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# TRAINING REPORT

SATELLITE CROP MONITORING WORKSHOP

THAILAND

Conducted By

U.S. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
COOPERATIVE INSTITUTE FOR APPLIED METEOROLOGY,
UNIVERSITY OF MISSOURI-COLUMBIA
U.N. ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
ASIAN INSTITUTE OF TECHNOLOGY

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# THE REPORT OF SATELLITE CROP MONITORING WORKSHOP

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COMPLETED AT

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## EXECUTIVE SUMMARY

This workshop program concentrated on the use of potential tools for assessment the crop condition in Thailand. Three potential tools were emphasized:

1. Meteorological satellite, AVHRR/NOAA level 1B data to evalute land use and crop conditions using The Ambroziak Color Coordinate system

2. The normalized difference vegetation index (NDVI) with the meteorological data for enhancement the correction analysis

3. DRAGON,MICVEGI and LOTUS software

The vegetation index and color coordinate system from AVHRR/NOAA satellite is a promissing tool that can supplement hard copy images from these satellites. This satellite system provides large area daily coverage as opposed to the 16 to 18 day recurring coverage for Landsat. The data from AVHRR/NOAA must be used in conjunction with other elements such as precipitation, crop calender and landuse maps. Efforts should be made to integrate satellite data into operational agricultural assessment in Thailand.

Numerous potential applications for this data have been identified, in particular, Fisheries, Marine science and Irrigation Department.

ACKNOWLEDGEMENT

The authors of the report were sponsored by

1. UNDP AND USAID/OFDA funding
2. NOAA/CIAM technical training
3. ESCAP is coordinating the programme

The workshop was coordinated by Dr.Gary E. Johnson, Chief of the CAB, NOAA. He conducted various lectures on crop monitoring and remote sensing technique and shared his experience with the authors, his guidance and suggestions during the course of training are sincerely appreciated.

Dr. Wayne L. Decker, Chairman of Atmospheric Sciences , University of Missouri-Columbia, lectured on plant process models for Assessing production.

Dr. Rao Achutuni, Agricultural Meteorologist, NOAA , lectured on the Normalized Difference vegetation Index (NDVI).

Dr. Oranut Paisarnuchapong, a Senior Meteorologist from the Thai Meteorological Department, lecture on techniques for minimizing cloud contamination in satellite images analysis.

Ms. Sandra Weisman and Mr.Michael Scheinkman, Computer specialist from CIAM, lectured on introduction to the DRAG-ON, NDVI, XY program, MICVEGI, FCONVERT software for analysing NOAA/AVHRR data.

The authors also wish to thank Dr. John Lukens, AIT, Mr. Jan Orsini, ESCAP for their valuable guidance and strong support.

Finally, we would like to thank INRDM Staff for their helpful.

## I. INTRODUCTION

The National Oceanic And Atmospheric Administration (NOAA), working with the U.S. Agency For International Development's Office Of Foreign Diaster Assistance (USAID/OFDA) and The Cooperative Institute For Applied Meteorology (CIAM) has designed and developed a drougt early warning system for food crops in tropical regions. This system is based upon the detection of below normal rainfall during the growing season and AVHRR imageries on the ambroziak color coordinated system (ACCS) is being used on the phase I mission.

The technology transfer during phase I focused on the utilization of cumulative rainfall indices and statistical climate crop yield models to :-

1. Monitor drought
2. Assess the impact on crop production and
3. Produce and dissiminate an operational crop assessment early warning bulletin within each country, The National Meteorological Department, The Ministry Of Agriculture, and the agency involved in matters of national food security for instance.

Phase I was considered quite successful in Thailand. The drought early warning units within the government framework, especially effective during the severe drought of 1987, and the crop assessment bulletins on a near real-time basis has been made.

The phase II project is being held at the Asian Institute of Technology (AIT) for 4 weeks (12 June - 7 July 1989) to utilize NOAA/AVHRR satellite data which can be recieved at the Meteorological Department of Thailand on twice daily basis. Although relatively coarse in resolution, the NOAA satellite data enables a continous real-time analysis of the phenologv of any crop provided the monsoon clouds can be removed by selection of the cloud free areas of a sequence of superimposed images. This low cost technology, developed and refined by the climate applications branch of NOAA and CIAM, has been tested extensively in the sahelian countries of Africa.

## 2. NOAA SATELLITE DATA CHARACTERISTICS

The AVHRR form NOAA satellite are channel 1, channel 2 and channel 4 being received by The Facility of The National Meteorological Department of Thailand on the level 1B computer compatible tape (CCT) archiving system.

The AVHRR data which is covered the whole country will be selected for each agency and downloaded to the diskettes archiving. The distribution of the diskettes will be set up from the MET Office to the Office of Agricultural Economics (OAE), The Department of Agriculture (DOA) and The National Research Council on daily basis.

## 3. PROPOSED DATA PRODUCTS, FLOW AND INTEGRATION

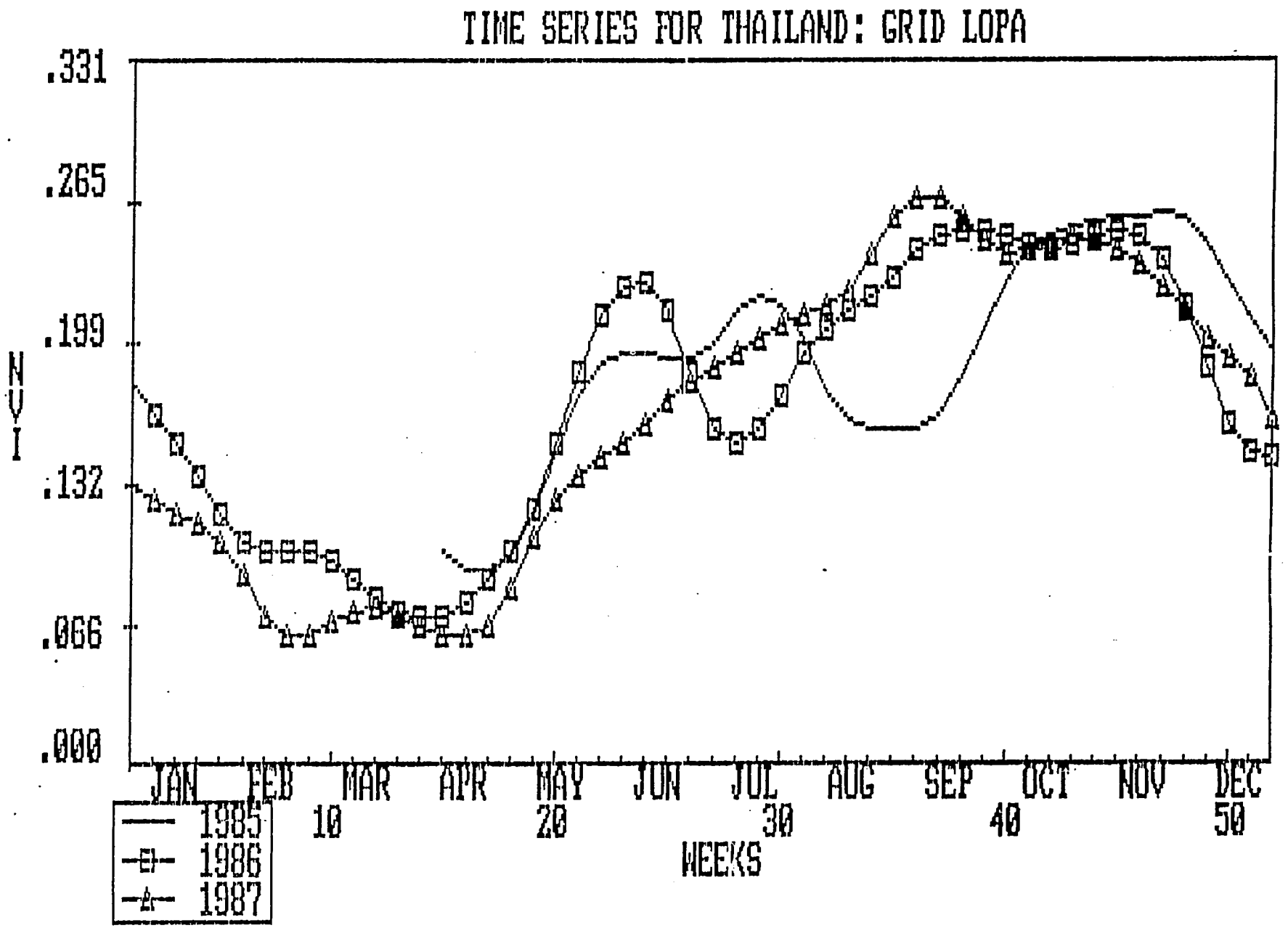
### 3.1 NDVI

LOP BURI PROVINCE

In 1987 early start of growing season compare to 1985, 1986 and 1988 (Fig. 1,2). But in 1987 had dry spell in JUNE make a serious damage to crop, especially maize which grow in March and April. Although in 1986 the planting was stayed on the peak in June and declined in July because of the maize harvested period, in contravercy NDVI curve increase again from second crop season.

SARA BURI PROVINCE

Sara Buri is also one of the major planted area of maize of Thailand 1987 shown slightly ahead of growing season compared to 1985, 1986 and 1988. Dry spell in June might have some effect on crop, but not serious as on Lop Buri, 1986 and 1988 will have good crop production, when compared to 1985 and 1987.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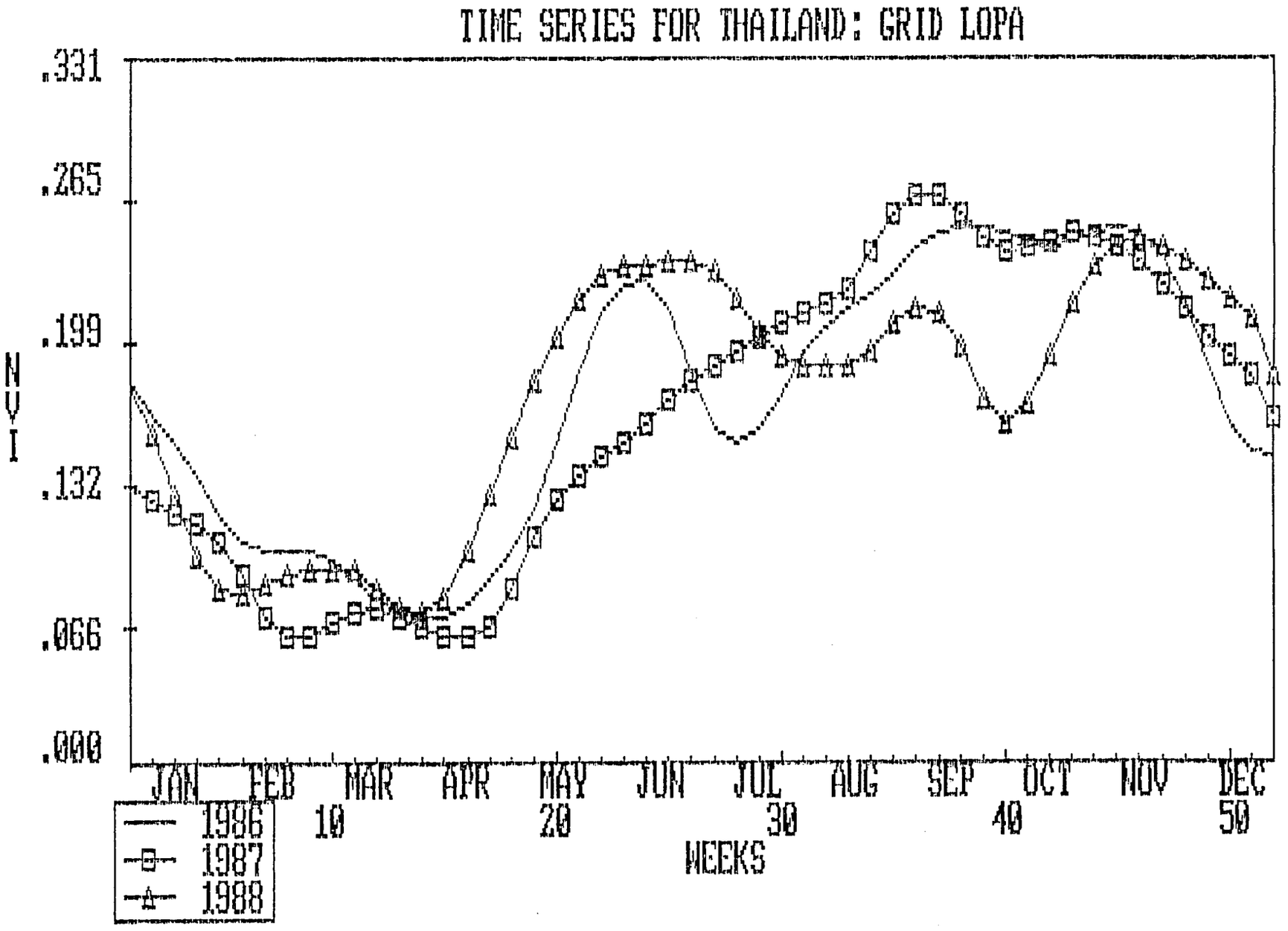
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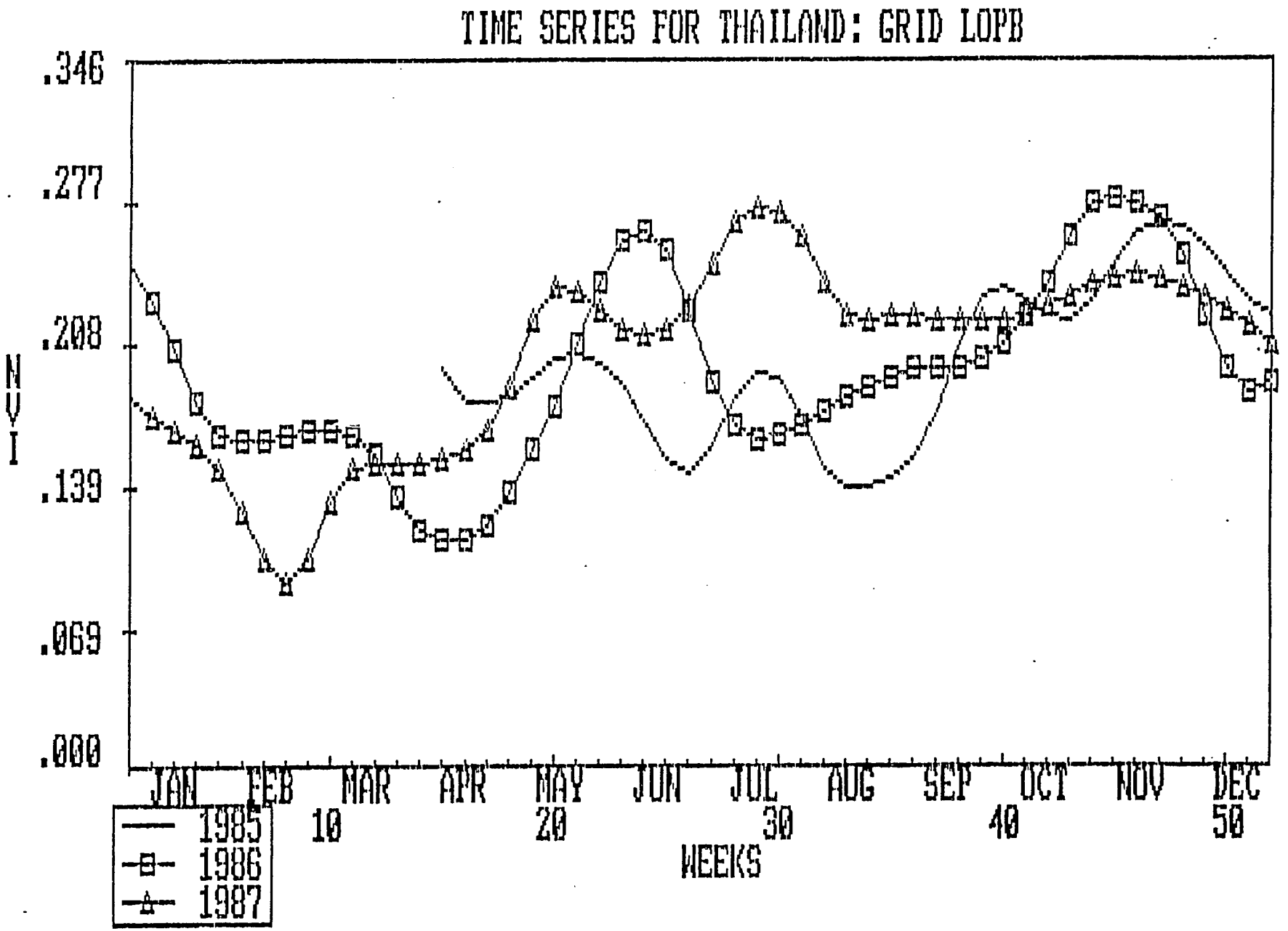
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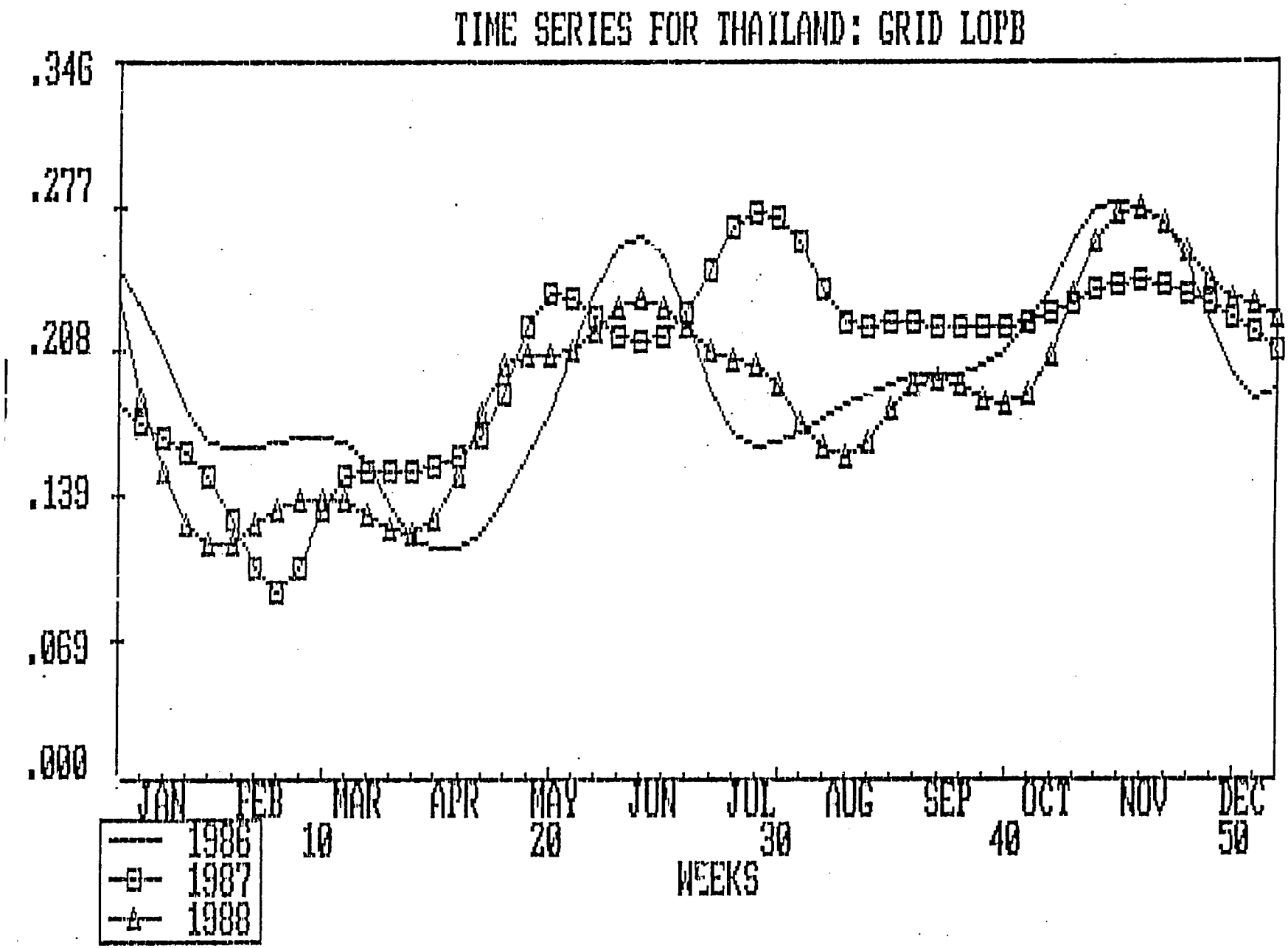
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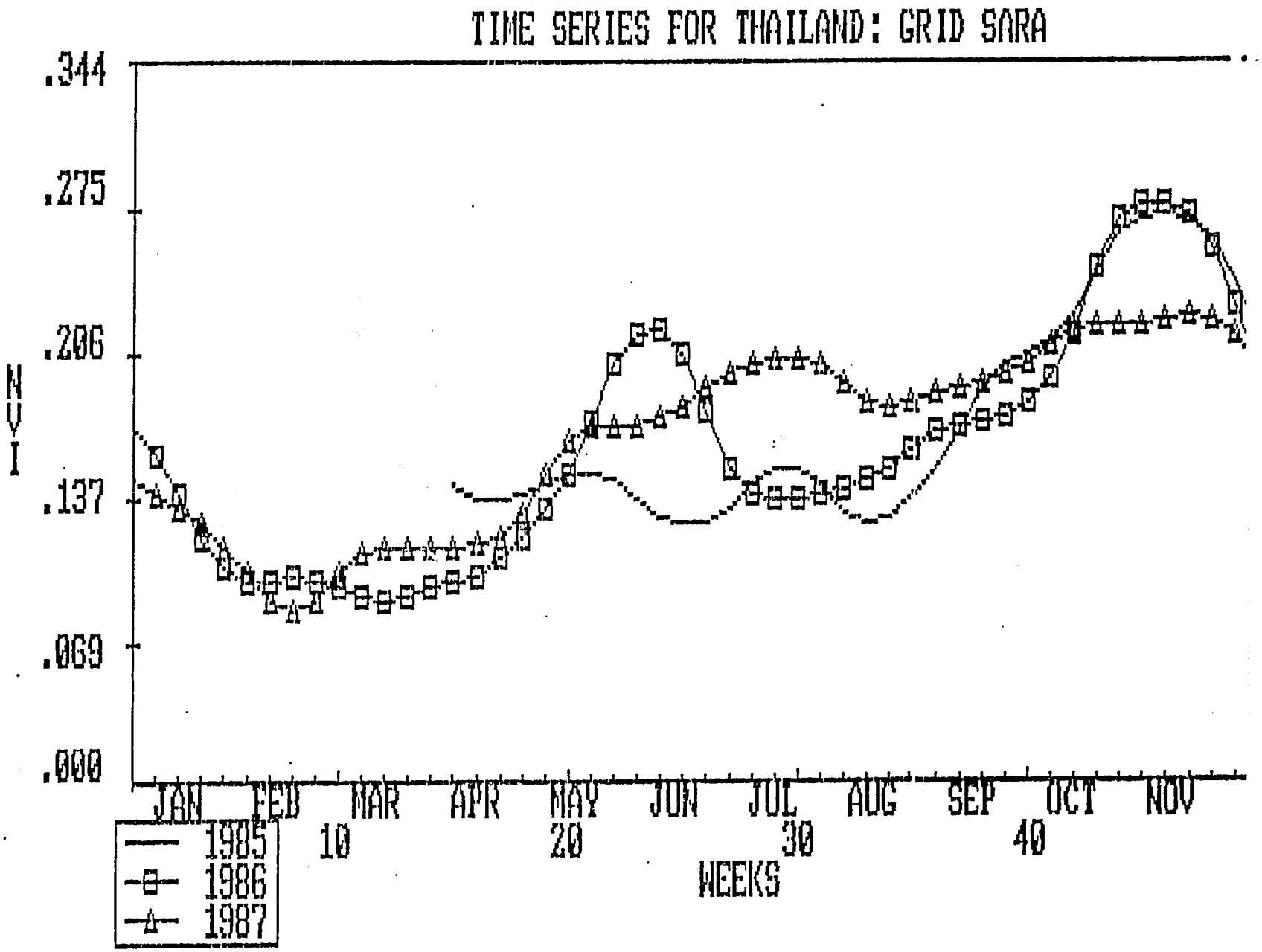
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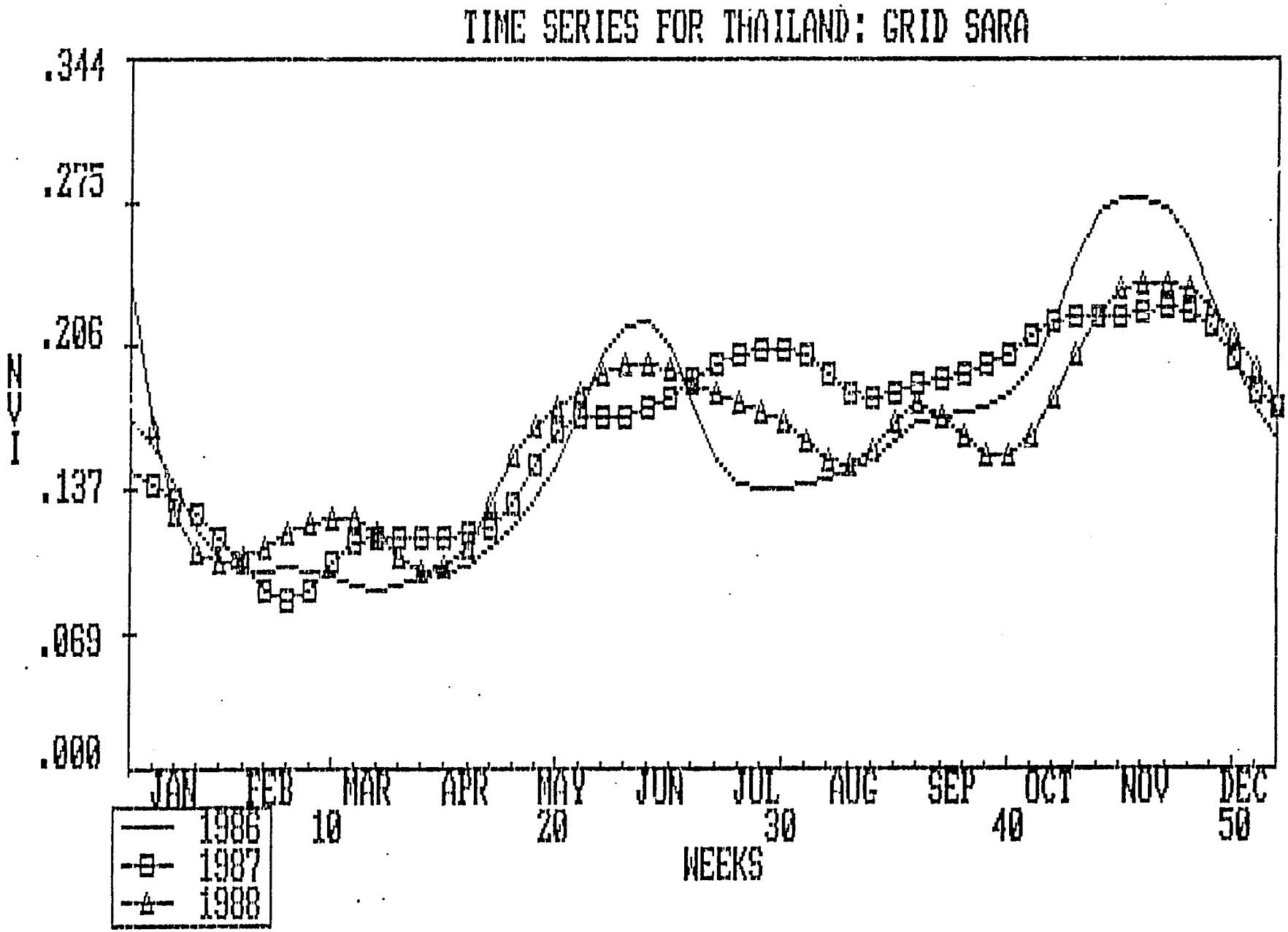
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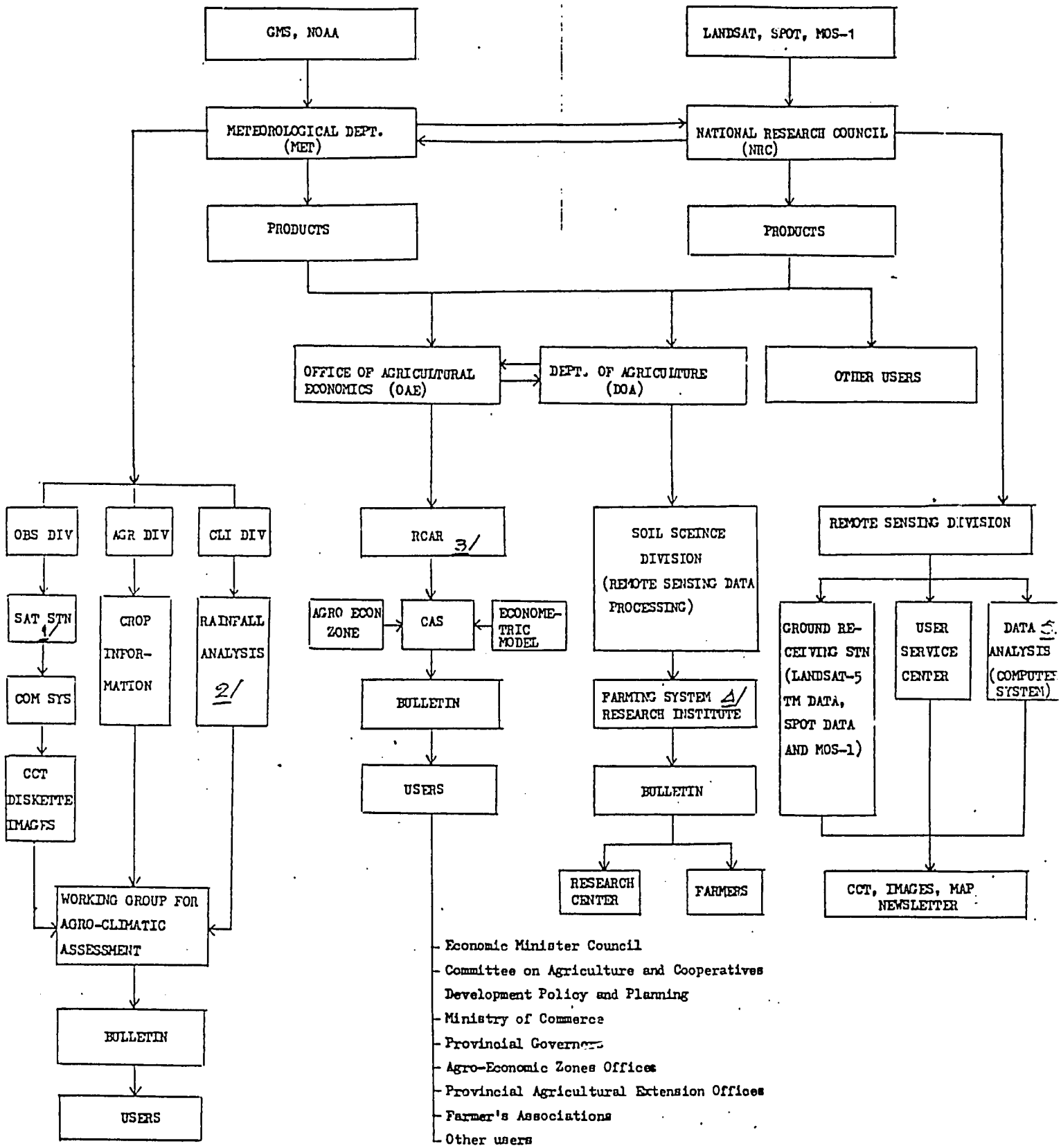
# LINKAGE BETWEEN ORGANIZATIONS



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## 3.2 IMAGE ANALYSIS

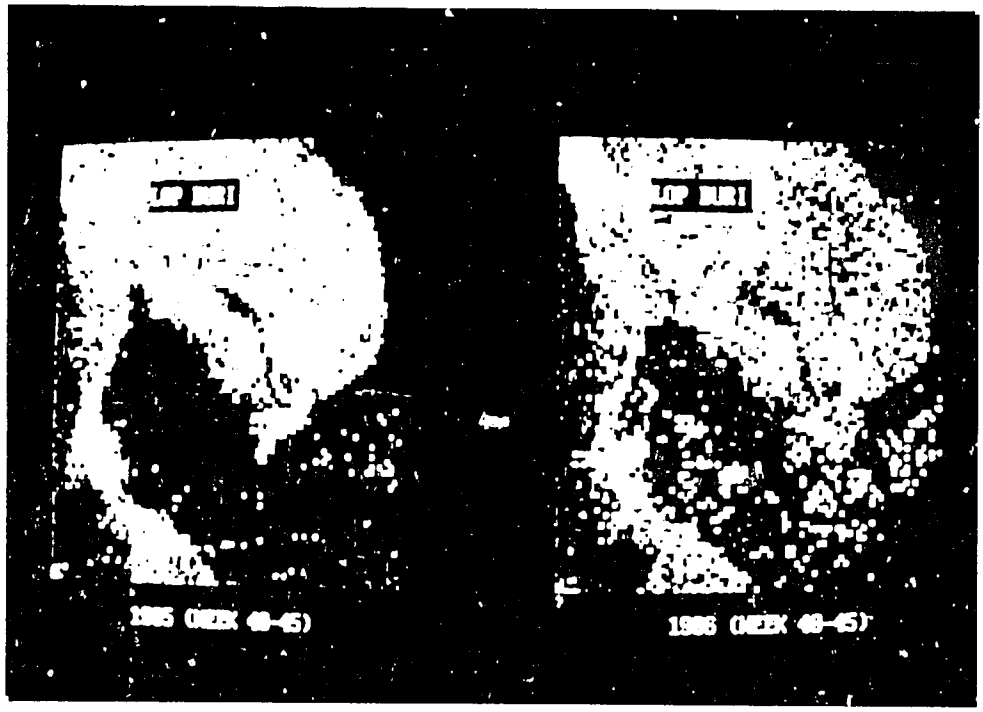
The AVHRR data recorded on 1985-1988, September-October in the period of 6 weeks, the weekly composite on this period were produced and taken, to create the NDVI image by using Ambroziak Color Coordinating System (ACCS) for image analysis.

In 1985 and 1986 the color look yellow. The yellow-green can be seen in the 1987 and 1988 images. From monthly rainfall record shows that the rainy season was delayed. Obviously, the crop calendar of Lop Buri was main rice in the highest vegetative or flowering period.

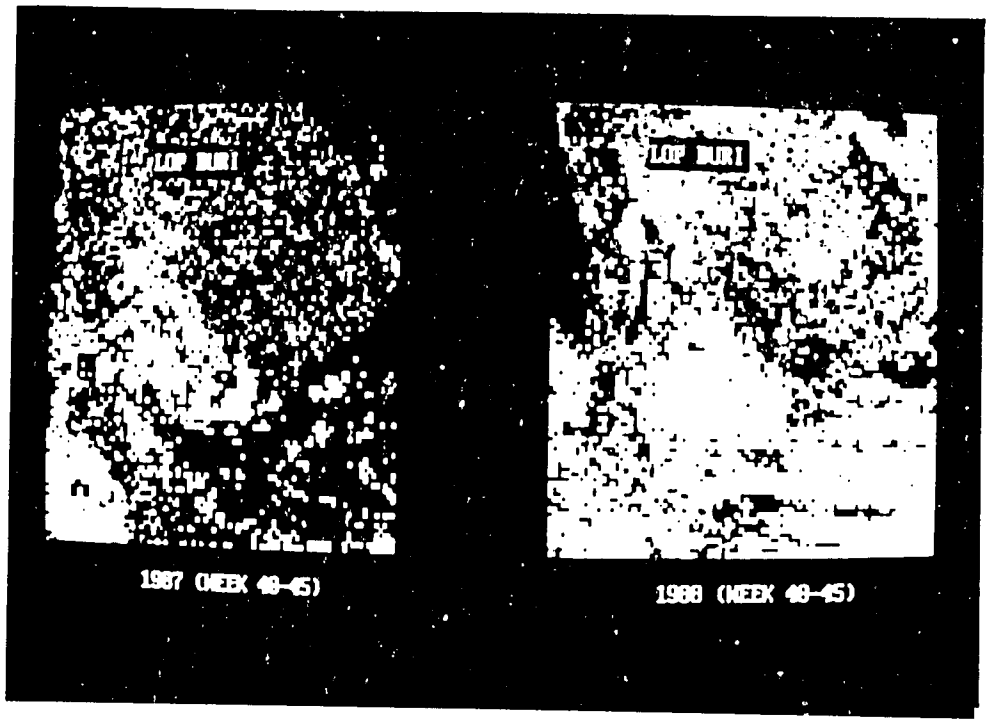
## 3.3 DATA INTEGRATION

There are 4 agencies involved in satellite crop monitoring mission; The Meteorological as the diskette contribution, The National Research Council, The Office of Agriculture Economics (OAE) and The Department of Agriculture (DOA) as the end user.

The flow chart of the assessment procedure and responsibilities are showed on appendix.




1985 (WEEK 40-45) 1986 (WEEK 40-45)




1987 (WEEK 40-45) 1988 (WEEK 40-45)

## 4. THE ASSESSMENT BULLETIN

There are two bulletins area available at the present time.

Firstly, The report of climatic impact assessment for Thailand. This montly report is being managed and distributed by the working group of The Meteorological Department Staff. Secondly, The OAE produces a weekly bulletin on crop conditions and farm-gate price. This report is routinely reached to The Economic Ministry Council every monday as well as to the related agencies.

Proposed changes in two bulletins format and contents from the AVHRR data will enhance them more accurate confidential and reliable than ever before.

## 5. PLANNING AND FOLLOW UP

The color monitor (NEC Multisync II) and card for NRC, DOA, MET, and PC (supplied)to OAE will be provided through the escap channel and the installation the equipment with a personal computer (PC) at each agency will be arranged on their own responsibility.

The field verification and final evaluation has been drawn for more confidential interpretation after the man power, equipment, information and analysis are combined together for a period of time.

## 6. CONCLUSIONS AND RECOMMENDATIONS

6.1 The 4 weeks workshop at AIT is tremendous benefit to Thailand. We have been informed of the new technology on satellite crop monitoring. It gained our knowledge and experience from both in the classroom and on the field with many models which can be applied to other agencies.

6.2 The AVHRR data and ACCS can be useful in assessing the crop condition and trend of agricultural crops. To do this most effectively data with minimal cloud is required and more experience in relating image tones to crop conditions must be completed.

6.3 In the topic humid and monsoon area, the cloud is the main obstructions. Although the weekly composite is being used.

6.4 Soil moisture regime should be added on the analysis procedure.

6.5 The Meteorological station and planted area are not the same location.

6.6 The agriculture staff on planting area should report the crop condition to the head office for analysis.

There is a need to flow the AVHRR/NOAA level 1B data on a weekly basis, field verification for interpretation result, and intergrate the results in a cooperative way with The Agroclimatic Assessment team in Thailand.

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## 9. APENDICES

9.1 The organization chart assessment the linkage between organizations and responsibility have show onfigure I.

9.2 Listing of equipment and data provided through the workshop:-

9.1.1 1 set of NEC multisync II color monitor

9.2.1 AIT wonder card (XUGA)

9.3.1. 7 diskette.

- 3 Dragon image processing systems
- 1 NDVI Software
- 1 Fconvert
- 1 XY programme
- 1 MICVEGI software