sri Lanka: Continued dry conditions during the northeast monsoon period has adversely affected the maha (main) rice crop which is normally transplanted during October-November and harvested in March-May. Agroclimatic indices (expressed in percentiles on a scale from 0 to 100) are below the 10th percentile. These values have been historically associated with crop failure.

Bangladesh: In coastal regions, the boro rice crop which is normally transplanted during October-December and harvested in mid March-May may have been adversely affected by below normal rainfall during the previous southwest monsoon season. Pre-season rainfall deficits have not been supplemented with local showers during the seasonally dry boro rice growing period.

Thailand: Yields for the main rice crop currently being harvested in peninsular Thailand are likely to be below normal. Rainfall during both the southwest and northeast monsoon seasons was well below normal. Agroclimatic/crop condition indices for the affected peninsular regions are: Southeast/3rd percentile, South Central/14th and Southwest/22nd percentile.

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Vietnam: In the Annam region, the main rice crop normally transplanted in November and harvested in May was affected by below normal rainfall during the current growing season. Agroclimatic/crop condition index values are only 38 percent of normal.

Malaysia: Yields for the main and dry-upland rice crops (now nearing maturity) in some regions of Malaysia are expected to be below normal due to dry conditions during the southwest and northeast monsoon seasons. Agroclimatic/crop condition indices for the affected regions are: West Sarawak/11th percentile and East Coast Peninsular Malaysia/14th percentile.

Burma: The rice crops normally transplanted during December and harvested in March-May may have been affected by reduced irrigation supplies due to below normal southwest monsoon seasonal rains in all states.

Philippines: Below normal rainfall during both the southwest and northeast monsoon seasons probably affected yields for the secondary maize crop harvested in January and the secondary rice crop now reaching maturity in some regions. Agroclimatic/crop condition indices (expressed as a percentage of normal) for the affected regions are: West Visayas/56 percent, West Mindanao/63 percent, Bicol/67 percent, Mindoro/68 percent, East Visayas/74 percent and East Mindanao/75 percent of normal.

Indonesia: Regional yields for the main maize crop harvested in January as well as for the dry-upland main rice crops now nearing maturity were probably reduced by below normal rainfall during the northeast monsoon season. Agroclimatic/crop condition indices for the affected regions, expressed as a percent of normal are: East Sumatra/64 percent, North Sulawesi/64 percent, West Sumatra/67 percent and Kalimantan/79 percent of normal.

India: Winter wheat yields in some states for the crop normally planted in October and harvested in April/May was affected by a shortage of irrigation supplies due to a below normal rainfall during the previous southwest monsoon. Affected areas include: East Madhya Pradesh, East Rajasthan, West Rajasthan, Jammu and Kashmir.

Recent rainfall in Pakistan and Nepal probably benefitted the winter wheat crops normally planted in October-November and harvested in March-April. The dry-lowland rice crop in Laos have benefitted from recent rains.

cc: Paul Krumpe

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Columbia, Missouri 65201

DATE: March 11, 1982

TO: Malcolm Reid OA/D242

THRU: Clarence Sakamoto OA/D241

FROM: Louis Steyaert OA/D241

SUBJECT: Early Warning Assessment for Southern Asia: October - March 1982 (Prepared by V.R. Achutuni)

There is the potential for reduced food supplies in Sri Lanka due to severe drought impact on the 1981/82 maha rice crop. Main and dry-upland rice yields in some states of West Malaysia will probably be below normal. Winter wheat yields in West Bengal, India are expected to be below normal. Yields for the secondary rice crop in regions of the Philippines are likely to be below normal.

Bangladesh: Unseasonal rainfall during February benefitted the winter wheat and boro rice crops. Statistical climate/crop yield models suggest slightly above normal yields.

India: Above normal rainfall during February is likely to benefit the winter wheat crop in the previously affected regions of East Madhya Pradesh, East Rajasthan, West Rajasthan, Jammu and Kashmir. Wheat yield models suggest normal to above normal yields for most states in India, except West Bengal (81% of normal yield). The summer rice models indicate normal to above normal yields for the important rice producing states in India.

Malaysia: The main and dry-upland rice crops currently being harvested are expected to be below normal due to dry conditions in the southwest and northeast monsoon season. The main rice models for West Malaysia indicate below normal yield for several states in the country. Rice yields, expressed as a percent of normal, for the affected states are: Perak (73%), Kedah (78%), Selangor (79%), Johor (83%) and Perlis (87%)/

Nepal: Above normal rainfall during the usually dry months of January and February probably benefitted the winter wheat crop planted during November-December and to be harvested in March-April.

Pakistan: The winter wheat crop planted during October-November and to be harvested in April-May probably benefitted from above normal rainfall during February.

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Philippines: Below normal rainfall during the southwest and northeast monsoon seasons may have affected the secondary rice crop now in its maturity stage. Rainfall during the post-monsoon months of January and February has also been below normal over much of the country.

Sri Lanka: The 1981/82 maha rice crop currently being harvested was adversely affected by below normal rainfall conditions during the northeast monsoon season. Agroclimatic/crop condition indices, on a scale from zero to 100 percentile range, are below the 10th percentile. As previously reported by CEAS, such index values have been historically associated with crop failures. These conditions follow severe drought impact on the 1981 yala rice crop harvested during August-September, 1981. Yields were reduced by abnormally low rainfall conditions during the 1981 southwest monsoon season. Severe drought impact on two consecutive rice crops suggests the likelihood of reduced food supplies and adverse economic impact on the national economy. Agroclimatic/crop condition index values for the 1981 yala crop and the 1981/82 maha crop are comparable to those in 1975/76 for these crops when emergency food relief was provided. However, drought impact during 1975/76 was more localized in the Hills and Dry Zone regions. Current conditions apply to the entire country.

cc: Paul Krumpe
Lou Steyaert
Rao Achutuni

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Columbia Missouri 65201

DATE: April 19, 1982

TO: Malcolm Reid OA/D242

THRU: Clarence Sakamoto OA/D241

FROM: Louis Steyaert OA/D241

SUBJECT: Early Warning Assessment for Southern Asia: October - April 1982 (Prepared by V.R. Achutuni)

The main rice crop in Malaysia is expected to be 15-20 percent below normal. The main and dry-upland rice crops in Indonesia are likely to be below normal due to drought. The secondary rice crop in the Philippines and Vietnam (Annam region) will also be below normal. The secondary maize crop in Laos is also expected to be below normal. Planting of the yala rice crop in parts of Sri Lanka (Dry Zone and Hills region) is likely to be delayed. The wheat and boro rice crops in Bangladesh are expected to be near normal.

Bangladesh

Unseasonal rainfall during February and March benefitted the boro rice crop (April harvest). Crop yield models suggest near normal boro yields. The March harvest wheat crops is expected to be near normal. Planting of the 1982 aus rice crop is likely to be accelerated following a wet March.

Indonesia

A partial failure of the 1981-82 northeast monsoon season (October-January) followed by dry conditions during February and March is affecting the main and dry-upland rice crops (April harvest).

Laos

The March harvested secondary maize crop is expected to be below normal following dry conditions during both the 1981 southwest monsoon season, as well as the current growing season.

Malaysia

The 1981-82 main rice crop (March harvest) is expected to be 15-20 percent below normal. Severe drought during the 1981 southwest monsoon season (April-June) and the 1981-82 northeast monsoon season (October-February) affected the rice crop in peninsular Malaysia.

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Philippines

Above normal rainfall during March in the regions of West Mindanao, East Visayas and West Visayas is likely to improve prospects for the secondary rice crop (May harvest). Elsewhere, conditions for the secondary rice crop remains unfavorable.

Sri Lanka

Continued drought in the Dry Zone and Hills region is likely to delay planting of the 1982 yala rice crop.

Vietnam

The secondary rice crop (May harvest) in the Annam region is being adversely affected by below normal rainfall conditions during the northeast monsoon season and the current growing season.

cc: Paul Krumpe
Lou Steyaert
Rao Achutuni

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Columbia, Missouri 65201

DATE: May 10, 1982

TO: Malcolm Reid OA/D241

THUR: Clarence Sakamoto OA/D241

FROM: Louis Steyaert OA/D241

SUBJECT: Early Warning Assessment for Southern Asia: October, 1981 - April, 1982 (Prepared by V.R. Achutuni and L. Steyaert)

The 1981/82 main rice and maize crops in Indonesia and the main rice crop in the Annam region of Vietnam will be below normal. The secondary rice crop in the northeast monsoon regions of the Philippines will also be below normal. Favorable weather during March-April benefitted planting of the aus and broadcast aman rice crops in Bangladesh and the yala rice crop in Sri Lanka.

Bangladesh

Generally favorable rainfall conditions during March-April benefitted planting of the aus and broadcast aman rice crops. However, premonsoonal rainfall conditions in the Northeast and Highlands regions are about 80 percent of normal which may impact planting of rice (aus and broadcast aman).

Indonesia

The main rice (April - June harvest) and the dry-upland rice (March - May harvest) crops are expected to be well below normal. Rainfall during the 1981-82 northeast monsoon season (October-January) as well as rainfall during the period February-April was very erratic. Agroclimatic/crop condition indices, expressed in percentiles on a scale of 0 to 100, are in the lower 10th percentile range particularly in East Sumatra, West Sumatra, Java, Nusa Tenggara, Kalimantan, North Sulawesi and South Sulawesi. Such index values have been historically associated with crop failure or the inability to successfully grow multiple rice crops during the same season. The April planting of the secondary rice crop is likely to be delayed due to the prevailing dry conditions. The main maize crop (February-March harvest) was also below normal. Agroclimatic/crop condition index values, expressed as percentiles for the affected regions are: 1) East Sumatra 3rd percentile, 2) West Sumatra 6th percentile, 3) Nusa Tenggara 24th percentile and 4) Java 26th percentile.

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Malaysia

Transplanting of the off-season rice crop is on schedule following generally favorable weather conditions during April. However, the success of this crop is contingent upon a normal southwest monsoon rainfall (April-July). April-July rainfall is also important for the 1982/83 main rice crop in the NW regions beginning in July, 1982. Irrigation supplies in peninsular Malaysia remain very low following severe drought during the 1981-82 season.

Philippines

The secondary rice crop, transplanted during December-February and to be harvested in May-June, was adversely affected by below normal rainfall conditions. Agroclimatic/crop condition index values, expressed as a percent of normal, for the affected regions are: 1) Southern Luzon 49%, 2) Bicol 50%, 3) Western Visayas 62% and 4) Eastern Visayas 66% of normal.

Sri Lanka

Improved rainfall conditions during April benefitted planting of the yala rice crop. However, normal rainfall conditions during May-July are essential for the success of this crop. Furthermore, irrigation water supplies in tanks remain critically low due to previous severe drought conditions.

Vietnam

The main rice crop in the Annam region, normally transplanted during December and harvested in May, is expected to be below normal. Rainfall during the 1981-82 northeast monsoon season (September-December) was 38 percent of normal and rainfall during the growing season was also very erratic.

cc: L. Steyaert
R. Achutuni
P. Krumpe

APPENDIX C

Biweekly Weather Assessments for South and Southeast Asia. (NOAA/CEAS Cables)

JUNE 4, 1981

PREPARATIONS FOR PLANTING OF RICE IN PARTS OF SRI LANKA AND BURMA WILL BE EXPEDITED BY THE TIMELY ARRIVAL OF THE SUMMER MONSOON THIS PERIOD, AS THE RI*AINS WILL BOOST SOIL MOISTURE LEVELS IN MOST AREAS. SATELLITE IMAGERY, SYNOPTIC REPORTS AND UPPER-LEVEL WINDS SUGGEST THAT THE MOO*NSOON BEGAN ON SCHEDULE AROUND MAY 30-33 IN WESTERN SECTIONS OF SRI LANKA AND SOUTHERN BURMA. RAINFALL AMOUNTS TOPPING 160 MM WERE OBSERVED DURING THE SECOND WEEK IN THE WET ZONE {REGION 1} OF SI*RI LANKA, WHILE HEAVY SHOWERS BROUGHT 150 TO 200 MM TO COASTAL PARTS OF SOUTHERN BURMA {IRRAWADDY {2}} AND ***{2} AND PEGU {3}} DURING THE FIRST HALF OF THE PEI*RIOD. HOWEVER, SIGNIFICANTLY MORE MOISTURE IS NEEDED ACROSS MUCH OF SRI LANKA, ESPECIALLY THE HILLS {3} REGION, TO BOOST FINAL PLANTING AND INITIAL DEVELOPMENT OF THE SECONDARY "YALA" RICE CROP

SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WKS	LONGER DURATION	INTENSITY	DURATION
SRI LANKA/ WET ZONE	WET			
HILLS {3=3}	DRY	DRYOU==DROUGHT	40-60PCT.	26WKS
BURMA/ IRRAWADDY {2} PUGU {3}	WET			

JUNE 5, 1981

SOIL MOISTURE RESERVES WILL BE GREATLY ENHANCED BY THE PROMPT ARRIVAL IN LATE MAY OF THE SUMMER MONSOON OVER SOUTHERN AND INLAND SECTIONS OF THAILAND. THE RECENTLY PLANTED RICE CROP SHOULD BENEFIT FROM THE TIMELY SHOWERS, WHICH SATELLITE IMAGERY AND OTHER SOURCES INDICATE ARE PENETRATING MUCH OF INDOCHINA AND ADJACENT REGIONS. THE BULK OF THE PRECIPITATION OCCURRED DURING THE FIRST HALF OF THE PERIOD, WITH TOTALS IN EXCESS OF 150 MM REPORTED ACROSS INTERIOR THAILAND AS WELL AS ITS SOUTHWEST PROVINCE (REGION 8). DROUGHT CONDITIONS HAVE BEEN BROKEN OVER MALAYSIA'S NORTHWEST REGION (1) BY THE SHOWERS, WHICH BROUGHT OVER 170 MM TO SOME SECTIONS DURING THE PERIOD.

LIVESTOCK AND GRAZING CONDITIONS CONTINUE TO WORSEN OVER EAST LUZON (3), PHILIPPINES, WHERE SEVERE DROUGHT HAS PREVAILED FOR NEARLY SIX MONTHS. FURTHER SOUTH, PLANTING OF THE MAJOR AND UPLAND RICE CROPS LIKELY FACE FURTHER DELAYS IN WEST AND EAST MINDANO (11 AND 12), DESPITE ERRATIC RAINS OF MID-APRIL AND EARLY MAY.

WATER SHORTAGES ARE LIKELY RE-DEVELOPING OR WORSENING IN NORTH SULAWESI (4), INDONESIA AND EAST SABAH (6), MALAYSIA, WHERE DROUGHT HAS RETURNED AND IS PERSISTING, RESPECTIVELY. PLANTING OF THE RICE CROP IN EAST SABAH LATER IN JUNE MAY BE DELAYED IF NORMAL RAINS FAIL TO MATERIALIZE.

SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
THAILAND/	WET			
N. HILLS (1)		CENTRAL (6)	SOUTHWEST (8)	
N. PLAINS (2)		EAST (7)	MALAYSIA/NW (1)	WET

NORTHWEST {1}			
MALAYSIA/ E. SABAH {6}	DRY	DROUGHT	30-50 PCT. 16 WKS.
PHILIPPINES/ E. LUZON {3}, W & E MINDONO {11,12}	DRY	DROUGHT	30-50 PCT. 16-26WKS
PHILIPPINES/ BICOL {7} E. VISAYAS {10}	DRY	DROUGHT	30-50 PCT. 17 WKS.

JULY 2, 1981: (JUNE 15-28 PERIOD)

FLOODWATERS, WHICH WERE LIKELY CAUSED BY RECENT HEAVY RAINS FROM TROPICAL STORM IKE AND THE MONSOON IN MID-JUNE OVER THE NORTHWESTERN PHILIPPINES, HAVE PROBABLY RECEDED ACROSS THE AREA DUE TO THE RETURN OF DRIER WEATHER. FURTHER EAST, DROUGHT CONDITIONS HAVE FINALLY BEEN BROKEN OVER EAST LUZON, AS RECENT PRECIPITATION FROM IKE AND TYPHOON JUNE GREATLY BOOSTED MOISTURE LEVELS ACROSS THE PROVINCE. HOWEVER, SUBSTANTIALLY MORE RAIN IS NEEDED TO FURTHER ENHANCE WATER RESERVES AND ALLEVAMIATE POOR GRAZING CONDITIONS.

ELSEWHERE, PLANTING OF THE MAJOR AND UPLAND RICE CROPS IN WEST AND EAST MINDANO IS LIKELY BEING FURTHER DELAYED AS A RESULT OF PERSISTENT DROUGHT. W. MINDANO HAS FAILED TO RECEIVE ANY SUBSTANTIAL PRECIPITATION SINCE EARLY FEBRUARY 1981. IN NORTH SULAWESI, INDONESIA ARABLE FIELDS ARE LIKELY BECOMING PARCHED, AS AN EIGHT-MONTH DROUGHT CONTINUES TO PLAGUE THE PROVINCE. HOWEVER, ONLY SCATTERED SUBSISTENCE FARMING EXISTS IN THIS AREA.

PROSPECTS FOR NORMAL SOWING OF THE "YALA" (SECONDARY) RICE CROP REMAIN MIXED OVER PARTS OF SRI LANKA, DESPITE PRE-MONSOONAL RAINS OF EARLY MAY. CONDITIONS ARE MOST UNFAVORABLE IN THE INLAND HILLS DISTRICT, WHERE MODERATE-TO-SEVERE DROUGHT HAS PERSISTED FOR OVER SIX MONTHS. SUBSTANTIAL MOISTURE IS NEEDED IN MOST AREAS TO PROMOTE FINAL PLANTING OF THE RICE CROP, CURRENTLY PROJECTED AT 510,000 TONS VS A PREVIOUS GOAL OF 720,000 TONS (FAO, JUNE 1981).

WATER-LOGGED FIELDS AND IMPASSABLE ROADS HAVE LIKELY RESULTED ALONG COASTAL SECTIONS OF SOUTHWESTERN INDIA, WHICH HAS RECEIVED THE BRUNT OF THE SUMMER MONSOON FOR SEVERAL WEEKS. HARDEST HIT HAS BEEN THE PROVINCE OF COASTAL KARNATAKA, WHERE SOME STATIONS HAVE RECORDED OVER 1100 MM OF RAINFALL SINCE JUNE 10. FURTHER EAST, LOCAL FLOODING LIKELY OCCURRED IN CENTRAL PARTS OF E. MADHYA PRADESH, WHERE THE MONSOON'S ONSET BROUGHT 300-350 MM DURING THE SECOND HALF OF THE PERIOD.

PLANTING OF MAJOR RICE CROPS IN SOUTHERN PARTS OF BANGLADESH AND WESTERNMOST BURMA REMAINS UNCERTAIN DUE TO AN ERRATIC, WEAK MONSOON. WEEKLY PRECIPITATION HAS BEEN RUNNING ONLY 25-30 PERCENT OF THE LONG-TERM AVERAGES SINCE EARLY JUNE, PARTICULARLY ACROSS THE BANGLADESH STATES OF NORTHEAST, COASTAL AND HIGHLANDS, WHICH EXPECT OVER 100 MM EACH WEEK THROUGHOUT MOST OF THE SUMMER.

2. . TABULAR SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
PHILIPPINES/ W. MINDANO	DRY	DROUGHT	20-40 PCT.	20 WKS.
PHILIPPINES/ BICOL		DROUGHT	25-45 PCT.	21 WKS.
E. VISAYAS				
E. MINDANO				

04	UNCLASSIFIED			
N. SULAWESI				
SRI LANKA/ HILLS	DRY	DROUGHT	30-50 PCT.	30 WKS.
INDIA/ E. MADHYA PRADESH	FLOODS			

JULY 16,1981: (JUNE 29 - JULY 12, 1981 PERIOD)

FLOODWATERS HAVE LIKELY STARTED TO RECEDE OVER PARTS OF WESTERN AND NORTHERN INDIA, AS HEAVY MONSOONAL RAINS TAPERED OFF AFTER THE BEGINNING HALF OF THE PERIOD. APPROXIMATELY 20 PEOPLE WERE KILLED, WHILE COMMUNICATIONS AND TRANSPORTATION WERE DISRUPTED IN PARTS OF W. UTTAR PRADESH AND SUB HIMALAYAN WEST BENGAL, WHERE PRECIPITATION TOTALS EXCEEDING 350 MM WERE REPORTED DURING THE FIRST WEEK. HOWEVER, OCCASIONAL FLOODING IS NOT UNUSUAL OVER INDIA DURING THE SUMMER, AS THE SOUTHWEST MONSOON OVERSPREADS THE REMAINDER OF THE COUNTRY BY MID-JULY.

THE OUTLOOK FOR FALL-HARVESTED CROPS REMAINS GENERALLY GOOD BECAUSE OF THE ABUNDANT MONSOON RAINS THIS SEASON.

FLOODING WAS LIKELY ALLEVIATED ACROSS THE CENTRAL PHILIPPINES DURING THE LATTER HALF OF THE PERIOD, AS DRIER WEATHER RETURNED IN THE AFTERMATH OF TROPICAL STORMS KELLY AND LYNN. HARDEST HIT WERE THE PROVINCES OF S. LUZON AND BICOL, WHICH WERE BUFFETED BY GALE-FORCE WINDS AND HEAVY RAINS. ALTHOUGH DROUGHT CONDITIONS WERE ERADICATED IN BICOL, CROP DAMAGE WILL

PROBABLY RESULT IN REDUCED YIELDS ACROSS THE AREA. FURTHER SOUTH, THE FRINGES OF KELLY AND LYNN FAILED TO RELIEVE LONG-TERM DRYNESS IN THE REGIONS OF W. AND E. MINDANO, WHERE DROUGHT IS APPROACHING ITS SIXTH MONTH.

2. TABULAR SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
PHILIPPINES/ S. LUZON BICOL	FLOODS			
PHILIPPINES/ W & E. MINDANO	DRY	DROUGHT	25-45 PCT	23 WKS
INDONESIA/ N. SULAWESI	DRY	DROUGHT	30-50 PCT	32 WKS
INDIA/ W. UTTAR PRADESH BIHAR PLAINS SUB HIMALAYAN W. BENGAL	FLOODS			
SRI LANKA/HILLS	DRY	DROUGHT	25-45 PCT	32 WKS

JULY 31, 1981: (JULY 13-26 PERIOD)

SOIL MOISTURE LEVELS HAVE RECENTLY BECOME DEFICIENT OVER SOUTHERN PARTS OF VIETNAM, DUE TO A MONTH-LONG DRY SPELL. THERE ARE INDICATIONS FROM VARIOUS SOURCES THAT MOISTURE RESERVES HAVE BEEN RUNNING AT 35-50 PERCENT OF THE LONG-TERM MEAN IN PARTS OF THE MEKONG DELTA AND THE SOUTHERN PLATEAU. ADEQUATE RAINFALL DURING THE SUMMER MONTHS IS CRUCIAL ACROSS SOUTHERN VIETNAM, ESPECIALLY IN THE MEKONG DELTA, TO ASSURE NORMAL DEVELOPMENT OF THE MAIN RICE CROP.

YIELDS OF THE FIRST AND UPLAND RICE CROPS IN SOUTHERN SEC-

TIONS OF THE PHILIPPINES WILL LIKELY BE SHARPLY REDUCED THIS YEAR DUE TO PERSISTENT DROUGHT ACROSS THE AREA. CUMULATIVE RAINFALL IN THE PROVINCES OF W. AND E. MINDANAO HAS BEEN RUNNING ONLY 20-40 PERCENT OF THE LONG-TERM AVERAGE SINCE LAST FEBRUARY. LOW MOISTURE RESERVES AND A SHORT GROWING SEASON PRECLUDE ANY POSSIBILITY OF NORMAL CROP YIELDS DURING HARVESTING, EVEN IF SUBSTANTIAL RAINS SHOULD MATERIALIZE.

MODERATE DROUGHT REMAINS ENTRENCHED OVER NORTH SULAWESI, INDONESIA, DESPITE NEAR-NORMAL RAINS THIS PERIOD. MOISTURE LEVELS HAVE LIKELY GROWN CRITICALLY LOW IN SOME AREAS, WHERE CHANCES OF CONTAMINATED DRINKING WATER SUPPLIES MAY HAVE INCREASED.

MORE THAN 550 PEOPLE WERE FEARED DEAD AND OVER 100,000 LEFT HOMELESS BY HEAVY RAINS AND FLOODING WHICH STRUCK NORTHWESTERN AND NORTHEASTERN INDIA DURING THE PERIOD (REUTERS, JULY 22, 1981; "WASHINGTON, POST", JULY 25, 1981). THE PROVINCES OF W. AND E. RAJASTHAN WERE HARDEST HIT, WHERE PRECIPITATION AMOUNTS REACHING 700 MM WERE REPORTED AND THE VILLAGE OF HINDONIA WAS SWEPT AWAY BY THE MOREL RIVER. IN THE STATE OF ASSAM, FLOODWATERS HAVE LIKELY RECEDED DURING THE SECOND WEEK AFTER RECENT HEAVY RAINS ABATED OVER CENTRAL SECTIONS.

WATER SHORTAGES HAVE LIKELY DEVELOPED OVER MUCH OF PEGU AND KAREN, BURMA, DUE TO THE ONSET OF MODERATE DROUGHT ACROSS THE AREA. CUMULATIVE RAINFALL HAS BEEN RUNNING ONLY 30-50 PERCENT OF THE LONG-TERM MEAN SINCE LATE MAY. MINIMAL IMPACT IS EXPECTED ON THE COUNTRY'S RICE CROP, SINCE THE BULK OF THE CROP IS GROWN FURTHER WEST IN IRRAWADDY, WHERE MOISTURE CONDITIONS REMAIN MORE FAVORABLE.

DEVELOPMENT OF SRI LANKA'S SECONDARY "YALA" RICE CROP MAY THREATENED BY THE RETURN OF DROUGHT CONDITIONS TO THE WET

ZONE REGION, WHERE RAINFALL HAS BEEN ACCRUING AT LESS THAN ONE-THIRD OF THE LONG-TERM AVERAGE FOR THE PRECEDING TWO MONTHS. ELSEWHERE, LONG-TERM DROUGHT PERSISTS IN THE HILLS DISTRICT, WHICH HAS EXPERIENCED 34 WEEKS OF DEFICIENT MOISTURE.

2. TABULAR SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
VIETNAM/	DRY			
S. PLATEAU				
MEKONG DELTA				
PHILIPPINES	DRY	DROUGHT	25-45 PCT.	25 WKS.
W. & E MINDANAO				
INDONESIA/		DROUGHT	30-50 PCT.	34 WKS.
N. SULAWESI				
INDIA/W. & E.	FLOODS			
RAJASTHAN				
ASSAM				
BURMA/	DRY	DROUGHT	30-50 PCT.	8 WKS.
PEGU, KAREN				
SRI LANKA/	DRY	DROUGHT	20-40 PCT.	8 WKS.
WET ZONE				

AUGUST 4, 1981: (JULY 27 - AUGUST 2 PERIOD)

APPROXIMATELY 20 PERCENT OF THE RICE CROP HAS BEEN RUINED AND 25 VILLAGES REPORTED SUBMERGED BY FLOODWATERS IN THE MEKONG RIVER VALLEY OF SOUTHWESTERN LAOS (AP, JULY 29, 1981). FLOODING HAS BEEN ATTRIBUTED TO SEVERAL WEEKS OF HEAVY RAINS WHICH HAVE BROUGHT OVER 200 PERCENT OF NORMAL PRECIPITATION TO SOME AREAS.

AUGUST 14, 1981: (JULY 27 - AUGUST 9 PERIOD)

ALTHOUGH MOISTURE RESERVES IMPROVED, FINAL PLANTING OF RICE AND OTHER FALL HARVESTED CROPS WAS LIKELY DELAYED DUE TO WATERLOGGED FIELDS IN EAST CENTRAL SECTIONS OF INDIA. MONSOONAL RAINS THE SECOND WEEK CAUSED FLOODING ACROSS THE AREA. PARTS OF ORISSA, EAST MADHYA PRADESH, VIDARBHA, AND TELANGANA REPORTED 200 TO 300 MM (8 TO 12 IN.) OF RAIN.

MOISTURE RESERVE PROBLEMS LIKELY CONTINUED IN PARTS OF THE SOUTHERN INTERIOR OF BURMA DUE TO LACK OF PRECIPITATION. MODERATE DROUGHT PREVAILED OVER MOST OF KAREN AND NORTHERN PEGU ALSO DUE TO INADEQUATE RAINFALL.

THE OUTLOOK REMAINS POOR FOR LATE SUMMER HARVESTING OF SRI LANKA'S SECONDARY YALA RICE CROP. MODERATE TO SEVERE DROUGHT CONTINUES TO PLAGUE THE HILLS DISTRICT AND TO WORSEN IN THE WET ZONE. CUMULATIVE PRECIPITATION SINCE LAST DECEMBER HAS BEEN ONLY 20 TO 40 PERCENT OF THE LONG-TERM AVERAGE.

SOME 25 VILLAGES WERE FLOODED AND 20 PERCENT OF THE RICE CROP WAS DESTROYED ALONG THE MEKONG RIVER VALLEY IN VIENTIANE, LAOS (AP, JULY 29, 1981) DUE TO HEAVY RAINS OF 400 TO 600 MM (16 TO 24 IN.) IN LATE JULY. DRIER WEATHER DURING THE SECOND HALF OF THE PERIOD, HOWEVER, ALLOWED FLOODWATERS TO BEGIN RECEDING FROM MOST AREAS.

SOIL MOISTURE CONDITIONS LIKELY CONTINUE TO DETERIORATE IN THE SOUTHERN PLATEAU OF VIETNAM DUE TO DEFICIENT RAINFALL. DEVELOPMENT OF THE TRANSPLANTED RICE CROP MAY BE THREATENED AFTER SIX WEEKS OF DRY WEATHER.

THE OUTLOOK REMAINS POOR FOR A NORMAL HARVEST OF THE FIRST AND UPLAND RICE CROPS IN THE SOUTHERN PHILIPPINES DUE TO LONG-TERM DROUGHT.

MODERATE DROUGHT WAS MITIGATED SLIGHTLY OVER NORTH SULAWESI, INDONESIA BY SUBSTANTIAL RAINS DURING THE FIRST HALF OF THE PERIOD. THE FIRST SUBSTANTIAL RAIN SINCE MID-MAY PRODUCED 30 TO 55 MM (1.2 TO 2.2 IN.) TOTALS OVER MUCH OF THE PROVINCE. TO REVERSE WATER SHORTAGES AND TO REPLENISH MOISTURE RESERVES CONSIDERABLY MORE RAINFALL IS NEEDED.

SUMMARY OF AFFECTED AREAS

REGION	SIG. WEATHER LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
LAOS/ VIENTIANE	FLOODS			
VIETNAM/ S. PLATEAU	DRY			
PHILIPPINES/ W & E MINDANAO	DRY	DROUGHT	25-45 PCT	27 WKS.
INDONESIA/ N. SULAWESI	WET	DROUGHT	35-55 PCT.	36 WKS.
INDIA/ ORISSA E. MADHYA PRADESH VIDARBHA TELANGANA	FLOODS			

BURMA/	DRY	DROUGHT	30-50 PCT.	10 WKS.
PEGU				
[illegible] REN				
SRI LANKA/	DRY	DROUGHT	20-40 PCT.	10 WKS..
WET ZONE				
HILLS	DRY	DROUGHT	20-40 PCT.	36 WKS.

AUGUST 19, 1981: (AUGUST 10-16 PERIOD)

SOME DAMAGE TO THE SORGHUM, MILLET AND COTTON CROPS MAY HAVE OCCURRED IN PARTS OF GUJARAT (REGION 15), INDIA, WHERE FLOODING WAS LIKELY TRIGGERED BY HEAVY RAINS THIS WEEK. INLAND SECTIONS OF THE PROVINCE REPORTED CLOSE TO 400 MM OF PRECIPITATION - OVER 800 PERCENT OF THE LONG-TERM AVERAGE.

DEVELOPMENT OF THE TRANSPLANTED RICE CROP MAY BE IMPAIRED OVER EASTERN PARTS OF VIETNAM'S S. PLATEAU DISTRICT (4), WHERE DROUGHT CONDITIONS HAVE APPARENTLY MATERIALIZED. SATELLITE IMAGERY, SOIL MOISTURE DATA AND OTHER SOURCES SUGGEST THAT RAINFALL HAS BEEN RUNNING BELOW 50 PERCENT OF THE LONG-TERM MEAN SINCE MID-JUNE.

AUGUST 24, 1981: (AUGUST 10-23 PERIOD)

TRANSPLANTING OF THE RICE CROP WAS REPORTED INCOMPLETE ACROSS SOUTHERN SECTIONS OF KAMPUCHEA (FBIS, AUGUST 17, 1981) DUE TO DROUGHT IN W. HILLS. THE DROUGHT IN SOME AREAS HAS FORCED FARMERS TO PLANT CLOSER TO THE COAST NEVERTHELESS, SATELLITE IMAGERY AND REPORTS SUGGEST AN ACTIVE SUMMER MONSOON MAY BE BRINGING SEASONAL PRECIPITATION ACROSS MUCH OF THE COUNTRY THIS SEASON.

SOIL MOISTURE LEVELS REMAIN LOW IN THE DROUGHT-STRICKEN S. PLATEAU DISTRICT IN VIETNAM. SATELLITE PHOTOS AND OTHER SOURCES

INDICATE THE REGION HAS RECEIVED LESS THAN 50 PERCENT OF NORMAL PRECIPITATION SINCE MID JUNE.

HYDROELECTRIC POWER WAS BOOSTED BY HEAVY RAINS OVER COASTAL SECTIONS OF CENTRAL LUZON IN THE PHILIPPINES. PLANTING OF THE FIRST RICE CROP, HOWEVER, WAS POSSIBLY DELAYED DUE TO FLOODING THE SECOND WEEK. THE PORT OF BAGUIO RECEIVED OVER 525 MM (21 IN.) OF RAIN FROM A STALLED CONVECTIVE SYSTEM.

AN EARLY HARVEST OF THE FIRST AND UPLAND RICE CROPS IN W. AND E. MINDANAO WILL BEGIN IN SEPTEMBER. A LOW YIELD IS EXPECTED DUE TO DROUGHT SINCE EARLY SUMMER. CUMULATIVE RAINFALL IN W. MINDANAO HAS BEEN LESS THAN 30 PERCENT OF THE LONG-TERM AVERAGE SINCE JUNE.

THE DROUGHT CONTINUES TO WORSEN OVER NORTH SULAWESI, INDONESIA WHICH HAS NOT RECEIVED SUFFICIENT RAINFALL SINCE LATE JULY.

THE SORGHUM, MILLET AND COTTON CROPS LIKELY INCURRED DAMAGE FROM FLOODING TRIGGERED BY HEAVY RAINS THE FIRST WEEK OVER INLAND PARTS OF GUJARAT, INDIA. AHMABAD REPORTED ABOUT 400 MM (16 IN.) OF RAIN. FLOODWATERS RECEDED SOMEWHAT THE SECOND WEEK AS RAINS TAPERED OFF.

RECENTLY PLANTED AUTUMN AND WINTER RICE CROPS IN E. UTTAR PRADESH, INDIA WERE POSSIBLY DAMAGED BY MONSOONAL RAINS AND FLOODING THE SECOND WEEK OVER THE SOUTHERN HALF OF THE PROVINCE. ALSO, MUDDY ROADS LIKELY IMPAIRED LOCAL TRANSPORTATION. ALLAHABAD REPORTED AT LEAST 450 MM (18 IN.) OF RAIN.

WATER SHORTAGES AND DROUGHT IN KAREN, BURMA PROBABLY WORSENED BECAUSE RAINFALL HAS BEEN BELOW 40 PERCENT OF NORMAL THIS PERIOD.

THE OUTLOOK FOR SEPTEMBER'S HARVEST OF YALA, THE SECONDARY ICE CROP IN THE CENTRAL SRI LANKA HILLS DISTRICT, GROWS BLEAK.

THE DISTRICT'S DROUGHT HAS WORSENED BECAUSE PRECIPITATION AMOUNTS HAVE BEEN LESS THAN ONE-THIRD OF NORMAL.

2. TABULAR SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
KAMPUCHEA/				
W. HILLS		DROUGHT	40-60 PCT.	8 WKS.
VIETNAM/				
S. PLATEAU	DRY	DROUGHT	30-50 PCT.	8 WKS.
PHILIPPINES/				
C. LUZON	FLOODS			
PHILIPPINES/				
W. & E. MINDANAO	DRY	DROUGHT	25-40 PCT.	29 WKS.
INDONESIA/				
N. SULAWESI	DRY	DROUGHT	30-50 PCT.	38 WKS.
INDIA/GUJARAT,				
E. UTTAR, PRADESH	FLOODS			
BURMA/KAREN	DRY	DROUGHT	30-50 PCT.	12 WKS.
SRI LANKA/HILLS	DRY	DROUGHT	20-40 PCT.	38 WKS.

AUGUST 30, 1981: (AUGUST 24-30 PERIOD)

RICE CROP YIELDS MAY BE REDUCED THIS MONTH BY PREMATURE DRYNESS IN NORTHERN AND CENTRAL SECTIONS OF INDIA. IN PARTICULAR, AN EARLY HARVEST IS POSSIBLE IN THE PROVINCES OF W. UTTAR PRADESH (REGION 8) AND PUNJAB (9), WHERE PRECIPITATION HAS BEEN BELOW NORMAL FOR THREE CONSECUTIVE WEEKS. SATELLITE IMAGERY, SURFACE REPORTS AND UPPER-LEVEL WINDS SUGGEST THAT THE SUMMER MONSOON MAY BE RETREATING 2 TO 4 WEEKS AHEAD OF SCHEDULE IN SOME AREAS.

SEPTEMBER 11, 1981: (AUGUST 24 - SEPTEMBER 6 PERIOD)

FURTHER TRANSPLANTING OF THE MAJOR RICE CROP LIKELY HAS BEEN ABORTED OVER SOUTHERN SECTIONS OF KAMPUCHEA'S W. HILLS DISTRICT DUE TO PERSISTENT BELOW-NORMAL RAINFALL THAT HAS APPARENTLY INTENSIFIED DROUGHT CONDITIONS. ACCORDING TO FAO REPORTS FOR AUGUST, LAST YEAR'S FOOD SHORTAGES MAY BE COMPOUNDED AND FUTURE AGRICULTURAL RELIEF PROGRAMS MAY BE NECESSARY IF MONSOONAL RAINS FAIL TO BECOME RE-ESTABLISHED THIS MONTH.

FINAL DEVELOPMENT OF THE PRINCIPAL RICE CROP MAY ALSO BE HAMPERED IN NEIGHBORING SECTIONS OF SOUTHERN VIETNAM, PARTICULARLY IN WESTERN PARTS OF THE MEKONG DELTA WHERE SOIL MOISTURE LEVELS HAVE BECOME LOW IN RECENT WEEKS. RAINFALL HAS BEEN ERRATIC SINCE LATE JULY, RUNNING 45 PERCENT OF THE LONG-TERM MEAN.

DROUGHT CONDITIONS WERE ALLEVIATED SOMEWHAT OVER WESTERN AND EASTERN SECTIONS OF W. AND E. MINDANAO, PHILIPPINES, RESPECTIVELY, BY MODERATE-TO-HEAVY RAINS THIS PERIOD. LOW YIELDS OF THE FIRST AND UPLAND RICE CROPS, HOWEVER, ARE STILL EXPECTED THIS AUTUMN. DURING THE FIRST WEEK, OVER 100 MM (4 IN.) WAS REPORTED IN SECTIONS OF E. MINDANAO WHILE SMALLER AMOUNTS WERE OBSERVED IN W. MINDANAO IN THE LATTER HALF OF THE PERIOD.

LONG-TERM DROUGHT WAS PROBABLY ELIMINATED AS WELL IN NORTHEAST SECTIONS OF N. SULAWESI, INDONESIA, WHICH RECEIVED OVER 140 MM OF MOISTURE DURING THE SECOND WEEK. HOWEVER, WATER SHORTAGES LIKELY STILL PLAGUE THE REMAINDER OF THE PENINSULA, WHICH HAS FAILED TO RECEIVE SUBSTANTIAL RAINS SINCE MID-JULY.

AUTUMN RICE CROP YIELDS OVER PARTS OF NORTH CENTRAL AND WESTERN INDIA MAY BE REDUCED THIS FALL, AS AN EARLY END OF

MONSOONAL RAINS MAY INDICATE AN EARLY HARVEST. SATELLITE IMAGERY, UPPER-LEVEL WINDS AND SURFACE REPORTS SUGGEST THAT THE SUMMER MONSOON HAS BEEN RETREATING SOUTHWARD 2 TO 4 WEEKS EARLY SINCE LATE AUGUST. WEEKLY RAINFALL HAS BEEN RUNNING ONLY 20 TO 35 PERCENT OF THE LONG-TERM MEAN OVER MOST AREAS; ESPECIALLY IN THE UTTAR PRADESH PROVINCES, W. & E. RAJASTHAN AND THE MADHYA PRADESHES. PLANTING OF THE WINTER WHEAT CROP NEXT MONTH MAY BE DELAYED IF THE MONSOON'S PREMATURE WITHDRAWAL RESULTS IN LOW MOISTURE RESERVES OVER WESTERN SECTIONS OF THE SUB-CONTINENT.

2. TABULAR SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
INDIA/	DRY			
E. & W. UTTAR PRADESH, W. & E. RAJASTHAN, W. & E. MADHYA PRADESH, GUJARAT, KONKAN, TELANGANA, RAYALASEEMA, COASTAL KARNATAKA, W. & S. INT. KARNATAK, KERALA				
KAMPUCHEA/W. HILLS	DRY	DROUGHT	35-55 PCT.	10 WKS.
VIETNAM/S. PLATEAU	DRY	DROUGHT	30-50 PCT.	10 WKS.
PHILIPPINES/ & E. MINDANAO	DRY	DROUGHT	25-40 PCT.	31 WKS.
INDONESIA/ N. SULAWESI	DRY	DROUGHT	DR** 30-50 PCT.	40 WKS.

SEPTEMBER 16,1981: (SEPTEMBER 7-13 PERIOD)

CROP YIELDS FOR RICE, COTTON AND GROUNDNUTS WILL LIKELY BE REDUCED THIS FALL OVER MUCH OF NORTHERN INDIA, AS THE SUMMER MONSOON CONTINUES TO WANE SEVERAL WEEKS EARLY. SOWING OF WINTER GRAINS IN OCTOBER MAY BE JEOPARDIZED IF LOW MOISTURE RESERVES ARE FURTHER DEPLETED DURING THE REMAINDER OF SEPTEMBER.

MOISTURE RESERVES WERE LIKELY REPLENISHED ACROSS MUCH OF SRI LANKA, WHICH RECEIVED THE FIRST SIGNIFICANT RAINS SINCE MID-MAY. HOWEVER, THE MAJOR RICE PRODUCING AREA OF WET ZON 1*WHICH HAS BEEN PLAGUED BY RECURRENT DROUGHT SINCE LAST DECEMBER, WILL NOT BENEFIT SUBSTANTIALLY FROM THE PRECIPITATION DUE TO THE UPCOMING HARVEST LATER THIS MONTH.

SEPTEMBER 24, 1981: (SEPTEMBER 7-20 PERIOD)

NUMEROUS AGRICULTURAL AND RELATED PROBLEMS OVER MUCH OF NORTH-CENTRAL INDIA HAVE BEEN ATTRIBUTED TO THE SUMMER MONSOON'S PREMATURE WITHDRAWAL. IN ADDITION, APPROXIMATELY FORTY PEOPLE WERE REPORTED KILLED DURING MID-PERIOD WHEN POST-MONSOONAL RAINS STRUCK PARTS OF EAST UTTAR PRADESH {REGION 7}, {UPI, SEPT. 15, 1981}. SCORES OF MUD HUTS WERE WASHED AWAY BY THE SWOLLEN RAPTI RIVER AND ITS TRIBUTARIES, DROWNING THEIR INHABITANTS AND PRESUMABLY LEAVING OTHERS HOMELESS.

INDIA'S HOPES FOR SELF-SUFFICIENCY IN THE FOOD MARKET ALSO HAVE BEEN MARRED BY THE ERRATIC MONSOON. NEAR-DROUGHT OR DROUGHT CONDITIONS, WHICH HAVE BEEN REPORTED IN SEVERAL KEY NORTHERN STATES, MAY COMPEL THE ASIAN SUB-CONTINENT TO IMPORT AN ADDITIONAL 2 TO 3 MILLION TONS OF WHEAT THIS FALL FROM THE U.S. AND OTHER COUNTRIES AFTER AN EARLIER PURCHASE IN JULY {WASHINGTON POST, SEPT. 22, 1981}. FAMINE HAS OCCURRED IN MOST OF

RAJASTHAN'S (11 AND 12) 26 DISTRICTS, WHILE RICE CROP LOSSES OF 25 TO 30 PERCENT ARE EXPECTED IN THE UTTAR PRADESHES (7 AND 8) AND PUNJAB (9). TO HELP FARMERS PLANT SUBSISTENCE CROPS THIS FALL, SURPLUS WATER IS BEING DISTRIBUTED FOR IRRIGATION AND POWER SUPPLIES.

MOISTURE RESERVES WILL BE BOOSTED BY TWO WEEKS OF HEAVY RAINS OVER MUCH OF TAMIL NADU (22) IN SOUTHERN INDIA, WHICH SHOULD BENEFIT NEXT MONTH'S PLANTING OF THE WINTER RICE CROP. HOWEVER, SOME FLOODING LIKELY WAS TRIGGERED BY THE PRECIPITATION, WHICH TOTALED 200 TO 400 MM (8 TO 16 IN.) OVER MOST AREAS.

DROUGHT CONDITIONS HAVE LIKELY BEEN ERADICATED OVER MOST OF SRI LANKA, DUE TO SEVERAL WEEKS OF MODERATE-TO-HEAVY RAINS THAT RANGED FROM 100 TO 200 MM (4 TO 8 IN.). HOWEVER, THE MOISTURE HAS ARRIVED TOO LATE TO BENEFIT THE "YALA" SECONDARY RICE CROP, WHICH IS NORMALLY HARVESTED IN LATE SEPTEMBER OR EARLY OCTOBER.

SCATTERED FOOD SHORTAGES HAVE BEEN REPORTED IN NORTHERN AND SOUTHERN SECTIONS OF KAMPUCHEA (CAMBODIA) DUE TO ERRATIC DROUGHT AND FLOODS FROM THE SUMMER MONSOON THIS SEASON (WASHINGTON POST, SEPT. 21, 1981). IN SPITE OF SEVERAL RECENT DRY SPELLS IN THE NORTHERN HILLS DISTRICT (REGION 1), THREATS OF RENEWED FAMINE SHOULD BE MINIMIZED, SINCE THE BULK OF THE COUNTRY'S SUBSISTENCE AGRICULTURE IS RAISED FURTHER SOUTH NEAR THE COAST. ALSO, VARIOUS DATA SOURCES SUGGEST THAT ANY WATER SHORTAGES SHOULD BE VERY LOCALIZED IN THE NORTH DUE TO ADEQUATE SOIL MOISTURE RESERVES IN MOST SECTIONS.

PROJECTED FOOD DEFICITS ARE MORE LIKELY IN THE

WESTERN HILLS AREA (3), WHERE FREQUENT FLOODS HAVE BEEN REPORTED ALONG THE COAST SINCE MID-JUNE. FLOODING PROBABLY WAS AGGRAVATED DURING THE SECOND HALF OF THIS PERIOD DUE TO HEAVY COASTAL RAINS WHICH BROUGHT OVER 300 MM TO SOME AREAS. ANY RECENTLY PLANTED OR TRANSPLANTED RICE CROPS MAY HAVE SUSTAINED FURTHER LOSSES, WHICH WILL COMPOUND POTENTIAL FOOD PROBLEMS. THE FAO ESTIMATES A DEFICIT OF 160,000 TONS OF FOOD, PRIMARILY RICE, WHEN THE MAIN CROP IS HARVESTED IN DECEMBER AND JANUARY; CAMBODIAN GOVERNMENT AND SOVIET FIGURES ARE ROUGHLY TRIPLE THIS AMOUNT. THE U.N.'S EMERGENCY RELIEF PROGRAM MAY REQUIRE EXTENSION INTO 1982 IF FURTHER FLOODING OCCURS.

DROUGHT CONDITIONS APPEAR TO HAVE BEEN ALLEVIATED OVER VIETNAM'S SOUTHERN PLATEAU (4) DISTRICT BY SCATTERED SHOWERS AND THUNDERSTORMS DURING THE PERIOD. HOWEVER, WATER SHORTAGES PROBABLY STILL PREVAIL IN SOME AREAS, SINCE SOIL MOISTURE LEVELS REMAIN LOW IN ISOLATED LOCATIONS.

EXTENSIVE FLOODING, LANDSLIDES AND UPROOTED UTILITY POLES WERE REPORTED ACROSS THE NORTHERN PHILIPPINES DURING THE SECOND WEEK, AS TYPHOON "CLARA" STRUCK MUCH OF LUZON ISLAND WITH HEAVY WINDS AND RAINS (UPI, SEPT. 20, 1981). THE PROVINCE OF CENTRAL LUZON (1), CAGAYAN VALLEY (2) AND EASTERN LUZON (3) APPARENTLY BORE THE BRUNT OF THE STORM, WHICH LASHED NORTHERN AND EASTERN SECTIONS OF THE ISLAND WITH 120 KNOTS (140 MPH) WINDS AND 300 MM (12 IN.) RAINS. UNUSUALLY LOW PRECIPITATION TOTALS REPORTED IN WESTERN AND SOUTHERN LUZON (4 AND 5) APPEAR UNREPRESENTATIVE SINCE SATELLITE IMAGERY INDICATES THAT THE TYPHOON ENCOMPASSED THE ENTIRE ISLAND DURING SEPTEMBER 19 TO 20.

SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	SIG. WEATHER LONGER DURATION	INTENSITY	DURATION
INDIA/ E. UTTAR PRADESH {7}	FLOODS			
INDIA/ W. UTTAR PRADESH {8} PUNJAB {9} W & E RAJASTHAN {11 & 12} W & E. MADHYA PRADESH {13 & 14}	DRY	NEAR-DROUGHT	20-50 PCT.	6 WKS.
INDIA/ TAMIL NADU {22}	FLOODS			
SRI LANKA	WET			
KAMPUCHEA/ N. HILLS {1}	DRY			
KAMPUCHEA/ W. HILLS {3}	FLOODS			
VIETNAM/ S. PLATEAU {4}	DRY	DROUGHT	40-60 PCT.	12 WKS.
PHILIPPINES/ C. LUZON {1} CAGAYAN VALLEY {2} E. LUZON {3} W. LUZON {4} S. LUZON {5}	FLOODS			

OCTOBER 14, 1981: (SEPTEMBER 21 - OCTOBER 4 PERIOD)

1. REPORT FOR SEPTEMBER 21 - OCTOBER 4, 1981. THIS ASSESSMENT MAY BE SHARED WITH APPROPRIATE AGENCIES WITHIN HOST GOVERNMENT.

APPROXIMATELY 1,500 PEOPLE HAVE BEEN REPORTED DEAD AND THOUSANDS LEFT HOMELESS BY THE WORST FLOODING TO STRIKE NEPAL IN 30 YEARS ("WASHINGTON POST", OCTOBER 6, 1981). TORRENTIAL RAINS, ASSOCIATED WITH A TROPICAL DISTURBANCE THAT ORIGINATED IN THE BAY OF BENGAL, DUMPED 230 MM TO 780 MM (9.2 IN TO 31.2 IN.) IN THE CENTRAL AND WESTERN PORTION OF THE HIMALAYAN MOUNTAIN KINGDOM DURING THE SECOND WEEK. HUNDREDS OF THOUSANDS OF DOLLARS WORTH OF CROP DAMAGE WAS REPORTED, WHILE NUMEROUS MUD-BUILT AND CEMENT HOMES WERE SWEPT AWAY BY THE COLLAPSE OF A DAM NEAR NAHALPUR VILLAGE. TRANSPORTATION INTO KATMANDU WAS DISRUPTED DUE TO WASHED-OUT ROADS LINKING STRICKEN AREAS WITH THE CAPITAL.

PREVIOUS FLOODING IN THE NEIGHBORING INDIA PROVINCE OF E. UTTAR PRADESH LIKELY WAS INTENSIFIED BY THE SAME SYSTEM, WHICH DEPOSITED OVER 120 MM (4.8 IN.) IN NORTHERN AREAS. FINAL HARVESTING OF THE AUTUMN RICE CROP, WHICH SUSTAINED EARLIER DAMAGE FROM PAST STORMS, WILL BE FURTHER DELAYED, CONTRIBUTING TO INCREASED FOOD SHORTAGES.

FLOODWATERS HAVE STARTED RECEDING FROM MOST OF KONKAN, INDIA AND, ESPECIALLY BOMBAY, WHICH IS STILL RECOVERING FROM LAST WEEK'S TORRENTIAL DOWNPOURS. LOCAL AUTHORITIES ARE PROBABLY STILL ASSESSING THE DAMAGE FROM THE 650 MM (26 IN.) RAINS, WHICH KILLED ABOUT 15 RESIDENTS AND TRIGGERED EARTHSLIDES NEAR THE POPULOUS COASTAL CITY (AP, SEPTEMBER 23, 1981).

HARVESTING OF THE MAJOR RICE CROP MAY BE STARTED EARLY IN CENTRAL BURMA DUE TO THE EARLY WITHDRAWAL OF THE SUMMER MONSOON. SOME MOISTURE STRESS IS ESPECIALLY POSSIBLE IN THE PROVINCES OF CHIN, MANDALAY, SHAN AND SOUTHERN SAGAING, WHERE RAINFALL HAS BEEN RUNNING ONLY 20 TO 40 PERCENT OF THE LONG-TERM MEAN SINCE EARLY SEPTEMBER.

PROSPECTS FOR HIGH YIELDS OF THE MAJOR RICE CROP IN KAMPUCHEA'S WESTERN HILLS DISTRICT REMAIN POOR DUE TO PREVIOUS FLOOD DAMAGE TO TRANSPLANTED CROPS. ALTHOUGH CHRONIC FLOODING WAS SOMEWHAT RELIEVED OVER COASTAL SECTIONS, FOOD DEFICITS ARE STILL ANTICIPATED LATER THIS YEAR, WHICH WILL LIKELY PROMPT EXTENSION OF INTERNATIONAL RELIEF ASSISTANCE INTO 1982. CUMULATIVE RAINFALL SINCE EARLY JUNE STILL REMAINS CONSIDERABLY ABOVE NORMAL IN SOME FLOOD-STRICKEN AREAS - OVER 200 PERCENT OF THE LONG-TERM AVERAGE IN ISOLATED LOCATIONS.

FLOODWATERS BEGAN TO RECEDE ACROSS MUCH OF THE NORTHERN PHILIPPINES THIS PERIOD FOLLOWING THE ONSLAUGHT OF TYPHOON "CLARA" ON SEPTEMBER 19. IN THE WAKE OF THE STORM TWO NATIVE SHIPS WERE DESTROYED WITH OVER 20 PEOPLE CLAIMED MISSING AND PRESUMED DEAD, PRIMARILY OFF CAGAYAN ISLAND (UPI, SEPTEMBER 22, 1981).

2. TABULAR SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	SIG. WEATHER INTENSITY	SIG. WEATHER DURATION
NEPAL/				
MOUNTAINS				
W. HILLS				
E. HILLS				
W. TERAI	FLOODS			
INDIA/				
E. UTTAR PRADESH				
KONKAN	FLOODS			
BURMA/				
ARAKAN				
MAGWE				
CHIN				
MANDALAY				
SHAN				
SAGAING	DRY			
SRI LANKA/				
HILLS		DROUGHT	40-60 PCT.	44 WKS.
KAMPUCHEA/				
W. HILLS	WET			
PHILIPPINES/				
C. LUZON				
CAGAYAN VALLEY				
E. LUZON				
W. LUZON				
S. LUZON	DRY			

OCTOBER 15, 1981: (OCTOBER 5-11 PERIOD)

IRREVERSIBLE CROP DAMAGE IS EXPECTED OVER THE WESTERN HALF OF NEPAL IN THE AFTERMATH OF THE WORST FLOODING TO AFFECT THE AREA SINCE THE 1950'S. FLOODWATERS STARTED RECEDING ACROSS STRICKEN AREAS THIS WEEK WITH THE RETURN OF DRIER WEATHER, ALLOWING LOCAL OFFICIALS TO FURTHER ASSESS THE WIDESPREAD DAMAGE.

OCTOBER 16, 1981

A NOAA REPORT OF A SHORTFALL IN THE KAMPUCHEA RICE CROP OF 160,000 TONS WAS CREDITED TO THE FAO IN A RECENT WASHINGTON POST ARTICLE - AN APPARENT MISUNDERSTANDING ON THE PART OF THE WASHINGTON POST. THIS ARTICLE OF SEPTEMBER 21, 1981, WHICH STATED "THE U.N. FOOD AND AGRICULTURE ORGANIZATION ESTIMATES A DEFICIT OF 160,000 TONS OF FOOD, MOSTLY RICE, WHEN THE CURRENT RAINY SEASON'S CROP IS HARVESTED AT THE END OF THE YEAR.", WAS USED BY NOAA AS ANCILLARY DATA TO QUANTIFY AN EXPECTED LARGE SHORTFALL IN THE KAMPUCHEA RICE CROP DUE TO FLOODING. A SWEDISH REPORT OF 200,000 TONS AND A THAI REPORT OF MORE THAN 300,000 TONS WERE ALSO AVAILABLE WHEN THE REPORT WAS WRITTEN, BUT NOAA DECIDED TO ADOPT WHAT WAS THOUGHT TO BE A CONSERVATIVE FAO ESTIMATE. THE FAO HAS NOT, HOWEVER, YET RELEASED ITS 1982 ESTIMATE AND WE REGRET THE INACCURACY.

NOVEMBER 4, 1981: (OCTOBER 19 - NOVEMBER 1 PERIOD)

APPROXIMATELY 1,300 FISHERMEN WERE REPORTED LOST AND NEARLY 200 BOATS CLAIMED MISSING IN A TROPICAL STORM THAT LASHED COASTAL SECTIONS OF INDIA'S GUJARAT PROVINCE WITH 90 MPH WINDS AND 10 FOOT WAVES LATE THIS PERIOD. SEARCH PARTIES WERE IMMEDIATELY DISPATCHED TO TRACK DOWN ANY SURVIVORS IN THE ARABIAN SEA. OVER LOW-LYING AREAS TO THE EAST, LOCAL RESIDENTS WERE FORCED TO EVACUATE TO HIGHER GROUND DUE

TO OVERFLOWING DAMS. IN ADDITION, UPROOTED TREES, DAMAGED HOMES AND DISRUPTED COMMUNICATIONS WERE ATTRIBUTED TO THE STORM (WASHINGTON POST, AP, 11/2/81). PLANTING OF THE WINTER WHEAT CROP MAY HAVE BEEN HAMPERED IN SOME COASTAL AREAS DUE TO FLOODING.

SOWING OF THE WINTER RICE CROP SHOULD BENEFIT IN PARTS OF SOUTHEASTERN INDIA, ESPECIALLY IN TAMIL NADU DUE TO THE TIMELY ARRIVAL OF THE NORTHEAST MONSOON. AUTUMN IS THE MOST CRUCIAL SEASON FOR RICE PRODUCTION IN THIS PROVINCE, SINCE THE WINTER MONSOON CONSTITUTES THE PRIMARY MOISTURE SOURCE FOR AGRICULTURAL OUTPUT.

WEATHER ANALYSES AND AGROCLIMATIC CROP INDICES FOR THE PAST SEVERAL MONTHS (JUNE-SEPTEMBER 1981) SUGGEST MODERATE DROUGHT IMPACT IN PARTS OF SOUTH ASIA, PARTICULARLY IN COASTAL SECTIONS OF BANGLADESH AND BURMA. POTENTIAL AREAS OF CONCERN INCLUDE THE COASTAL AND HIGHLANDS REGIONS OF BANGLADESH AND ARAKAN, BURMA, WHERE MAIZE AND RICE MAY BE AFFECTED. TEST AND EVALUATION OF THESE INDICES IS STILL BEING CONDUCTED ON A TIMELY BASIS. STRONGER CONCLUSIONS REGARDING AGROCLIMATIC CONDITIONS IN PARTS OF SOUTH ASIA WILL BE MADE AS THE TEST MODE PROGRESSES AND APPROPRIATE DATA VALIDATION IS COMPLETED.

RECENT REPORTS OF DROUGHT AND WATER SHORTAGES IN VIETNAM'S TONKIN PROVINCE STILL APPEAR EXAGGERATED, SINCE VARIOUS DATA SOURCES INDICATE THAT LAST OCTOBER WAS MODERATELY WET ACROSS THE AREA.

HARVESTING OF THE MAJOR RICE CROP IN SOUTHEASTERN VIETNAM MAY BE FURTHER DELAYED BY A RENEWED SURGE OF

MODERATE-TO-HEAVY RAINS, WHICH LIKELY AGGRAVATED EARLIER MINOR FLOODING FROM TROPICAL STORM "FABIAN". HOWEVER, DEFICIENT MOISTURE RESERVES CAUSED BY RECENT DROUGHT WILL BE FURTHER REPLENISHED BY THE MUCH-NEEDED PRECIPITATION.

DROUGHT CONDITIONS HAVE RETURNED TO W. MINDANAO IN THE SOUTHERN PHILIPPINES DUE TO PERSISTENT DRYNESS SINCE SEPTEMBER. OUTPUT FROM HYDROELECTRIC POWERPLANTS HAS LIKELY BEEN REDUCED DUE TO SCATTERED WATER SHORTAGES. FINAL HARVESTING OF THE FIRST AND UPLAND RICE CROPS WILL PROBABLY RESULT IN VERY POOR YIELDS, AS CHRONIC DROUGHT HAS DOMINATED THE PROVINCE MUCH OF THE SEASON.

COASTAL FLOODING LIKELY RESULTED FROM HEAVY MONSOONAL RAINS, WHICH DUMPED 230 MM .480 MM (9.4 IN. 15.2 IN.) OVER W. SUMATRA, INDONESIA DURING THE LATTER HALF OF THE PERIOD. ANY DELAYED PLANTING OF THE MAIN RICE CROP SHOULD HAVE MINIMAL IMPACTS ON THE ECONOMY SINCE THE BULK OF THE NATION'S RICE IS RAISED ON THE ISLAND OF JAVA.

SUMMARY OF AFFECTED AREAS

		SIG. WEATHER		
REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
INDIA				
GUJARAT	WINDS, FLOODS			
INDIA				
COASTAL ANDHRA PRADESH				
TAMIL NADU	WET			

BANGLADESH

COASTAL

HIGHLANDS DRY

BURMA

ARAKAN DRY

VIETNAM

S. PLATEAU

MEKONG DELTA WET

PHILIPPINES

W. MINDANAO DRY DROUGHT 25-45 PCT. 10 WKS.

INDONESIA

W. SUMATRA FLOODS

NOVEMBER 10, 1981: (NOVEMBER 2-8 PERIOD)

RESCUE EFFORTS FOR HUNDREDS OF FISHERMEN CONTINUED OFF THE COAST OF SOUTHWESTERN INDIA AS HIGH WINDS AND FLOODING SUBSIDED ACROSS THE PROVINCE OF GUJARAT THIS PERIOD. OVER TEN LIVES WERE CLAIMED BY THE TROPICAL STORM, WHILE AT LEAST 100 HUTS WERE WASHED AWAY IN SEVERAL INLAND VILLAGES {UPI, 11/3/81}.

FIVE CHILDREN WERE REPORTEDLY WASHED OUT TO SEA AND 9 PEOPLE LEFT HOMELESS AS FLASH FLOODING SWEPT THROUGH SECTIONS OF THE NORTH-CENTRAL PHILIPPINES LAST WEEK {AP, 11/8/81}. IN ADDITION, A NEW BRIDGE WAS DESTROYED BY THE SWOLLEN DUMACA RIVER AFTER SEVERAL DAYS OF MODERATE-TO-HEAVY RAINS. THE STATE OF S. LUZON WAS APPARENTLY MOST AFFECTED BY THE PRECIPITATION, WHICH DUMPED 200 MM TO 250 MM {8 IN. TO 10 IN.} IN SOME AREAS.

NOVEMBER 19, 1981: (NOVEMBER 2-15 PERIOD)

PREVIOUS DAMAGE TO THE RICE CROP CAUSED BY TYPHOON "CLARA" HAS LIKELY BEEN COMPOUNDED BY THE RETURN OF DROUGHT CONDITIONS TO THE NORTHERN PHILIPPINES THIS PERIOD. HARVESTING OF THE FIRST RICE CROP LIKELY STARTED EARLY IN C. LUZON DUE TO THE DRY SPELL, WHILE THE GROWTH STAGE OF THE MAJOR CROP IN CAGAYAN VALLEY MAY BE SHORTENED THIS FALL. AGRICULTURAL OUTPUT SHOULD NOT BE SIGNIFICANTLY AFFECTED IN E. LUZON, WHERE RAINFALL HAS BEEN RUNNING ONLY 25 PERCENT OF THE LONG-TERM AVERAGE SINCE MID-SEPTEMBER. HOWEVER, LIVESTOCK AND GRAZING CONDITIONS MAY BE DETERIORATING DUE TO DRYING PASTURES.

FURTHER SOUTH, LAST WEEK'S FLOODING IN THE PROVINCES OF S. LUZON AND BICOL WAS AGGRAVATED BY MORE HEAVY RAINS WHICH DUMPED AN ADDITIONAL 200-300 MM IN SOME AREAS. CLEANUP OPERATIONS AND EFFORTS TO RELOCATE OVER 900 PEOPLE LEFT HOMELESS WERE LIKELY HAMPERED BY THE RENEWED SURGE OF PRECIPITATION AND MAY BE FURTHER HINDERED IF TYPHOON "HAZEN" THREATENS THE AREAS LATER THIS WEEK.

DROUGHT CONDITIONS WERE ALLEVIATED SOMEWHAT OVER WESTERN SECTIONS OF W. MINDANAO DURING THE LATTER HALF OF THE PERIOD, MODERATE RAINS DEPOSITED UP TO 80 MM NEAR THE COAST. PROSPECTS FOR FINAL REAPING OF THE FIRST AND UPLAND RICE CROPS OVER THE REMAINDER OF THE PROVINCE CONTINUE POOR, AS A CURTAILED HARVEST WILL LIKELY REDUCE POTENTIAL YIELDS.

TRANSPORTATION TIE-UPS, CONSTRUCTION PROBLEMS AND COMMUNICATIONS DISRUPTIONS WERE ATTRIBUTED TO TORRENTIAL RAINS WHICH OCCURRED OVER WESTERN SRI LANKA ON NOVEMBER 9-10. HARDEST HIT WAS THE CAPITAL CITY OF COLOMBO, WHICH RECEIVED APPROXIMATELY 200 MM (8 IN.) IN A 24-HR PERIOD. CONDITIONS REPORTEDLY WERE SLOWLY RETURNING TO NORMAL (EXCEPT FOR ERRATIC

TELEPHONE SERVICE) AS DRIER WEATHER REPLACED THE TROPICAL DISTURBANCE TOWARDS THE END OF THE WEEK.

OVERALL CROP PRODUCTION CONDITIONS FOR RICE HAVE BEEN REPORTED ADEQUATE IN BANGLADESH DESPITE THE EARLY WITHDRAWAL OF THE SUMMER MONSOON IN SEPTEMBER (FBIS, OCTOBER 1981). PROSPECTS ARE FAVORABLE FOR THE CURRENT HARVEST OF THE "AUS" CROP AND THE UPCOMING REAPING OF THE "AMAN" CROP. THIS YEAR'S GRAIN PRODUCTION IS ESTIMATED AT 16.2 MILLION TONS - AN INCREASE OF ONE MILLION FROM LAST YEAR'S YIELD (NEWSWEEK, /26/81).

TABULAR SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
SRI LANKA/ WET ZONE	FLOODS			
SRI LANKA/ HILLS	DRY	DROUGHT	25-45 PCT.	52 WKS.
PHILIPPINES/ C. LUZON, CAGAYAN VALLEY, E. LUZON	DRY	DROUGHT	20-40 PCT.	8 WKS.
PHILIPPINES/ S. LUZON, BICOL	FLOODS			
PHILIPPINES/ W. MINDANAO	DRY	DROUGHT	25-45 PCT.	12 WKS.

NOVEMBER 24, 1981: (NOVEMBER 2-15 PERIOD)

HARVESTING OF THE RICE CROP WAS LIKELY HAMPERED IN PARTS OF CENTRAL AND LOWER BURMA THIS WEEK, AS HEAVY RAINS FROM A TROPICAL STORM FELL ALONG THE COAST ON NOVEMBER 19-20. SOUTHWEST BURMA, INCLUDING THE PROVINCES OF ARAKAN AND IRRAWADDY, RECEIVED THE HEAVIEST PRECIPITATION, RANGING FROM 150-235 MM. FLOOD AND WIND DAMAGE WAS PROBABLY COMMON IN THESE REGIONS AS WINDS GUSTED TO NEAR-HURRICANE FORCE ALONG THE IMMEDIATE SHORE.

ANY FURTHER FLOODING IN THE CENTRAL PHILIPPINES WAS LIKELY MINIMAL AS THE FULL EFFECT OF TROPICAL STORM "HAZEN" REMAINED OFFSHORE EAST OF THE ISLANDS. SATELLITE IMAGERY AND SYNOPTIC REPORTS FOR NOVEMBER 19-20 INDICATE THAT THE SYSTEM WEAKENED CONSIDERABLY AS IT BRUSHED PARTS OF S. LUZON AND BICOL WITH LIGHT-TO-MODERATE RAINS AND MODERATE GALES. THE POTENTIAL FOR RENEWED FLOODING AND STRONG WINDS EXISTS WITHIN THE NEXT SEVERAL DAYS AS TYPHOON "IRMA" BEARS DOWN FROM THE EAST.

DECEMBER 3,1981: (NOVEMBER 16-29 PERIOD)

HARVESTING OF THE MAJOR RICE CROP IN CENTRAL BURMA LIKELY RESUMED THIS WEEK FOLLOWING TWO DAYS OF HEAVY RAINS AND WINDS FROM A TROPICAL CYCLONE AROUND NOVEMBER 20. SOME REDUCTION IN GRAIN YIELDS ARE POSSIBLE ALONG THE COAST, ESPECIALLY IN THE PROVINCES OF IRRAWADDY AND ARAKAN, WHICH EXPERIENCED 200 MM RAINFALLS AND NEAR-HURRICANE FORCE WINDS FROM THE STORM.

DEVELOPMENT OF THE "MAHA" MAIN RICE CROP MAY BE SLOWED IN PARTS OF SRI LANKA THIS FALL AND WINTER DUE TO ERRATIC RAINS SINCE THIS SUMMER. A STEADY NORTHEAST MONSOON IS CRUCIAL FOR A GOOD "MAHA" CROP, WHICH GENERALLY CONSTITUTES 65 PERCENT OF ANNUAL RICE PRODUCTION. THE HILLS REGION HAS

BEEN VULNERABLE TO CROP SHORTFALLS DURING MUCH OF 1981 DUE TO RECURRENT DROUGHT. RAINFALL HAS AMOUNTED TO 30-40 PERCENT OF THE LONG-TERM MEAN SINCE JANUARY.

APPROXIMATELY 270 PEOPLE WERE KILLED BY TYPHOON "IRMA" WHILE 200 OTHERS WERE REPORTED INJURED OR MISSING. THE STORM STRUCK THE NORTH-CENTRAL PHILIPPINES ON NOVEMB 23-24. LUZON ISLAND BORE THE BRUNT OF THE SYSTEM, WHICH SHED THE AREA WITH 140-MPH WINDS AND 10- TO 15-FT WAVES. TWO-HUNDRED FIFTY THOUSAND RESIDENTS WERE ALSO LEFT HOMELESS BY EXTENSIVE FLOODING AND MUDSLIDES. DISRUPTED TRANSPORTATION AND POOR COMMUNICATIONS HAVE RENDERED FINAL DAMAGE ESTIMATES INCOMPLETE, BUT VARIOUS SOURCES CLAIM THAT "IRMA" MAY BE THE WORST STORM TO STRIKE THE NORTHERN PHILIPPINES IN 10 YEARS (AP, 11/27/81, 11/29/81, N.Y. TIMES, 11/27/81).

THE AGRICULTURAL INDUSTRY IN THE NORTHERN PHILIPPINES HAS BEEN PLAGUED BY FREQUENT STORMS AND INTERVENING DROUGHT IN SOME REGIONS SINCE MID-SEPTEMBER. IN THE AFTERMATH OF TYPHOON "CLARA", WHICH STRUCK THE AREA IN LATE SUMMER, DEVELOPMENT OF THE MAJOR RICE CROP WAS PROBABLY THWARTED BY WIND AND WATER DAMAGE. POTENTIAL CROP YIELDS MAY ALSO BE REDUCED - BUT TO A LESSER DEGREE - BY A MODERATE EIGHT-WEEK DROUGHT THAT DOMINATED NORTHERN LUZON DURING OCTOBER AND PART OF NOVEMBER. THE RICE CROP IN THE CAGAYAN VALLEY WAS LIKELY DAMAGED BY LOCAL FLOODING AND HEAVY WINDS, WHILE HARVESTING OPERATIONS IN C. LUZON WERE PROBABLY HAMPERED BY SATURATED FIELDS.

MODERATE DROUGHT HAS BEEN ERADICATED OVER MUCH OF W. MINDANAO IN THE SOUTHERN PHILIPPINES DUE TO A RETURN OF SUBSTANTIAL RAINS THIS PERIOD. HOWEVER, FINAL PROSPECTS FOR THE MAJOR AND UPLAND RICE CROPS, WHICH ARE IN THE MIDDLE OF THEIR HARVEST, REMAIN POOR.

2. TABULAR SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEEKS	LONGER DURATION	INTENSITY	DURATION
PHILIPPINES/				
C. LUZON				
CAGAYAN VALLEY				
E. LUZON				
W. LUZON				
S. LUZON	FLOODS, WINDS			
PHILIPPINES/				
W. MINDANAO	WET			
BURMA/				
IRRAWADDY	WET			
ARAKAN	WINDY			

DECEMBER 9, 1981: (NOVEMBER 29 - DECEMBER 5 PERIOD)

PLANTING OF THE WINTER RICE CROP MAY HAVE BEEN HAMPERED BY HEAVY RAINS, WHICH LIKELY TRIGGERED SOME FLOODING ALONG COASTAL SECTIONS OF TAMIL NADU, INDIA. SEVERAL STATIONS RECEIVED UP TO 205 MM OF PRECIPITATION - OVER 400 PERCENT OF THE LONG-TERM MEAN. HOWEVER, DURING THE REMAINDER OF DECEMBER, DEVELOPMENT OF THE CROP SHOULD BENEFIT FROM REPLENISHED SOIL MOISTURE RESERVES.

CLEAN-UP OPERATIONS RESUMED, WHILE TRANSPORTATION AND COMMUNICATIONS LIKELY RETURNED TO NORMAL OVER THE NORTHERN PHILIPPINES IN THE AFTERMATH OF TYPHOON "IRMA". FLOODWATERS ALSO PROBABLY RECEDED AS DRIER WEATHER PREVAILED OVER MOST AREAS THIS PERIOD.

DECEMBER 19, 1981: (DECEMBER 13-19 PERIOD)

FLOODWATERS RECEDED AND COMMUNICATIONS LIKELY RETURNED TO NORMAL THIS WEEK, AS DRIER WEATHER RETURNED TO BANGLADESH AND EASTERN INDIA IN THE WAKE OF A RECENT TROPICAL CYCLONE. SOME LOSSES TO THE AMAN AND PRIMARY RICE CROPS, WHICH ARE IN THE MIDDLE OF HARVEST, ARE STILL POSSIBLE FROM THE HEAVY WINDS AND RAINS. HOWEVER, ANY ADVERSE IMPACTS ON THE CURRENTLY-PLANTED BORO CROP SHOULD REMAIN MINIMAL DUE TO ENHANCED MOISTURE RESERVES.

FLOODING HAS ALSO ABATED IN SOUTHEASTERN THAILAND FOLLOWING TWO WEEKS OF TORRENTIAL RAINS. THE FATE OF SEVERAL MISSING MARINERS OFFSHORE REMAINS UNCERTAIN, WHILE THE EXTENT OF ANY DAMAGE TO THE DEVELOPING RICE CROP IS STILL INDETERMINATE.

DECEMBER 31, 1981: (DECEMBER 13-26 PERIOD)

LOW SOIL MOISTURE RESERVES WERE REPLENISHED BY MODERATE RAINS WHICH FELL ACROSS CENTRAL SECTIONS OF INDIA THIS PERIOD. GROWING CONDITIONS FOR WINTER WHEAT WERE ALSO ENHANCED BY THE NEEDED RAINFALL. SOUTHERN PARTS OF THE MADHYA PRADESHE'S, NORTHEASTERN MAHARASHTRA AND VIDARBHA, WHICH HAD BEEN DRY SINCE LATE OCTOBER, RECEIVED 40 - 60 MM (1.6-2.4 IN.) OF PRECIPITATION. TIMELY MOISTURE IS ESSENTIAL FOR RAIN-FED WINTER CROPS IN CENTRAL INDIA SINCE LITTLE OR NO IRRIGATION WATER IS AVAILABLE FOR ADEQUATE GROWTH.

SEVEN PERSONS WERE REPORTED KILLED AND 26,000 WERE LEFT HOMELESS AS THE SECOND MAJOR TYPHOON WITHIN A MONTH LASHED THE CENTRAL PHILIPPINES ON DECEMBER 26-27. SEVERELY AFFECTED WAS THE PROVINCE OF MINDORO, WHERE OVER 5,000 HOMES WERE DAMAGED OR DESTROYED BY TYPHOON "LEE". SYNOPTIC DATA AND SURFACE OBSERVATIONS INDICATE THAT THE ISLAND OF BICOL BORE THE BRUNT OF THE STORM WITH 100 KT WINDS AND 340 MM

{13.5 IN.} RAINFALL TOTALS. PREVIOUS RICE CROP DAMAGE ISED BY TYPHOON "IRMA" LAST MONTH WAS LIKELY COMPOUNDED BY "LEE", WHICH WAS THE 23RD TYPHOON TO STRIKE THE AREA THIS SEASON.

AS FLOODWATERS CONTINUED TO RECEDE OVER EASTERN JAVA, INDONESIA AFTER A SPELL OF HEAVY PRECIPITATION IN EARLY DECEMBER, LANDSLIDES LIKELY MATERIALIZED IN WESTERN SECTIONS THIS WEEK DUE TO HEAVY MONSOONAL RAINS. TOTALS OF 200 TO 360 MM {8 IN. TO 14.4 IN.} WERE COMMON ACROSS MUCH OF THE WESTERN TIP OF THE ISLAND.

2. TABULARY SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
PHILIPPINES/				
S. LUZON				
MINDORO	WINDY			
BICOL	FLOODS			
INDONESIA				
JAVA	FLOODS			

JANUARY 6, 1982: (DECEMBER 27 - JANUARY 2, 1982 PERIOD)

FLOODWATERS STARTED TO RECEDE ACROSS THE CENTRAL PHILIPPINES LAST WEEK IN THE WAKE OF TYPHOON "LEE", ALLOWING CLEANUP OPERATIONS TO RESUME OVER STRICKEN AREAS. FINAL REPORTS INDICATED THAT 137 FILIPINOS WERE KILLED BY THE STORM, WHILE 500,000 PEOPLE WERE RENDERED HOMELESS.

JANUARY 21, 1982: (DECEMBER 27, 1981 - JANUARY 16, 1982 PERIOD)

DEVELOPMENT OF THE PRINCIPAL "MAHA" RICE CROP LIKELY REMAINS HAMPERED OVER THE NORTHERN TWO-THIRDS OF SRI LANKA DUE TO THE RECENT RETURN OF MODERATE-TO-SEVERE DROUGHT. THE DRY ZONE AND HILLS REGIONS HAVE BEEN EXPERIENCING APPRXIMATELY 25 PERCENT OF NORMAL MOISTURE SINCE EARLY NOVEMBER 1981. IN THE LATTER REGION DROUGHT APPEARS TO HAVE BECOME REESTABLISHED. THIS PATTERN IS SIMILAR TO EARLY 1981, WHEN THE NORTHEAST MONSOON ALSO WITHDREW PREMATURELY. A SUCCESSFUL SPRING HARVEST OF THE CROP IS CONTINGENT ON A NORMAL MONSOON DURING THE GROWING SEASON.

PLANTING OF THE SECOND RICE CROP HAS LIKELY BEEN FURTHER DELAYED OVER PARTS OF THE SOUTH-CENTRAL PHILIPPINES DUE TO THE WORSENING OF DROUGHT OR NEAR-DROUGHT CONDITIONS. THE PROVINCE OF W. VISAYAS HAS BEEN MOST VULNERABLE SO FAR. DRYNESS HAS PERSISTED THERE SINCE MID-NOVEMBER AND CONTINUES TO SPREAD INTO ADJACENT E. VISAYAS. WATER SHORTAGES REMAIN POSSIBLE IN BOTH REGIONS IF SEASONAL RAINS FAIL TO RETURN.

ATTERED MUDSLIDES LIKELY CONTINUED TO PLAGUE WESTERN PARTS OF JAVA, INDONESIA AFTER TWO WEEKS OF HEAVY RAINS. SOME STATIONS HAVE REPORTED 300-400 MM OF PRECIPITATION SINCE EARLY JANUARY. HOWEVER, ONGOING PLANTING OF THE SECOND RICE CROP SHOULD FURTHER BENEFIT FROM ENHANCED SOIL MOISTURE RESERVES ACROSS THE ISLAND.

2. SUMMARY OF AFFECTED AREAS

REGION	LAST 3 WEEKS	LONGER DURATION	INTENSITY	DURATION
SRI LANKA/				
DRY ZONE, HILLS	DRY	DROUGHT	20-30 PCT.	11 WKS.
PHILIPPINES/				
W. VISAYAS	DRY	DROUGHT	20-40 PCT.	11 WKS.

JANUARY 29, 1982: (JANUARY 10-23 PERIOD)

GROWTH OF THE PRINCIPAL "MAHA" RICE CROP HAS BEEN FURTHER THREATENED BY THE CONTINUATION AND EXPANSION OF DROUGHT CONDITIONS ACROSS SRI LANKA. MODERATE-TO-SEVERE DROUGHT PRESENTLY ENCOMPASSES THE ENTIRE ISLAND, WHICH HAS EXPERIENCED BELOW-AVERAGE RAINFALL SINCE LAST NOVEMBER. ON A PERCENTILE SCALE RANGING FROM 0-100, AGRO-CLIMATIC CROP INDICES ARE IN THE 5-10 RANGE. HISTORICALLY, SUCH LOW INDEX VALUES HAVE BEEN CORRELATED WITH MAJOR CROP FAILURES DURING THE CURRENT SEASON. PROSPECTS FOR A GOOD HARVEST THIS SPRING ARE POOR UNLESS SUBSTANTIAL RAINS MATERIALIZE BY FEBRUARY.

FINAL PLANTING OF THE SECOND RICE CROP HAS LIKELY BEEN DELAYED IN THE VISAYAS ISLAND CHAIN OF THE CENTRAL PHILIPPINES PRIMARILY DUE TO WORSENING DROUGHT. MODERATE-TO-SEVERE DRYNESS HAS BECOME WELL-ESTABLISHED OVER W. VISAYAS AND HAS ENVELOPED THE NORTHERN HALF OF ADJACENT E. VISAYAS THIS PERIOD. HOWEVER, THE THREAT OF WATER SHORTAGES HAS BEEN FORESTALLED IN THE SOUTHERN PART OF REGION 10 DUE TO THE ONSET OF LOCALLY HEAVY RAINS LAST WEEK. LOW-LYING FLOODING PROBABLY RESULTED IN THIS AREA, THOUGH, AS PRECIPITATION AMOUNTS REACHING 225 MM (9 IN.) WERE CONCENTRATED IN THE VICINITY OF LEYTE. LOW SOIL MOISTURE RESERVES HAVE LIKELY MATERIALIZED IN W. SABAH, MALAYSIA WHERE MODERATE DROUGHT HAS DEVELOPED. RAINFALL HAS BEEN ERRATIC AND LACKING SINCE LATE NOVEMBER, WITH CUMULATIVE PRECIPITATION RUNNING 30-40 PERCENT OF NORMAL. HOWEVER, CONDITIONS FOR HARVESTING OF THE RICE CROP HAVE BEEN FAVORABLE DUE TO THE DRY SPELL.

2. SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
PHILIPPINES/				
E. VISAYAS	FLOODS			
SOUTHERN PART				
PHILIPPINES/				
W. & E. VISAYAS	DRY	DROUGHT	20-40 PCT.	10 WKS.
MALAYSIA/				
W. SABAH	DRY	DROUGHT	30-40 PCT.	9 WKS.
SRI LANKA/				
ENTIRE AREA	DRY	DROUGHT	20-30 PCT.	10 WKS.

FEBRUARY 3, 1982: (JANUARY 24-30 PERIOD)

IN WESTERN PAKISTAN, WINTER GRAINS GREATLY BENEFITTED FROM MODERATE RAINFALL WHICH LIKELY ENHANCED MOISTURE RESERVES IN NORTHERN BALUCHISTAN AFTER PREVIOUS DRY WEATHER. FURTHER SOUTH, HOWEVER, MINOR FLOODING PROBABLY OCCURRED NEAR THE COAST, WHERE PRECIPITION AMOUNTS EXCEEDING 100 MM WERE REPORTED LAST WEEK.

GROWING CONDITIONS FOR WINTER WHEAT ALSO IMPROVED ACROSS CENTRAL INDIA, AS MODERATE RAINS FELL ACROSS THE AREA. WINTER RAINS ARE ESSENTIAL FOR PRODUCING GOOD YIELDS DURING THE HARVEST, WHICH NORMALLY RUNS THROUGH THE SPRING.

NEAR-DROUGHT CONDITIONS ARE DEVELOPING IN MALAYSIA'S NORTHWEST PROVINCE, WHERE RAINFALL HAS BEEN BELOW AVERAGE SINCE MID-DECEMBER. IMPACT ON AGRICULTURE SHOULD BE INSIGNIFICANT AT THIS TIME, THOUGH, SINCE THE RICE CROP IS PRESENTLY BEING HARVESTED.

FEBRUARY 11, 1982: (JANUARY 24 - FEBRUARY 6, 1982 PERIOD)

APPROXIMATELY 25 PEOPLE WERE PRESUMED KILLED IN NORTHERN KASHMIR, INDIA FROM A LANDSLIDE TRIGGERED BY HEAVY RAINS ON THE 2ND. SEVERAL HOMES AND CATTLE SHEDS WERE REPORTEDLY DESTROYED BY FLOOD-INDUCING RAINS, WHICH PROBABLY CAUSED SIMILAR DAMAGE IN NORTHERN PARTS OF THE NEIGHBORING NORTHWEST FRONTIER PROVINCE, PAKISTAN.

THE FOLLOWING STATEMENT SUMMARIZES A NOAA/CEAS CABLE RECENTLY SENT REGARDING THE 1981 CROP PROSPECTS IN BANGLADESH IN RESPONSE TO DECCA CABLE 0695. A 10 PERCENT SHORTFALL IN RICE PRODUCTION OF THE 1981 "AUS" AND "AMAN" CROPS IS EXPECTED IN SOUTHERN BANGLADESH DUE TO DROUGHT CONDITIONS EXPERIENCED FROM JUNE-NOVEMBER AND THE TROPICAL CYCLONE IN DECEMBER. THIS FORECAST IS BASED ON STATISTICAL CLIMATE/RICE YIELD MODELS WHICH INCORPORATED SEASONAL RAINFALL DATA. YIELDS WERE ALSO REDUCED BECAUSE OF FLOODS AND PEST OUTBREAKS DURING JULY. THE COASTAL AND HIGHLANDS REGIONS WERE MOST AFFECTED; IN THESE AREAS AGROCLIMATIC/CROP CONDITION INDEX VALUES UNDER 70 PERENT OF NORMAL WERE TABULATED. OVER 80,000 TONS OF RICE ALONE WERE REPORTED LOST IN MID-DECEMBER DUE TO THE TROPICAL CYCLONE.

YIELDS OF THE WHEAT AND "BORO" RICE CROPS, WHICH ARE SIGNIFICANTLY CORRELATED TO JANUARY-FEBRUARY RAINFALL, MAY ALSO BE REDUCED BY BELOW-AVERAGE PRECIPITATION SINCE MID-DECEMBER. A MORE DEFINITIVE ASSESSMENT ON THE CLIMATE IMPACT ON THESE CROPS WILL BE AVAILABLE IN EARLY MARCH.

THE FLOWERING STAGE OF SRI LANKA'S PRIMARY "MAHA" RICE CROP HAS LIKELY BEEN HAMPERED BY A LONG-TERM MODERATE-TO-SEVERE DROUGHT WHICH CONTINUES TO GRIP THE ISLAND. ALTHOUGH THE UPCOMING HARVEST OF THE CROP HAS PROBABLY STARTED EARLY,

PROSPECTS FOR A SUCCESSFUL YIELD THIS SPRING REMAIN POOR.

SOME DROUGHT IMPACT TO THE MAIN RICE CROP IS LIKELY IN THAILAND'S SOUTHEAST REGION DUE TO AN EXTENDED DRY SPELL. DESPITE ONE WET PERIOD NEAR THE BEGINNING OF DECEMBER, CUMULATIVE PRECIPITATION HAS BEEN RUNNING 40-60 PERCENT OF THE LONG-TERM MEAN SINCE LATE NOVEMBER. DURING THE CRITICAL GROWING MONTH OF JANUARY, RAINFALL RAN ONLY 10 PERCENT OF NORMAL. A FINAL ANALYSIS ON POTENTIAL REDUCTIONS OF CROP YIELD WILL BE AVAILABLE IN A FUTURE ASSESSMENT.

SCATTERED WATER SHORTAGES MAY BE DEVELOPING AS WELL OVER THE ADJACENT MALAYSIAN PENINSULA, WHERE NEAR-DROUGHT AND DROUGHT CONDITIONS HAVE DEVELOPED. RAINFALL, WHICH HAS BEEN ERRATIC SINCE MID-DECEMBER, HAS BEEN RUNNING 20-40 PERCENT OF NORMAL AND ONLY ABOUT 15 PERCENT SINCE JANUARY. PLANTING OF THE OFF-SEASON RICE CROP IN FEBRUARY MAY BE DELAYED IF SEASONAL RAINS FAIL TO RETURN. SINCE DRY SPELLS ARE COMMON ON THE PENINSULA DURING THE WINTER, ADEQUATE IRRIGATION IS A NECESSITY FOR A GOOD CROP. HOWEVER, THE DRYNESS HAS BENEFITTED THE ONGOING HARVEST OF THE MAIN RICE CROP.

FINAL TRANSPLANTING OF THE SECONDARY RICE CROP HAS LIKELY BEEN HINDERED BY PERSISTENT DROUGHT ACROSS W. VISAYAS IN THE PHILIPPINES. HOWEVER, DROUGHT IMPACT SHOULD BE INSIGNIFICANT SINCE, NORMALLY, LITTLE MOISTURE IS EXPECTED IN THE AREA UNTIL THE MAIN RAINY SEASON ARRIVES DURING APRIL AND MAY.

2. SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
THAILAND/				
SOUTHEAST	DRY	DROUGHT	40-60 PCT.	8 WKS.
MALAYSIA/				
NORTHWEST				
CENTRAL				
E. COAST				
SOUTHEAST	DRY	DROUGHT	20-40 PCT.	7 WKS.
PHILIPPINES/				
W. VISAYAS	DRY	DROUGHT	20-40 PCT.	12 WKS.
PAKISTAN/				
NORTHWEST FRONTIER	FLOODS			
INDIA/				
JAMMU AND KASHMIR	FLOODS			
BANGLADESH/				
COASTAL HIGHLANDS		DROUGHT	10-30 PCT.	8 WKS.
SRI LANKA (ALL)	DRY	DROUGHT	20-30 PCT.	12 WKS.

FEBRUARY 17, 1982: (FEBRUARY 7-13 PERIOD)

GRAZING AREAS PROBABLY EXPERIENCED RENEWED FLOODING IN PAKISTAN'S BALUCHISTAN PROVINCE, WHERE 90-120 MM OF PRECIPITATION WAS RECORDED. HOWEVER, GROWTH OF WINTER GRAINS BENEFITTED FROM THE RAINS.

MARCH 16, 1982: (MARCH 7-13 PERIOD)

ANY FLOODING FROM RECENT HEAVY RAINS LIKELY ABATED OVER PARTS OF NORTH-WESTERN INDIA THIS WEEK, AS DRIER WEATHER RETURNED TO W. UTTAR PRADESH AND PUNJAB. HARVESTING OF WINTER WHEAT, WHICH NORMALLY BEGINS IN MARCH, SHOULD PROCEED AS SCHEDULED.

MODERATE-TO-SEVERE DROUGHT PERSISTED ACROSS SRI LANKA THIS PERIOD DESPITE SOME SPOTTY RAINS OF 15-35 MM IN SOUTHERN AREAS. NEXT MONTH'S SOWING OF THE SECONDARY "YALA" RICE CROP REMAINS CONTINGENT ON THE TIMELY ARRIVAL OF SPRING RAINS.

MARCH 25, 1982: (MARCH 7-20 PERIOD)

PREPARATIONS FOR HARVESTING OF WINTER GRAINS IN WEST-CENTRAL PAKISTAN WERE LIKELY DELAYED BY MODERATE-TO-HEAVY RAINS DURING THE SECOND HALF OF THE PERIOD. SOME FLOODING PROBABLY ACCOMPANIED THE RAINS, WHICH LEFT 45-165 MM IN NORTHERN BALUCHISTAN. HOWEVER, PLANTING OF THE MAIN SURGARCANE CROP SHOULD BENEFIT FROM THE ABUNDANT MOISTURE.

LOCAL PROPERTY AND RELATED FLOOD DAMAGE LIKELY OCCURRED AS WELL IN NORTHWESTERN BANGLADESH AND SURROUNDING REGIONS FROM HEAVY THUNDERSTORMS DURING THE SECOND WEEK. RAINFALL AMOUNTS REACHING 105 MM WERE OBSERVED IN THE NORTHWEST REGION AND ADJACENT PARTS OF EASTERN INDIA. SOWING OF SUGARCANE AND THE "AUS" RICE CROP THIS MONTH SHOULD BE BOOSTED, THOUGH, BY ENHANCED MOISTURE RESERVES.

MAJOR FOOD SHORTAGES AND ADVERSE ECONOMIC IMPACT ARE LIKELY ACROSS SRI LANKA, WHICH REMAINS GRIPPED BY ITS WORST DROUGHT WITHIN A CENTURY. YIELD REDUCTIONS OF THE 1981 "YALA" RICE CROP WERE ESTIMATED TO BE SUBSTANTIAL, WHILE THE

OUTLOOK FOR THIS SEASON'S "MAHA" CROP IS SIMILARLY BLEAK.

'ORT CASH CROPS, SUCH AS TEA AND COCONUT, HAVE ALSO BEEN AFFECTED, WITH CURRENT PRODUCTION EXPECTED TO BE REDUCED BY 10-20 PERCENT. AS OF EARLY MARCH, AGROCLIMATIC/CROP CONDITION INDICES STOOD BELOW THE 10TH PERCENTILE - HISTORICALLY INDICATIVE OF CROP FAILURE. INDEX VALUES FOR THE LATEST RICE CROPS ARE COMPARABLE TO THOSE OF 1975/76, WHEN EMERGENCY FOOD RELIEF WAS AUTHORIZED. PROSPECTS FOR NEXT MONTH'S PLANTING OF THE 1982 "YALA" CROP ARE POOR DUE TO DEPLETED MOISTURE RESERVES IN TANKS AND RESERVOIRS.

PRODUCTION OF THE MAIN RICE CROP WILL LIKELY FALL BELOW NORMAL THIS SEASON IN SOUTHERN THAILAND, WHERE HARVESTING HAS PROBABLY BEEN COMPLETED EARLY DUE TO PROLONGED DRYNESS. THE COMBINATION OF FLOOD-INDUCING RAINS IN EARLY DECEMBER AND A SUBSEQUENT 3-MONTH DROUGHT HAS RESULTED IN DAMAGE TO THE CROP. AS OF LATE FEBRUARY, THE AGRO-CLIMATIC/CROP CONDITION INDEX FOR THE SOUTHEAST REGION WAS ONLY AT THE 3RD PERCENTILE - REPRESENTATIVE OF CROP LOSS.

YIELDS OF THE MAIN AND DRY-UPLAND RICE CROPS CURRENTLY BEING HARVESTED OVER THE MALAYSIAN PENINSULA WILL PROBABLY BE REDUCED AS WELL DUE TO ERRATIC RAINFALL FROM LAST YEAR'S 'MER AND WINTER MONSOONS. THE MAIN RICE MODELS FOR WESTERN MALAYSIA SUGGEST SHORTFALLS OF 15-20 PERCENT IN THIS SEASON'S OUTPUT. SOWING OF THE OFF-SEASON CROP WILL BE FURTHER DELAYED IF NORMAL RAINS FAIL TO MATERIALIZE.

HARVESTING OF THE RICE CROPS IN W. SARAWAK, MALAYSIA, CONTINUES TO BENEFIT FROM DRY WEATHER, WHICH HAS DOMINATED THE AREA SINCE EARLY JANUARY. BELOW-AVERAGE YIELDS ARE STILL EXPECTED, THOUGH, SINCE CUMULATIVE PRECIPITATION HAS BEEN RUNNING UNDER HALF OF THE LONG-TERM MEAN.

DEVELOPMENT OF THE SUGARCANE CROP HAS PROBABLY BEEN SLOWED IN W. VISAYAS, PHILIPPINES, DUE TO LONG-TERM DROUGHT. ANY ADVERSE IMPACT SHOULD BE MINIMAL, HOWEVER, SINCE SUGARCANE CAN BE GROWN ALL YEAR ROUND DURING THE WET AND DRY SEASONS. ADEQUATE MOISTURE WILL BE CRUCIAL, THOUGH, TO ENSURE GOOD PLANTING CONDITIONS FOR THE DRY-UPLAND AND MAIN RICE CROPS THIS SPRING.

APPROXIMATELY 30 PEOPLE WERE REPORTED KILLED AND 41 OTHERS CLAIMED MISSING IN THE SOUTHERN PHILIPPINES, WHERE TROPICAL STORM MAMIE STRUCK ON THE 20TH. SATELLITE IMAGERY INDICATES THAT WEST AND EAST MINDANAO BORE THE BRUNT OF THE ,RM, WITH HEAVY RAINS AND WIND GUSTS APPROACHING 60 KTS. SOME 15,000 PEOPLE WERE ALSO LEFT HOMELESS BY THE STORM.

2. SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
THAILAND/				
SOUTHEAST	DRY	DROUGHT	25-45 PCT.	14 WKS.
MALAYSIA/				
PENINSULA	DRY	DROUGHT	15-35 PCT.	13 WKS.
MALAYSIA/				
W/ SARAWAK	DRY	DROUGHT	35-55 PCT.	11 WKS.
PAKISTAN/	FLOODS			
BALUCHISTAN				
BANGLADESH/	FLOODS			
NORTHWEST				
SRI LANKA (ALL)	DRY	DROUGHT	20-40 PCT.	18 WKS.

APRIL 9, 1982: (MARCH 28 - APRIL 3 PERIOD)

DROUGHT CONDITIONS WERE SLIGHTLY ALLEVIATED OVER SRI LANKA DURING THE FIRST HALF OF THE PERIOD, WHEN MODERATE-TO-HEAVY RAINS DAMPENED THE ISLAND WITH 35-168 MM OF MUCH-NEEDED MOISTURE. THE PRECIPITATION REPRESENTED THE FIRST SUBSTANTIAL RAINS TO AFFECT THE AREA SINCE LAST NOVEMBER. HOWEVER, ANY BENEFICIAL IMPACT TO AGRICULTURE WAS OFFSET BY THE RETURN OF VERY DRY WEATHER TO ALL REGIONS IN LATE MARCH. PROSPECTS FOR THE 1982 SECONDARY "YALA" RICE CROP, WHICH IS SOWN-THEN TRANSPLANTED-FROM APRIL-JUNE, REMAIN GRIM DUE TO INADEQUATE STORAGE WATER IN RESERVOIRS AND TANKS.

HARVESTING OF THE 1981/82 "BORO" RICE CROP OVER MUCH OF BANGLADESH WILL BE FAVORED BY THE RETURN OF DRY WEATHER TO CENTRAL AND SOUTHERN AREAS THIS PERIOD, FOLLOWING ABUNDANT MARCH RAINS. YIELDS FOR THIS CROP, PRIMARILY RAISED IN THE NORTHEAST REGION, WILL PROBABLY BE NEAR TO BELOW NORMAL DEPENDING ON LOCAL IRRIGATION SUPPLIES. ALTHOUGH PRE-SEASON RAINFALL (JULY-SEPTEMBER) WAS ESSENTIALLY ADEQUATE, A DRY OCTOBER LIKELY REDUCED YIELDS IN LOCATIONS WHERE TANKS, PONDS, AND STREAMS ARE UTILIZED FOR IRRIGATION. PRECIPITATION DURING THE DRY MONTHS (NOVEMBER-FEBRUARY) IS LESS CRUCIAL FOR PROPER DEVELOPMENT DUE TO LOW MOISTURE DEMAND, WHILE EARLY SPRING RAINS CAN STILL BENEFIT THE CROP IN ITS FINAL GROWTH STAGES. REPORTED FOOD SHORTAGES IN BANGLADESH HAVE RESULTED FROM PREVIOUS DROUGHT CONDITIONS.

PROMPT PLANTING OF THE SECONDARY "AUS" RICE CROP THIS SPRING IS CONTINGENT UPON PRE-MONSOONAL SHOWER ACTIVITY DURING APRIL AND MAY.

DROUGHT CONDITIONS WERE SLIGHTLY ALLEVIATED ACROSS THE MALAYSIAN PENINSULA AND ADJOINING SOUTHEAST THAILAND THIS

PERIOD BY SOME MUCH-NEEDED PRECIPITATION. SATELLITE IMAGERY INDICATED THAT MOST OF THE AREA EXPERIENCED SCATTERED SHOWERS AND THUNDERSTORMS DURING BOTH WEEKS, WITH AN ESTIMATED 60-80 MM REPORTED. LONG-TERM DRYNESS SINCE MID-DECEMBER HAS RESULTED IN ADVERSE IMPACT TO THE RICE BEARING AREAS. LOCAL GOVERNMENT OFFICIALS RECENTLY STATED THAT APPROXIMATELY 400,000 TONS OF RICE WILL HAVE TO BE IMPORTED IN 1982 IF DROUGHT PERSISTS. SOWING AND TRANSPLANTING OF THE OFF-SEASON RICE CROP THIS SPRING MAY FACE FURTHER DELAYS CURTAILMENTS IF SEASONAL RAINS REMAIN ERRATIC OR SPARSE. AS OF MID-MARCH, YIELDS OF THE MAIN RICE CROP, WHICH SHOULD BE IN ITS FINAL HARVEST, WERE EXPECTED TO BE APPROXIMATELY 80 PERCENT OF NORMAL FOR THE FOLLOWING STATES: PERAK, KEDAH, SELANGOR, JOHOR AND PERLIS.

SOME REDUCTIONS IN YIELDS OF THE DRY-UPLAND AND MAIN RICE CROPS ARE LIKELY AS WELL IN W. SARAWAK, MALAYSIA DUE TO CONTINUED MODERATE DROUGHT. HARVESTING OF THE CROP HAS BEEN HASTENED, THOUGH, BY THE DRY SPELL. FURTHER EAST, PRODUCTION OF THE MAIN AND DRY-UPLAND CROPS IN W. SABAH SHOULD BE UNAFFECTED BY THE ONSET OF NEAR-DROUGHT CONDITIONS, SINCE HARVESTING WAS LIKELY COMPLETED BY MID-MARCH.

DROUGHT CONDITIONS WERE LIKELY ERADICATED IN W. VISAYAS OF THE PHILIPPINES AT THE EXPENSE OF FLOODING RAINS FROM TYPHOON NELSON IN LATE MARCH. SATELLITE PHOTOS AND SUPPORTING SYNOPTIC OBSERVATIONS INDICATED THAT THE CENTRAL PHILIPPINES WERE ENGULFED BY THE STORM'S CIRCULATION FOR 36-48 HOURS. WIDESPREAD PROPERTY DAMAGE AND SOME LOSS TO THE SECONDARY RICE CROP PROBABLY RESULTED IN THE AREA, WHICH WAS BUFFETTED BY WIND GUSTS APPROACHING 110 KTS AND HEAVY INS OF 100-200 MM.

2. SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
THAILAND/				
SOUTHEAST	SHOWERS	DROUGHT	30-50 PCT.	16 WKS.
MALAYSIA/				
PENINSULA	SHOWERS	DROUGHT	20-40 PCT.	15 WKS.
MALAYSIA/				
W. SABAH	DRY	DROUGHT	20-40 PCT.	7 WKS.
PHILIPPINES/				
W. VISAYAS	FLOODS			
SRI LANKA				
(ALL)	WET (FIRST WK)	DROUGHT	25-45 PCT.	20 WKS.

APRIL 23, 1982: (APRIL 5-11 PERIOD)

PREPARATIONS FOR HARVESTING OF WINTER GRAINS IN WEST-CENTRAL PAKISTAN WERE LIKELY DELAYED BY MODERATE-TO-HEAVY RAINS DURING THE SECOND HALF OF THE PERIOD. SOME FLOODING PROBABLY ACCOMPANIED THE RAINS, WHICH LEFT 45-165 MM IN NORTHERN BALUCHISTAN. HOWEVER, PLANTING OF THE MAIN SURGARCANE CROP SHOULD BENEFIT FROM THE ABUNDANT MOISTURE.

LOCAL PROPERTY AND RELATED FLOOD DAMAGE LIKELY OCCURRED AS WELL IN NORTHWESTERN BANGLADESH AND SURROUNDING REGIONS FROM HEAVY THUNDERSTORMS DURING THE SECOND WEEK. RAINFALL AMOUNTS REACHING 105 MM WERE OBSERVED IN THE NORTHWEST REGION AND ADJACENT PARTS OF EASTERN INDIA. SOWING OF SUGARCANE AND THE "AUS" RICE CROP THIS MONTH SHOULD BE BOOSTED, THOUGH, BY ENHANCED MOISTURE RESERVES.

MAJOR FOOD SHORTAGES AND ADVERSE ECONOMIC IMPACT ARE LIKELY ACROSS SRI LANKA, WHICH REMAINS GRIPPED BY ITS WORST DROUGHT WITHIN A CENTURY. YIELD REDUCTIONS OF THE 1981

"YALA" RICE CROP WERE ESTIMATED TO BE SUBSTANTIAL, WHILE THE OUTLOOK FOR THIS SEASON'S "MAHA" CROP IS SIMILARLY BLEAK. EXPORT CASH CROPS, SUCH AS TEA AND COCONUT, HAVE ALSO BEEN AFFECTED; WITH CURRENT PRODUCTION EXPECTED TO BE REDUCED BY 10-20 PERCENT. AS OF EARLY MARCH, AGROCLIMATIC/CROP CONDITION INDICES STOOD BELOW THE 10TH PERCENTILE - HISTORICALLY INDICATIVE OF CROP FAILURE. INDEX VALUES FOR THE LATEST RICE CROPS ARE COMPARABLE TO THOSE OF 1975/76, WHEN EMERGENCY FOOD RELIEF WAS AUTHORIZED. PROSPECTS FOR NEXT MONTH'S PLANTING OF THE 1982 "YALA" CROP ARE POOR DUE TO DEPLETED MOISTURE RESERVES IN TANKS AND RESERVOIRS.

PRODUCTION OF THE MAIN RICE CROP WILL LIKELY FALL BELOW NORMAL THIS SEASON IN SOUTHERN THAILAND, WHERE HARVESTING HAS PROBABLY BEEN COMPLETED EARLY DUE TO PROLONGED DRYNESS. THE COMBINATION OF FLOOD-INDUCING RAINS IN EARLY DECEMBER AND A SUBSEQUENT 3-MONTH DROUGHT HAS RESULTED IN DAMAGE TO THE CROP. AS OF LATE FEBRUARY, THE AGRO-CLIMATIC/CROP CONDITION INDEX FOR THE SOUTHEAST REGION WAS ONLY AT THE 3RD PERCENTILE - REPRESENTATIVE OF CROP LOSS.

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BEEN RUNNING UNDER HALF OF THE LONG-TERM MEAN.

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MALAYSIA/				
W/ SARAWAK	DRY	DROUGHT	35-55 PCT.	11 WKS.
PAKISTAN/	FLOODS			
SOUTHEAST	WET	DROUGHT	25-45 PCT.	17 WKS.
MALAYSIA/				
E. SABAH	DRY	DROUGHT	20-40 PCT.	8 WKS.
PHILIPPINES/				
BICOL	DRY	DROUGHT	30-50 PCT.	8 WKS.

PAKISTAN/

NWFP

PUNJAB FLOODS

INDIA/

SSAM

SUB-HIMALAYAN

W. BENGAL FLOODS

SRI LANKA (ALL) WET DROUGHT 30-50 PCT. 22 WKS.

MAY 5, 1982: (APRIL 18 - MAY 1 PERIOD)

2. HARVESTING DELAYS FOR THE WINTER WHEAT CROP LIKELY RESULTED IN PUNJAB, PAKISTAN AND PUNJAB, INDIA FROM HEAVY RAINS 15-30 APRIL. PRECIPITATION OF 60-200 MM PROBABLY DISRUPTED TRANSPORTATION AND LOCAL COMMERCE IN THE AREA. SINCE LATE JANUARY, A SERIES OF MID-LATITUDE DISTURBANCES HAS DOMINATED SECTIONS OF NORTHEASTERN PAKISTAN AND NEIGHBORING INDIA WITH ABNORMALLY HIGH RAINFALL. OUTBREAKS OF BROWNRUST AND RELATED CROP DISEASE IN SOME AREAS ARE ATTRIBUTED TO PROLONGED WET WEATHER.

3. ABUNDANT MOISTURE WILL BENEFIT ONGOING PLANTING OF THE SUGARCANE CROP AND FUTURE SOWING OF AUTUMN GRAINS.

4. SOME FLOOD IMPACT TO LOCAL TRANSPORTATION AND COMMERCE PROBABLY HAS OCCURRED IN TAMIL NADU, INDIA FROM MODERATE-TO-HEAVY RAINS 23-30 APRIL. THE WESTERN FRINGES OF AN OFFSHORE TROPICAL SYSTEM DAMPENED THE PROVINCE WITH 30-100 MM OF PRECIPITATION, WHICH MAY HAVE WASHED OUT SOME DIRT ROADS. IMMINENT PLANTING OF AUTUMN RICE AND OTHER GRAINS WILL BENEFIT BY ENHANCED MOISTURE RESERVES.

TORRENTIAL RAINS FROM PRE-MONSOONAL SHOWERS ERADICATED THE WORST DROUGHT TO STRIKE SRI LANKA IN OVER A CENTURY.

MUCH-WELCOME PRECIPITATION DURING THE PAST SEVERAL WEEKS HAS ELIMINATED A TENACIOUS PATTERN OF ABNORMALLY DRY WEATHER THAT PLAGUED THE ISLAND SINCE DECEMBER 1980. LONG-TERM EFFECTS ON AGRICULTURE STILL MAY BE ANTICIPATED DUE TO INADEQUATE WATER RESERVES IN IRRIGATION SOURCES. PROSPECTS FOR THE 1982 SECONDARY "YALA" RICE CROP, READY FOR TRANSPLANTING, HAVE IMPROVED SIGNIFICANTLY DUE TO THE COPIOUS RAINS. TIE-UPS IN TRANSPORTATION AND OTHER SERVICES LIKELY RESULTED FROM THE DOWNPOURS OF 90-200 MM OVER MOST AREAS.

6. THIS ASSESSMENT BEGINS THE REPORTING OF THE DEVELOPMENT AND PROGRESS OF THE 1982 SUMMER MONSOON. LATEST SATELLITE IMAGERY AND UPPER AIR MAPS SUGGEST THE MONSOON IS FORMING BETWEEN THE EQUATOR AND 5 DEGREES N. LATITUDE SOUTH OF THE BAY OF BENGAL. WHILE LOW PRESSURE IS SLOWLY INTENSIFYING OFF THE INDIAN SUBCONTINENT NEAR THE SURFACE, EASTERLY FLOW IN THE STRATOSPHERE REMAINS WEAK AT THIS TIME. ACCORDING TO CLIMATOLOGY THE SOUTHWEST MONSOON BEGINS ITS NORTHWESTERLY MIGRATION INTO SRI LANKA AND BURMA AROUND MAY 25, REACHING BANGLADESH AND CENTRAL INDIA BY JUNE 5. THIS TIMETABLE IS CRITICAL IN ASSURING PROPER PLANTING AND GERMINATION OF SUBSISTENCE AGRICULTURE THROUGHOUT MUCH OF THE AREA.

7. SEVERAL WEEKS OF COPIOUS RAINS ERADICATED DROUGHT CONDITIONS OVER THE REMAINDER OF THE MALAY PENINSULA. ALTHOUGH DROUGHT IMPACT TO THE RECENTLY-HARVESTED DRY-UPLAND AND MAIN RICE CROPS REMAINS LIKELY, PROSPECTS FOR THIS YEAR'S OFF-SEASON CROP CONTINUE TO IMPROVE WITH THE PRECIPITATION. SCATTERED DRY SPOTS PERSIST ACROSS EASTERN SECTIONS OF THE PENINSULA, BUT SHOULD RECOVER IF SHOWER ACTIVITY BECOMES MORE ACTIVE. WATER DEMAND FOR WESTERN MALAYSIA WILL LESSEN DURING

THE NEXT SEVERAL MONTHS, SINCE THE SOUTHWEST MONSOON REPRESENTS A SECONDARY MOISTURE SOURCE FOR THE AREA.

8. MOISTURE RESERVES FOR JUNE PLANTING OF THE MAIN AND DRY-UPLAND RICE CROPS REMAIN BELOW NORMAL DUE TO MODERATE-TO-SEVERE DROUGHT IN E. SABAH, MALAYSIA. CUMULATIVE PRECIPITATION CONTINUES TO AVERAGE 30 PERCENT OF THE LONG-TERM MEAN -- SINCE MID-FEBRUARY.

9. DROUGHT CONDITIONS CONTINUE TO WORSEN IN THE PROVINCE OF BICOL OF THE PHILIPPINES. PLANTING OF THE DRY-UPLAND AND RICE CROPS IS DELAYED DUE TO INADEQUATE RAINS.

10. SATELLITE PICTURES AND SYNOPTIC OBSERVATIONS INDICATE MUCH OF THE PHILIPPINES RECEIVED NEGLIGIBLE MOISTURE SINCE MID-TO-LATE MARCH, WHEN TYPHOON NELSON BUFFETTED SOUTHERN SECTIONS WITH HEAVY RAINS AND WINDS. BECAUSE THE PHILIPPINES DO NOT RECEIVE THE FULL BRUNT OF THE SUMMER MONSOON CIRCULATION, THE ISLANDS DEPEND UPON THE PERENNIAL MARCH OF THE INTERTROPICAL CONVERGENCE ZONE AND ASSOCIATED STORM ACTIVITY FOR MOISTURE. DUE TO ANNUAL RAINFALL OF 2000-4000 MM THROUGHOUT MUCH OF THE COUNTRY CROP FAILURES GENERALLY RESULT FROM DAMAGING TYPHOONS RATHER THAN DROUGHT.

11. SUMMARY OF AFFECTED AREAS

REGION	LAST 2 WEEKS	LONGER DURATION	INTENSITY	DURATION
MALAYSIA/				
E. SABAH	DRY	DROUGHT	25-45 PCT.	10 WKS.
PHILIPPINES/				
BICOL	DRY	DROUGHT	25-45 PCT.	10 WKS.
PAKISTAN/				
PUNJAB	FLOODS			
INDIA/				
TAMIL NADU	FLOODS			
SRI LANKA	FLOODS			

MAY 12, 1982: (MAY 2-8 PERIOD)

2. DAMAGING WINDS AND HEAVY RAINS FROM A TROPICAL CYCLONE STRUCK SOUTHWESTERN BURMA ON MAY 4TH, LIKELY DISRUPTING TRANSPORTATION, COMMUNICATIONS AND OTHER SERVICES. SATELLITE IMAGERY AND SURFACE OBSERVATIONS INDICATE THE STORM MADE LANDFALL DURING THE AFTERNOON OR EVENING, PACKING WINDS OVER 130 KTS AND HEAVY RAINS. PROVINCES OF ARAKAN, IRRAWADDY, AND PEGU BORE THE BRUNT OF THE CYCLONE. DAMAGE TO AGRICULTURE IS PROBABLY MINIMAL SINCE MOST OF THE SECOND RICE CROP HAS BEEN HARVESTED AND PLANTING OF THE MAIN CROP BEGINS IN JUNE.

3. BELOW-NORMAL RAINFALL IN MANY AREAS OF INDONESIA LIKELY PRODUCED ADVERSE IMPACT TO THE 1981/82 MAIN AND DRY-UPLAND RICE CROPS CURRENTLY BEING HARVESTED. PRECIPITATION DURING THE NORTHEAST MONSOON LAST FALL AND THE FOLLOWING WINTER WAS ERRATIC IN E. AND W. SUMATRA, NUSA TENGGARA AND N. AND S. SULAWESI. THESE REGIONS, WITH JAVA AND KALIMANTAN, WERE DRY LAST MARCH AND APRIL, RAINFALL AVERAGING 20-40 PERENT OF NORMAL. AGROCLIMATIC/CROP YIELD INDICES, EXPRESSED AS PERCENTILES ON A SCALE OF 0 TO 100, ARE NEAR THE 10TH PERCENTILE THROUGHOUT MOST AREAS. SUCH INDEX VALUES HAVE HISTORICALLY INDICATED CROP FAILURE OR THE INABILITY TO SUCCESSFULLY GROW MULTIPLE RICE CROPS DURING THE SAME SEASON. PERSISTENT DRY WEATHER MAY HINDER ONGOING PLANTING AND TRANSPLANTING OF THE SECONDARY RICE CROP.

4. ERRATIC RAINFALL LIKELY HAS ADVERSELY AFFECTED THE SECONDARY RICE CROP IN PARTS OF THE PHILIPPINES. A COMBINATION OF DRY WEATHER AND FLOOD-PRODUCING RAINS SINCE DECEMBER LIKELY HAS RESULTED IN BELOW-NORMAL YIELDS IN PARTS OF BICOL AND W. AND E. VISAYAS. AGRO-CLIMATIC/CROP CONDITION INDICES RANGE 50-60 PERCENT OF NORMAL IN THESE AREAS.

CONTINUING DRY WEATHER MAY DELAY SPRING PLANTING OF THE MAIN AND DRY-UPLAND RICE CROPS IN THESE AREAS AS WELL AS W. AND E. MINDANAO.

5. THE POOR 1981-82 NORTHEAST MONSOON SEASON MAY REDUCE YIELDS OF THE SECOND MAIN RICE CROP IN VIETNAM'S ANNAM REGION. ESTIMATED RAINFALL DURING THIS PERIOD WAS 35-40 PERCENT OF NORMAL. TIMELY RAINS ARE NECESSARY THIS MONTH FOR PLANTING OF THE FIRST MAIN CROP AND THE DRY-UPLAND CROP IN THE S. PLATEAU.