

**REPORT  
ON THE  
AGRO-ECOLOGICAL ZONES PROJECT**

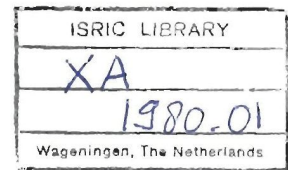
**Vol. 4**

**RESULTS  
FOR SOUTHEAST ASIA**

**Also issued in this series:**

1. Report of the First Meeting of the Advisory Panel on the Soil Map of the World, Rome, 19-23 June 1961.
2. Report of the First Meeting on Soil Survey, Correlation and Interpretation for Latin America, Rio de Janeiro, Brazil, 28-31 May 1962.
3. Report of the First Soil Correlation Seminar for Europe, Moscow, USSR, 16-28 July 1962.
4. Report of the First Soil Correlation Seminar for South and Central Asia, Tashkent, Uzbekistan, USSR, 14 September to 2 October 1962.
5. Report of the Fourth Session of the Working Party on Soil Classification and Survey (Subcommission on Land and Water Use of the European Commission on Agriculture), Lisbon, Portugal, 6-10 March 1963.
6. Report of the Second Meeting of the Advisory Panel on the Soil Map of the World, Rome, 9-11 July 1963.
7. Report of the Second Soil Correlation Seminar for Europe, Bucharest, Romania, 29 July to 6 August 1963.
8. Report of the Third Meeting of the Advisory Panel on the Soil Map of the World, Paris, 3 January 1964.
9. Adequacy of Soil Studies in Paraguay, Bolivia and Peru, November-December 1963.
10. Report on the Soils of Bolivia, January 1964.
11. Report on the Soils of Paraguay, January 1964.
12. Preliminary Definitions, Legend and Correlation Table for the Soil Map of the World, Rome, August 1964.
13. Report of the Fourth Meeting of the Advisory Panel on the Soil Map of the World, Rome, 18-21 May 1964.
14. Report of the Meeting on the Classification and Correlation of Soils from Volcanic Ash, Tokyo, Japan, 11-27 June 1964.
15. Report of the First Session of the Working Party on Soil Classification, Survey and Soil Resources (European Commission on Agriculture), Florence, Italy, 1-3 October 1964.
16. Detailed Legend for the Third Draft of the Soil Map of South America, June 1965.
17. Report of the First Meeting on Soil Correlation for North America, Mexico, 1-8 February 1965.
18. The Soil Resources of Latin America, October 1965.
19. Report of the Third Soil Correlation Seminar for Europe: Bulgaria, Greece, Romania, Turkey, Yugoslavia, 29 August to 22 September 1965.
20. Report of the Meeting of Rapporteurs, Soil Map of Europe (Scale 1 : 1 000 000) (Working Party on Soil Classification and Survey, European Commission on Agriculture), Bonn, Federal Republic of Germany, 29 November to 3 December 1965.
21. Report of the Second Meeting on Soil Survey, Correlation and Interpretation for Latin America, Rio de Janeiro, Brazil, 13-16 July 1965.
22. Report of the Soil Resources Expedition in Western and Central Brazil, 24 June to 9 July 1965.
23. Bibliography on Soils and Related Sciences for Latin America (1st edition), December 1965.
24. Report on the Soils of Paraguay (2nd edition), August 1964.

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Report on the

Agro-ecological Zones

Project

Vol. 4

RESULTS FOR

SOUTHEAST ASIA

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## FOREWORD

Projections reveal that to sustain the likely world population in the year 2000, an increase of 60 percent in agricultural production will be required. "Is there sufficient land to meet these needs?" becomes the overriding question. However, little precise information exists on which to base a reliable answer.

Previous appraisals of the global extents of arable lands, to support present and future human populations, vary from 3 to 7 thousand million hectares. Estimates of the populations these lands can support, vary from 7.5 to 40 thousand million.

These estimates however, do not take into account differences in production potential when it is calculated for a) different crops, e.g. pearl millet and white potato, with widely differing climatic and soil requirements, and b) different levels of inputs and technology, e.g. subsistence cultivation and commercial production. Such factors must be taken into account to arrive at realistic estimates of the agricultural production potential of the various lands of the world.

Equally important, in planning optimum use of the world's land resources, is the fact that these resources are immobile and unevenly distributed. Accordingly, not all crops can be grown in all areas; and expansion of production, through increased inputs and investment, will need to be planned and achieved in the context of a sound inventory of land and its production potential for various types of land uses.

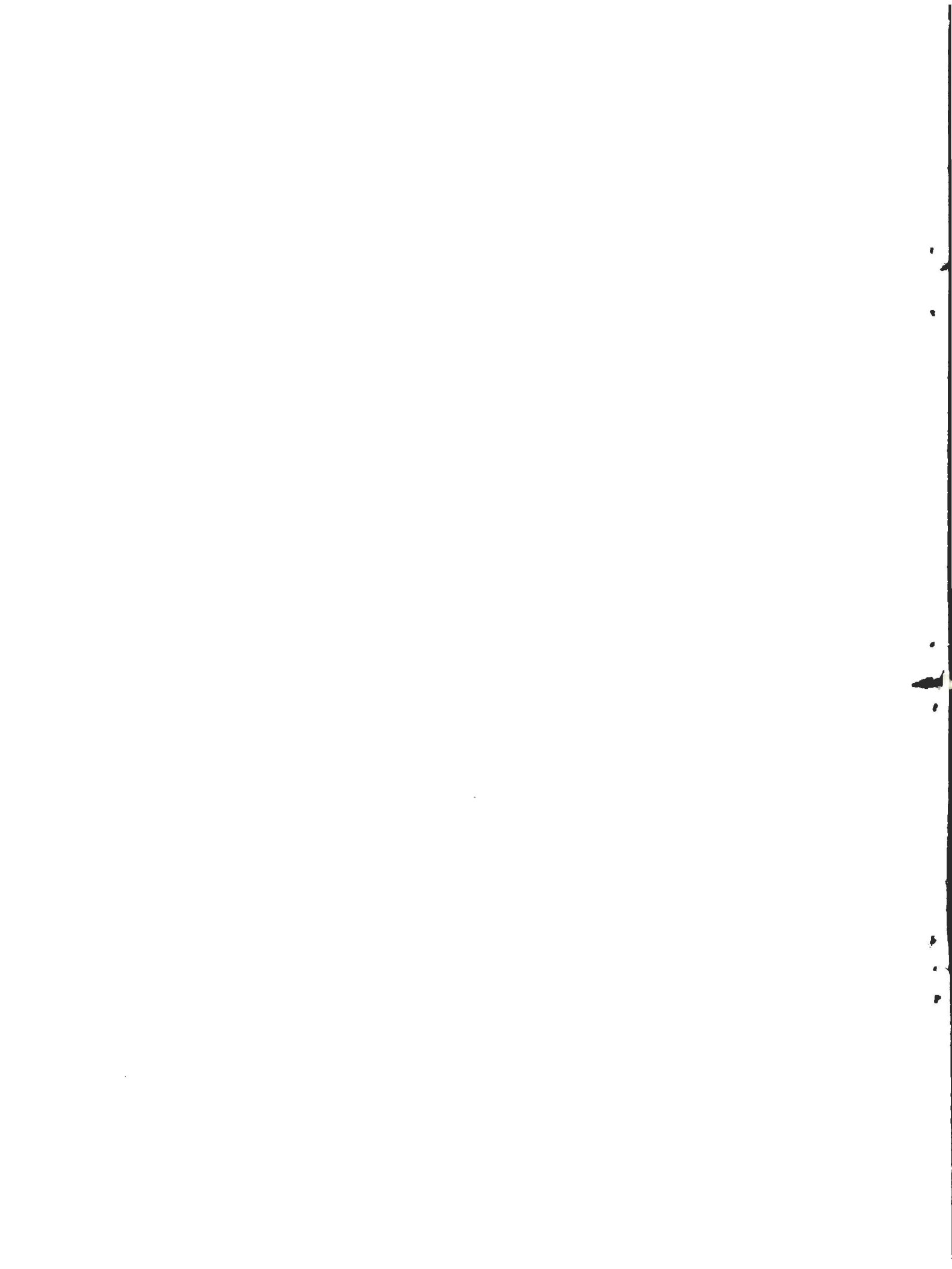
With a view to obtaining a first approximation of the production potential of the world's land resources, FAO initiated in September 1976 a study of potential land use by agro-ecological zones. This study will concurrently provide the physical data base necessary for broad-scale planning of future agricultural development. Initially the project deals with rainfed production potential, at two levels of inputs, for eleven crops in developing countries.

The methodology adopted for the study is presented in detail in World Soil Resources Report No. 48, Volume 1 (Part A) together with results for the African continent (Part B). The former part is intended for all national staff wishing to apply the methodology to detailed individual country studies. Volume 1 is available in English and French. Volume 2 reports results for Southwest Asia and Volume 3 reports results for Central and South America.

The present volume (Volume 4) reports results for Southeast Asia, providing information on the rainfed agricultural production potential of the region's various land resources.

The study was based on the work of consultant A.H. Kassam and other members of FAO who cooperated closely with Land and Water Development Division staff in this multidisciplinary undertaking. Mr. G.M. Higgins, FAO, Coordinator of the project, can be contacted for any further technical information.

R. Dudal  
Director  
Land and Water Development Division



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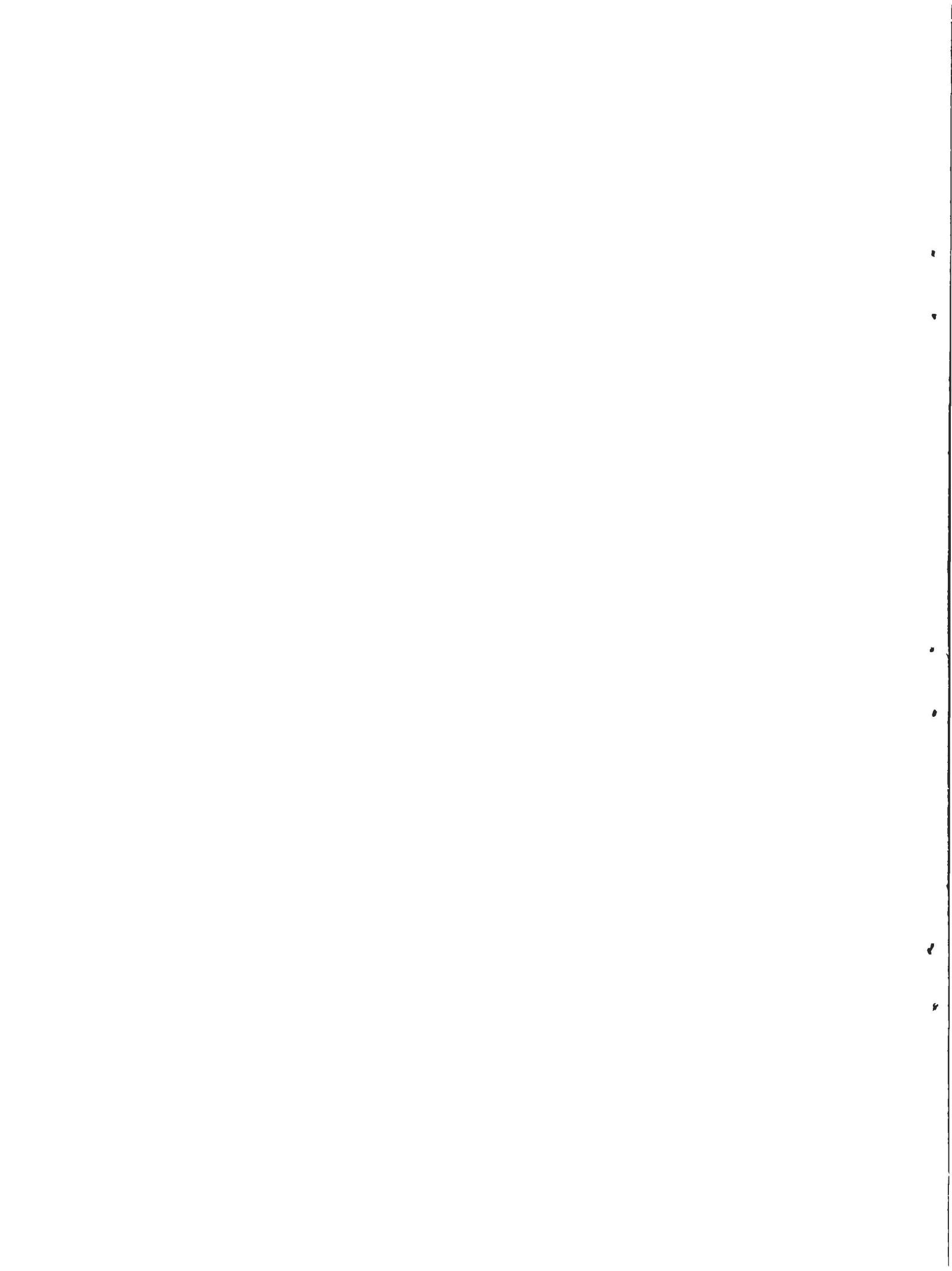
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## PART A - METHODOLOGY

### 1. INTRODUCTION

This fourth report of the Agro-ecological Zones Project presents land suitability data for rainfed crop production in Southeast Asia, covering the countries of: Bangladesh, Bhutan, Brunei, Burma, India, Indonesia, Kampuchea, Lao, Malaysia, Nepal, Pakistan, Philippines, Sabah M., Sarawak M., Singapore, Sri Lanka, Thailand and Vietnam, a total area of 898 million ha. The eleven crops considered are pearl millet, sorghum, maize, wheat, soybean, phaseolus bean, sweet potato, white potato, cassava, cotton and bunded rice.

The methodology used for this assessment of rainfed land suitability is as described in detail in Volume 1 (Methodology and Results for Africa), and comprises the following activities:

- i. selection and definition of land utilization types (crop and produce, production type, input level);
- ii. division of the crops of the study into groups based on differences in their photosynthesis pathways and the response of photosynthesis to temperature and radiation, and compilation of a crop adaptability inventory including crop phenological climatic requirements;
- iii. assemblage of information on the soil requirements of the crops, at each of the two levels of inputs envisaged;
- iv. compilation of a quantitative climatic inventory (1:5 million scale) based on major climates (characterizing temperature differences) and lengths of growing periods (characterizing time available when water and temperature permit crop growth) from station data on climate and water balance;
- v. computer assemblage of a soil inventory, by countries, from the FAO/Unesco Soil Map of the World;
- vi. overlay of the climatic inventory on the soil map and area measurement of resultant climate/soil units, the agro-ecological zones;
- vii. computer calculation (from v and vi) of country extents of soil units (by slope class, texture class and phase) by major climates and growing period zones (30 day intervals, except 1 - 74 day and 75 - 89 day zones);
- viii. matching of the climatic inventory (iv) with the crop groups (ii) and, where the climatic requirements of the crop groups are met, calculation of biomass and constraint-free individual crop yields by growing period zones;
- ix. matching of the soil requirements of crops (iii) with the soil units, slope classes, texture classes and phases of the soil map, by rating soil limitations at each of the two levels of inputs;

- x. compilation and rating of the various agro-climatic constraints to crop production occurring in the various major climates and growing period zones;
- xi. application of the agro-climatic constraints (x) to the constraint-free crop yields (viii) to derive anticipated (agro-climatically attainable) crop yields, by growing period zones;
- xii. estimation of benefit/cost ratios of production from the different growing period zones, as related to attainable crop yields;
- xiii. agro-climatic suitability classification of each growing period zone according to anticipated crop yields (xi);
- xiv. computer application of the soil limitation ratings on the agro-climatic suitability classification of each growing period zone according to the soil composition of the zone, to arrive at the land suitability classification i.e. extents of land variously suited to the production of the crop at each level of inputs.

## 2. CROP AND LAND UTILIZATION TYPES

As separate assessments of suitability are necessary for each crop and each level of input, the crops dealt with are limited to a number which can be handled in the two year duration of the study. Additionally the global nature of the project necessitates that the crops considered are of prime importance in all regions of the world. Accordingly the choice of crops was made from data on world and regional crop areas to ensure that the most important are considered by the study. Full details of the methodology of selection are contained in Volume 1 and the position of the eleven crops selected with regard to "area" importance in Southeast Asia is shown below:

	<u>Rice</u>	
	<u>Wheat</u>	
	<u>Millet</u>	
	<u>Sorghum</u>	
	<u>Maize</u>	
	<u>Cotton</u>	
	<u>Bean dry</u>	
Crops of the assessment	Chickpea	Most important twenty crops of Southeast Asia listed in decreasing order of importance with regard to area occupied.
are underlined.	Groundnut	
	Coconut	
	Rubber	
	Sugarcane	
	Rapeseed	
	Pulses	
	Barley	
	Sesame	
	Pidgeon pea	
	<u>Cassava</u>	
	<u>Linseed</u>	
	<u>Soybean</u>	

The annual harvested area of the 11 crops of the assessment, in comparison to total harvested area, is presented in Table 2.1 This data shows that the 11 crops of the assessment occupy more than two-thirds of the total land harvested in the region.

Pertinent in the definition of the crops of the evaluation are the facts that:

- the cereal and leguminous grain crops are produced for dry grain only (e.g. they do not include green cob production of maize, production of soybean and phaseolus bean as vegetables);
- the rice considered is lowland rainfed paddy rice (grown under uncontrolled, but bunded, flood water regimes) and does not include upland or hill (rainfed) rice;
- sorghum with white or yellow grains are considered in the evaluation; sorghums with red or brown bitter grains are mainly used for brewing beer and are not explicitly considered in the assessment;
- wheat refers to both bread and durum wheat;
- phaseolus bean comprises P. vulgaris, P. lunatus, P. aureus, P. radiatus, P. mungo and P. angularis;
- the crops comprise readily available local cultivars (low inputs) and high yielding cultivars (high inputs) of the following durations:

Phaseolus bean	90-120 days
Soybean	90-120 days
Bunded rice	100-130 days
Cotton	170-180 days
Sweet potato	120-150 days
Cassava	180-330 days
Pearl millet	70- 90 days
Sorghum	90-120 days (mean temperature $> 20^{\circ}\text{C}$ )
	$> 120$ days (mean temperature $\leq 20^{\circ}\text{C}$ )
Maize	90-120 days (mean temperature $> 20^{\circ}\text{C}$ )
	$> 120$ days (mean temperature $\leq 20^{\circ}\text{C}$ )
Wheat	100-130 days (spring cultivars)
	$> 120$ days (winter cultivars)
White potato	90-150 days.

Each crop of the study is evaluated at two levels of inputs, a low and a high. The theoretical attributes of the two input levels are shown in Table 2.2 and form the basis of the definition of the land utilization types employed in the assessment.

Table 2.1

1974/76. HARVESTED AREA (000 HA) OF ELEVEN CROPS  
(RAINFED AND IRRIGATED)

1/

	Pearl millet	Sorghum	Maize	Wheat	Soybean	Phaseolus bean	Sweet potato	White potato	Cassava	Cotton	Rice	Total	Total All Crops
Bangladesh		1	3	133		67	66	90		6	10 001	10 367	12 246
Bhutan	4		52	62				5			185	308	338
Brunei											3	3	12
Burma	209		177	73	20	194	4	11	2	171	5 004	5 905	8 013
India	18 260	16 020	5 983	19 016	140	8 437	216	584	383	7 514	38 656	115 209	171 436
Indonesia			2 396		714		315	22	1 426	16	8 456	13 345	21 301
Kampuchea			57		4	30	2		3	1	1 002	1 099	1 159
Lao			16		4		3	3	1	5	682	714	762
Malaysia			3				2		14		577	596	3 094
Nepal	124		452	298				53			1 252	2 179	2 498
Pakistan	606	456	619	6 012		118		27		1 916	1 688	11 442	16 705
Philippines			3 148		7	56	187	4	97	1	3 555	7 055	10 791
Sabah, M.			9				1		5		50	65	306
Sarawak, M.									6		113	119	364
Singapore													6
Sri Lanka	44	4	37			14	45		166	2	577	889	2 154
Thailand		131	1 170		122	186	39	2	509	63	8 012	10 234	12 842
Timor, E.			16			3	2		5		7	33	45
Vietnam		12	253		51	74	238	1	153	9	5 241	6 032	6 471
Total	19 247	16 624	14 391	25 594	1 062	9 179	1 120	802	2 770	9 704	85 101	185 594	270 543
Percent of total harvested area												68.6	

1/ Source: Recomputed FAO Production Yearbook data, 1977, Vol 31. Average of the years 1974, 1975 and 1976.

Table 2.2

## ATTRIBUTES OF THE TWO LAND UTILIZATION TYPES CONSIDERED

<u>Attribute</u>	<u>Low Inputs</u>	<u>High Inputs</u>
Crop and produce	The 11 rainfed crops described	
Production method	Rainfed production, no irrigation or water importation. Sole cropping only, no multiple cropping	
Market orientation	Subsistence production	Commercial production
Capital intensity	Low	High
Labour intensity	High, including uncosted family labour	Low, family labour costed, if used
Power source	Manual labour with hand tools	Complete mechanization including harvesting operations
Technology employed	Local cultivars. No (or markedly insufficient) fertilizer, no chemical pest, disease and weed control, fallow periods for both water and nutrient accumulation	High yielding cultivars. Adequate fertilizer application, chemical pest, disease and weed control, fallow periods for water accumulation only
Infrastructure requirement	Market accessibility not essential, inadequate advisory services	Communications and market accessibility essential, high level of advisory services
Land holding	Small, sometimes fragmented	Large, consolidated
Income level	Low	High

### 3. CROP CLIMATIC ADAPTABILITY

To enable crops to be matched to land qualities, the climatic inventory has been compiled in a form that permits interpretation of the climatic resources in terms of their suitability for production of the crops of the study. The appropriate climatic adaptability attributes of the crops therefore dictate what parameters are taken into account in the climatic inventory. The concepts and principles of crop climatic adaptability relevant to evaluation of land resources for crop production are described in detail in Volume 1.

In this regard crops have climatic requirements for photosynthesis and phenology both of which bear a relationship to yield. The rate of crop photosynthesis, growth and yield are directly related to the assimilation pathway and its response to temperature and radiation. However, the phenological climatic requirements, which must be met, are not specific to a photosynthetic pathway.

The crops of the study have been classified into climatic adaptability groups according to their fairly distinct photosynthesis characteristics. Each group comprises crops of 'equal ability' in relation to potential productivity, and the differences between groups in the response of photosynthesis to temperature and radiation determines productivity when climatic phenological requirements are met.

The crop adaptability groups employed and their characteristic average photosynthesis response to temperature and radiation are presented in Table 3.1

Wheat, white potato and highland phaseolus bean have a C<sub>3</sub> photosynthesis pathway. They belong to group I and are adapted to operate under cool conditions (< 20°C mean daily temperature).

Rice, lowland phaseolus bean, soybean, cotton, sweet potato and cassava also have a C<sub>3</sub> photosynthesis pathway. They belong to group II and are adapted to operate under warm conditions (> 20°C).

Millet, lowland sorghum and lowland maize have a C<sub>4</sub> photosynthesis pathway. They belong to group III and are adapted to operate under warm conditions (> 20°C).

Highland sorghum and highland maize also have a C<sub>4</sub> photosynthesis pathway. They belong to group IV and are adapted to operate under moderately cool conditions (15-20°C).

The time required to form yield depends on the phenological constraints on the use of time available in the growing period, and the location of yield in the plant (e.g. seed, leaf, stem, root) has an important influence. Temperature has a rate controlling/limiting effect on crop development and growth, and within the optimum temperature range for growth, it may influence the growth of specific parts and the accumulation of yield if located therein.

The attributes that have been compiled to assist in assessing the climatic adaptability of the crops vis-a-vis major climates in the matching exercise are presented in Tables 3.1 to 3.4 in Volume 1.



Table 3.1

AVERAGE PHOTOSYNTHESIS RESPONSE OF INDIVIDUAL LEAVES OF FOUR GROUPS OF  
CROPS TO RADIATION AND TEMPERATURE

Characteristics	Crop adaptability group <sup>1/</sup>			
	I	II	III	IV
Photosynthesis pathway	C <sub>3</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>4</sub>
Rate of photosynthesis at light saturation at optimum temperature (mg CO <sub>2</sub> dm <sup>-2</sup> h <sup>-1</sup> )	20-30	40-50	>70	>70
Optimum temperature (°C) for maximum photosynthesis	15-20	25-30	30-35	20-30
Radiation intensity at maximum photosynthesis (cal cm <sup>-2</sup> min <sup>-1</sup> )	0.2-0.6	0.3-0.8	>1.0	>1.0
Crops in the Agro-ecological Zones Project	Spring wheat Winter wheat Highland P. bean White potato	Paddy rice Lowland P. bean Soybean Cotton Sweet potato	Pearl millet Lowland sorghum Lowland maize	Highland sorghum Highland maize

<sup>1/</sup> For further information on crop adaptability groups see Tables 3.1 to 3.5 in FAO (1978). Volume 1.

#### 4. CLIMATIC INVENTORY

Data from over 570 stations in the region were used to compile the climatic inventory and a generalized version of the inventory is presented in Fig. 4.1. A very large amount of generalization has been employed in this presentation to accommodate the large reduction necessary in reducing from the original 1:5 million base scale to the present page size scale of approximately 1:25 million.

The characteristics and extents of the major climates during the growing period are presented in Table 4.1, while the extents of the growing period zones by major climates are given in Table 4.2.

The major climates in Table 4.1 reflect the temperature regime only during the growing period which has been defined as the duration when both water and temperature permit crop growth. A moisture supply from rainfall of half or more than half potential evapotranspiration (PET) has been considered to permit crop growth. Mean daily temperatures greater than 5°C have been considered as being conducive to growth. Examples of stations in different major climates are shown in Figs. 4.2, 4.3, 4.4, 4.5, 4.6, 4.7 and 4.8.

The inventory distinguishes two kinds of year-round growing periods, one where the period is continuously humid (365+), the other where it is not (i.e. 365-). A humid period is defined as a period when precipitation exceeds PET.

Areas where rainfall does not exceed 0.5 PET are inventoried as dry while areas where temperatures during the water availability period are continuously less than 5°C are inventoried as cold. Full details on the methodology are presented in Volume 1.

In the inventory, growing period zones are delineated by isolines of growing periods with values of 0, 75, 90, 120, 150, 180, 210, 240, 270, 300, 330, 365- and 365+. In the 10 major climates recognized in the region, a total of 14 growing period zones are inventoried while the areas which are designated as cold represent major climates 4, 10 and 12.

The inventory shows that 93.8 million hectares (10.4 percent of the total area) have no growing period because of water and/or temperature limitations. Of the remainder (803.8 million hectares), 60.8 million hectares (6.8 percent of the total area) have a growing period of less than 90 days, while 743 million hectares (82.7 percent of the total area) enjoy a growing period of more than 90 days. The inventory also shows that 159.4 million hectares (17.8 percent of the total area) have a year-round growing period.

While the major climates are distinguished in the inventory with definitive boundaries, it should be appreciated that there is always a transitional area between major climates. At the scale of the study, this fact is normally of no major consequence. However, in the case of the transition between major climates 7 and 11 (i.e. when areas with winter precipitation merge with those with summer precipitation), there is an overlap. This is particularly pronounced in Pakistan and small areas in northern India and southwest Nepal. In the inventory such areas have been included in major climate 7 because the winter precipitation alone is not sufficient for crop production under the LUT's considered. However, when conserved summer precipitation is added to this winter precipitation, winter crop production is possible and indeed practiced in such areas.

Particular country specific climatic circumstances, e.g. typhoon hazard in north Philippines, excessive long duration flooding in Bangladesh and aspect/temperature changes in major climates 3, 4, 9 and 10 have not been inventoried, being considered appropriate to be taken into account at the country level.

Table 4.1

 CHARACTERISTICS AND EXTENTS OF MAJOR CLIMATES <sup>1/</sup>  
 OF THE REGION DURING THE GROWING PERIOD

Climate	Major Climates during Growing Period		24-hr Mean (daily) Temperature (°C) Regime during the Growing Period <sup>2/</sup>	Suitable for Consideration during the Growing Period for Crop Group <sup>3/</sup>	Extents (000 ha)
	No	Descriptive Name			
Tropics All months with monthly mean temperatures, <sup>4/</sup> corrected to sea level, above 18°C	1	Warm tropics	More than 20 <sup>nd</sup>	II and III	667 589
	2	Moderately cool tropics	15 - 20	I and IV	8 872
	3	Cool tropics	5/10 - 15	I	4 226
	4	Cold tropics	Less than 5	Not suitable	1 812
Sub-tropics One or more months with monthly mean temperatures, corrected to sea level, below 18°C but all months above 5°C	5	Warm/moderately cool sub-tropics (summer rainfall) <sup>5/</sup>	More than 20	II and III	-
	6	Warm/moderately cool sub-tropics (summer rainfall) <sup>5/</sup>	15 - 20	I and IV	-
	7	Warm sub-tropics (summer rainfall)	More than 20	II and III	141 506
	8	Moderately cool sub-tropics (summer rainfall)	15 - 20	I and IV	8 353
	9	Cool sub-tropics (summer rainfall)	5/10 - 15	I	3 991
	10	Cold sub-tropics (summer rainfall)	Less than 5	Not suitable	18 803
	11	Cool sub-tropics (winter rainfall)	5/10 - 20	I	15 912
	12	Cold sub-tropics (winter rainfall)	Less than 5	Not suitable	26 551
Temperate One or more months with monthly mean temperatures, corrected to sea level, below 5°C	13	Cool temperate <sup>5/</sup>	5/10 - 20	I	-
	14	Cold temperate <sup>5/</sup>	Less than 5	Not suitable	-
				Total	897 615

<sup>1/</sup> Major climate reflects the temperature regime only during the growing period when water (rainfall) availability permits crop growth.

<sup>2/</sup> Mean daily temperature simulated from monthly averages of mean daily temperature.

<sup>3/</sup> See Vol. 1, Chapter 3 for details.

<sup>4/</sup> Monthly averages of mean daily temperature.

<sup>5/</sup> Major climates 5, 6, 13 and 14 are not mapped in the region.

Table 4.2

## EXTENTS (000 HA) OF GROWING PERIOD ZONES BY MAJOR CLIMATES 1/

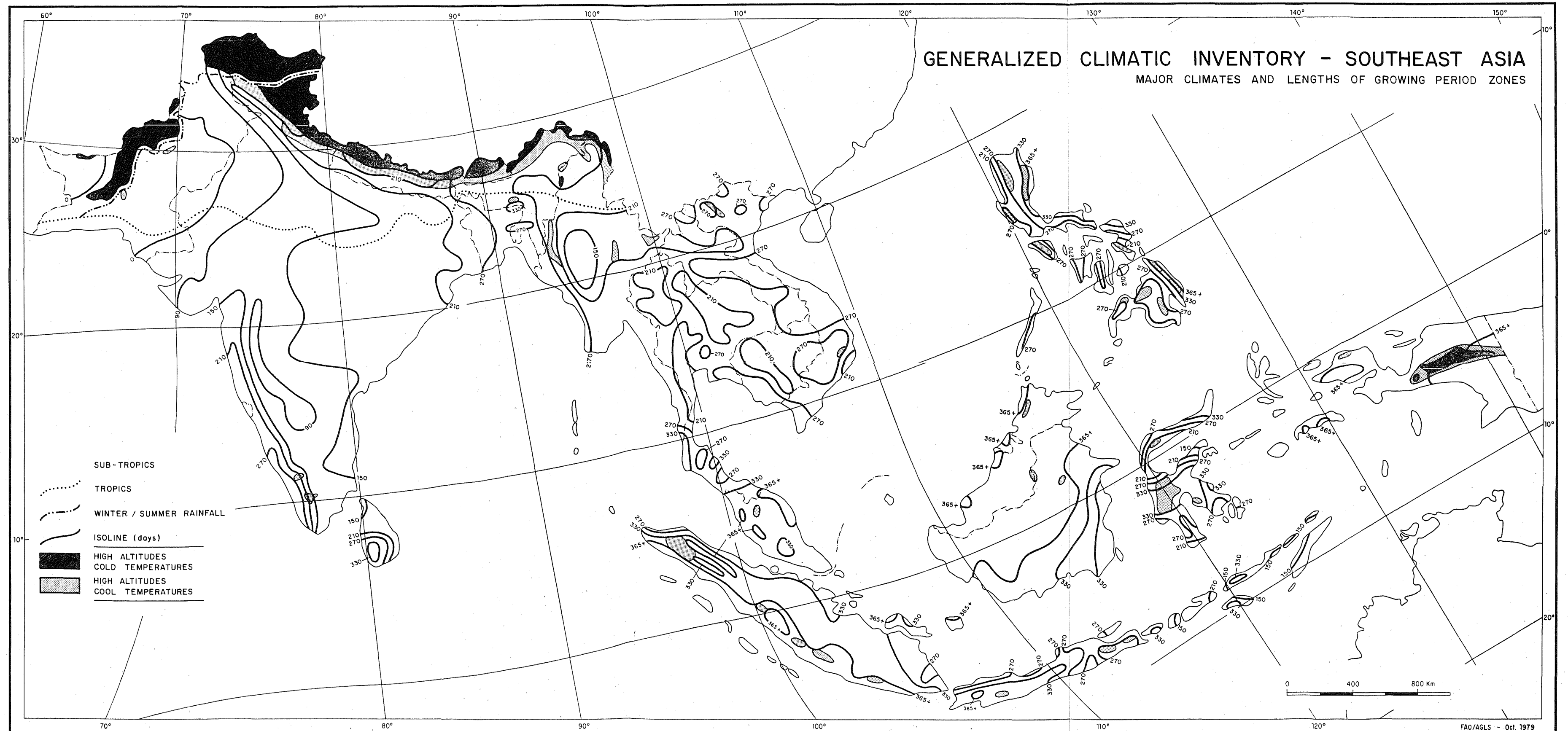
Major climate Growing Period zone	1	2	3	4	7	8	9	10	11	12	Total
N 365 <sup>+</sup> (-)	82 620	2 089	1 024								85 733
N 365 <sup>-</sup> (A)	70 302	2 273	1 084								73 659
N 330-364 (B)	22 298	1 032	497								23 827
N 300-329 (C)	48 210	1 129	544		8 404	3 079	1 500				62 866
N 270-299 (D)	54 206	923	431		4 424	464	213				60 661
N 240-269 (E)	67 300	496	219		8 694	945	463		119		78 236
N 210-239 (F)	63 078	407	193		8 992	1 396	678		163		74 907
N 180-209 (G)	84 956	447	199		7 888	811	373		214		94 888
N 150-179 (H)	59 544	55	25		14 293	809	370		122		75 218
N 120-149 (I)	53 466	21	10		16 383	396	181		115		70 566
N 90-119 (J)	31 407				10 887	116	51		29		42 490
N 75-89 (K)	9 171				3 780	161	81		213		13 406
N 1-74 (L)	15 807				23 917	30	12		7 650		47 416
O DRY (M)	5 224				33 844	146	69		7 287		46 570
O COLD (Z)				1 812				18 803		26 551	47 172
Total	667 589	8 872	4 226	1 812	141 506	8 353	3 991	18 803	15 912	26 551	897 615

N = Normal growing period zone.

Items in parenthesis refer to computer codings as used in Section 4.

1/ Major climates 5, 6, 13 and 14 not mapped in the region.

Fig. 4.1



STATION NO	LATITUDE	LONGITUDE	ALTITUDE	NO OF YEARS FOR PRECIP.	FOR OTHER DATA
42737	22.18	70.47	138	30	30

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Mla	PRECIPITATION (P)	1	0	1	3	7	99	293	143	93	25	5	4	674
	TEMP AVERAGE (T)	20.2	22.9	27.3	31.3	33.2	32.0	28.7	27.9	28.3	29.1	25.9	21.8	27.4
	TEMP MEAN MAX (TX)	28.1	30.7	35.3	38.8	40.5	37.8	32.6	31.6	32.9	35.4	33.2	29.6	33.9
	TEMP MEAN MIN (TN)	10.7	13.1	17.2	21.3	24.7	26.2	24.9	24.0	22.9	20.9	16.5	12.3	19.6
	TEMP MEAN DAY (TD)	22.6	25.1	29.6	33.3	35.5	34.1	30.2	29.2	29.7	30.8	27.9	24.1	29.3
	TEMP MN NIGHT (TNI)	16.8	19.3	23.5	27.4	30.2	30.3	27.6	26.7	26.4	26.0	22.4	18.4	24.6
	VAPOUR PRESS	8.2	9.1	12.2	16.3	22.3	27.9	29.2	28.0	26.0	18.5	11.2	8.8	18.1
	WIND SPEED 2M	2.6	2.7	3.7	4.1	5.5	5.6	5.5	5.0	3.6	2.3	2.2	2.2	3.7
	SUNSHINE %	83	83	82	82	78	54	34	34	55	78	83	83	69
	TOT. RADIATION	380	441	509	561	569	472	382	370	424	451	401	364	444
Wm	EVAPOTRANS. (PET)	146	163	264	309	361	235	171	158	156	176	156	134	2430

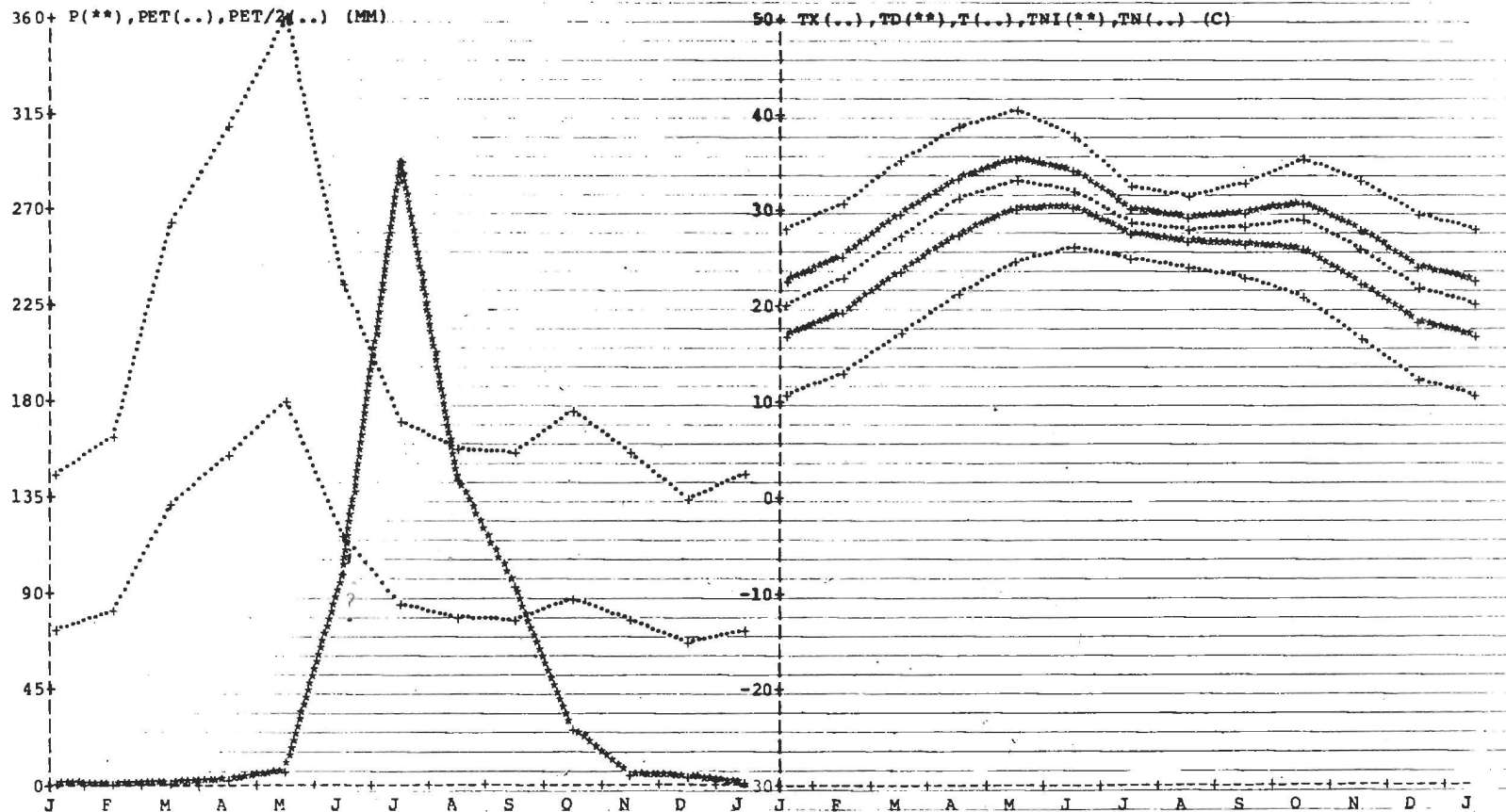


Fig. 4.2 An example of a station (Rajkot, India) in major climate 1 with a growing period of 96 days

	STATION NO 43081	LATITUDE		LONGITUDE		ALTITUDE		NO OF YEARS FOR PRECIP.			FOR OTHER DATA			
		18.40		78.06		381		30			30			
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YPAP
PRECIPITATION (P)	5	17	14	21	20	149	317	261	203	65	14	3	1086	
TEMP AVERAGE (T)	23.9	26.5	30.4	33.7	35.8	31.1	27.1	27.0	27.1	26.9	24.5	22.9	28.1	
TEMP MEAN MAX (TX)	30.0	32.6	36.4	39.2	41.5	36.2	30.5	30.1	30.6	31.5	29.7	28.9	33.1	
TEMP MEAN MIN (TN)	15.3	17.5	21.0	24.8	27.7	25.4	23.2	23.0	22.7	20.6	16.2	13.8	20.9	
TEMP MEAN DAY (TD)	25.3	27.8	31.5	34.6	37.1	32.8	28.2	27.8	28.1	28.0	25.4	24.1	29.2	
TEMP MN NIGHT (TNI)	20.4	22.7	26.3	29.8	32.5	29.1	25.7	25.4	25.4	24.4	20.9	19.0	25.1	
VAPOUR PRESS	13.0	12.5	12.5	14.7	15.9	23.2	26.0	26.3	26.0	21.7	16.0	13.2	18.4	
WIND SPEED 2M	.8	.9	1.0	1.0	1.2	1.7	1.7	1.4	1.0	.8	.7	.7	1.0	
SUNSHINE	90	90	90	84	82	65	52	58	61	76	84	90	77	
TOT. RADIATION	439	498	564	585	594	529	475	488	473	476	442	423	499	
EVAPOTRANSP. (PET)	97	116	166	182	205	178	146	143	129	124	97	88	1671	

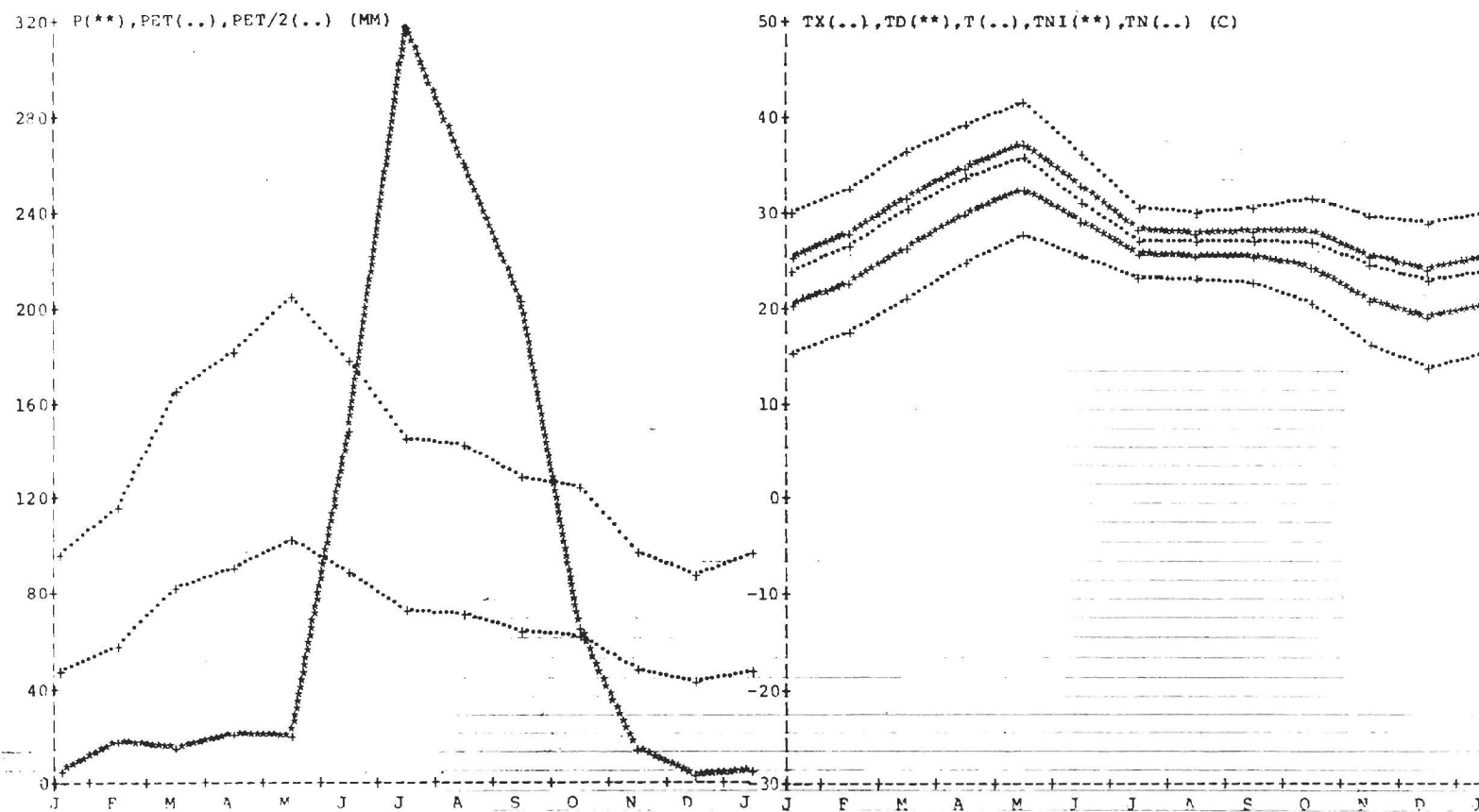


Fig. 4.3 An example of a station (Nizamabad, India) in major climate 1 with a growing period of 157 days

	STATION NO	LATITUDE	LONGITUDE	ALTITUDE	NO OF YEARS FOR PRECIP.	FOR OTHER DATA							
	96R34	-7.34	109.34	13	9	17							
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
PRECIPITATION (P)	394	320	368	280	236	109	32	30	117	260	294	386	2926
TEMP AVERAGE (T)	26.2	26.2	26.3	26.5	26.4	25.7	24.8	24.9	25.4	25.9	26.1	26.0	25.9
TEMP MEAN MAX (TX)	32.1	32.7	32.7	32.2	31.7	31.1	30.7	30.8	31.2	31.5	31.6	31.6	31.7
TEMP MEAN MIN (TN)	22.0	22.1	22.1	22.1	21.3	19.7	18.3	18.5	19.5	20.6	21.8	22.1	20.8
TEMP MEAN DAY (TD)	28.8	29.3	29.3	28.9	28.3	27.4	26.7	26.8	27.4	28.0	28.4	28.5	28.2
TEMP IN NIGHT (TNI)	25.1	25.3	25.3	25.2	24.5	23.2	22.1	22.3	23.1	23.9	24.8	25.0	24.1
VAPOUR PRESS	29.2	29.2	29.4	29.7	29.6	28.0	26.3	26.1	26.6	28.0	28.7	28.9	28.3
REL. HUMIDITY	86	86	86	86	86	85	84	83	82	84	85	86	85
WIND SPEED 2M	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
SUNSHINE %	53	55	56	68	68	69	67	62	53	48	55	52	59
TOT. RADIATION	476	486	475	483	440	419	422	439	445	449	482	469	457
EVAPOTRANSP. (PET)	127	116	126	120	110	98	100	108	112	121	123	124	1385

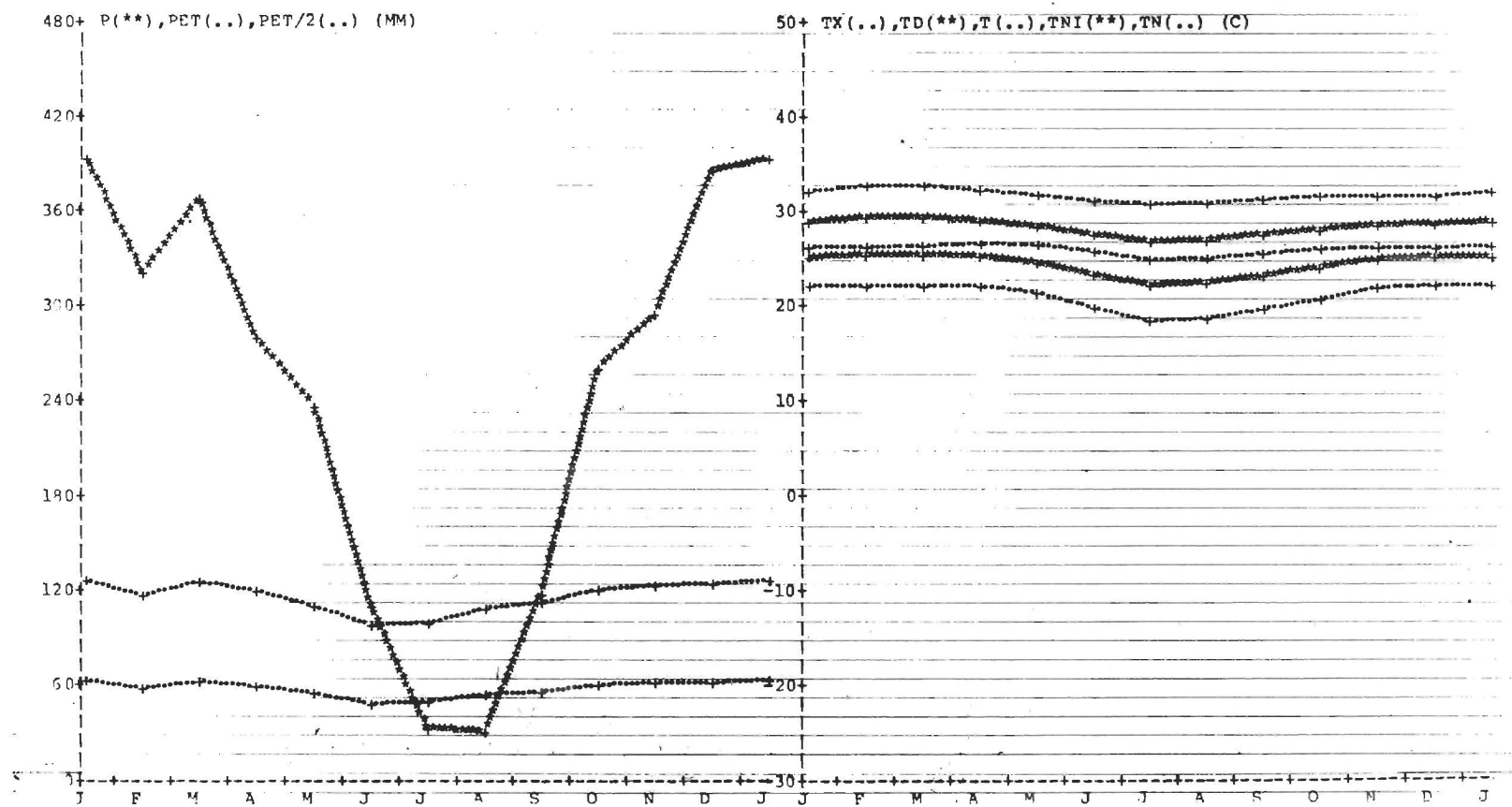


Fig. 4.4 An example of a station (Karanganjar, Indonesia) in major climate 1 with a growing period of 365- days.



	STATION NO	LATITUDE	LONGITUDE	ALTITUDE	NO OF YEARS FOR PPRECIP.							FOR OTHER DATA	
	96753	-6.36	106.47	240	5							10	
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
PRECIPITATION (P)	392	375	391	401	346	236	217	280	284	435	410	308	4076
TEMP AVERAGE (T)	24.5	24.5	24.7	25.2	25.3	25.2	25.1	25.2	25.4	25.3	25.1	24.8	25.0
TEMP MEAN MAX (TX)	31.3	31.1	31.5	31.7	31.7	31.4	31.6	32.0	32.6	32.5	32.1	31.6	31.8
TEMP MEAN MIN (TN)	20.4	20.3	20.4	20.7	20.6	20.0	19.4	19.5	20.1	20.5	20.6	20.4	20.2
TEMP MEAN DAY (TD)	27.8	27.6	27.9	28.2	28.1	27.7	27.7	28.0	28.6	28.6	28.4	28.0	28.0
TEMP MN NIGHT (TNI)	23.7	23.6	23.8	24.1	24.0	23.5	23.1	23.3	23.9	24.2	24.1	23.8	23.8
VAPOUR PRESS	26.1	26.4	26.4	26.6	26.4	25.6	24.5	24.3	24.6	25.4	25.8	25.6	25.6
REL. HUMIDITY	85	86	85	83	82	80	77	76	76	79	81	82	81
WIND SPEED 2M	.8	.8	.9	1.0	.9	.9	1.0	1.0	1.0	1.2	1.0	.9	.9
SUNSHINE %	40	44	53	62	64	70	75	78	79	69	58	47	62
TOT. RADIATION	422	441	465	465	433	428	452	498	542	529	490	446	468
EVAPOTRANSP. (PET)	112	104	119	115	108	100	111	123	132	137	124	119	140?

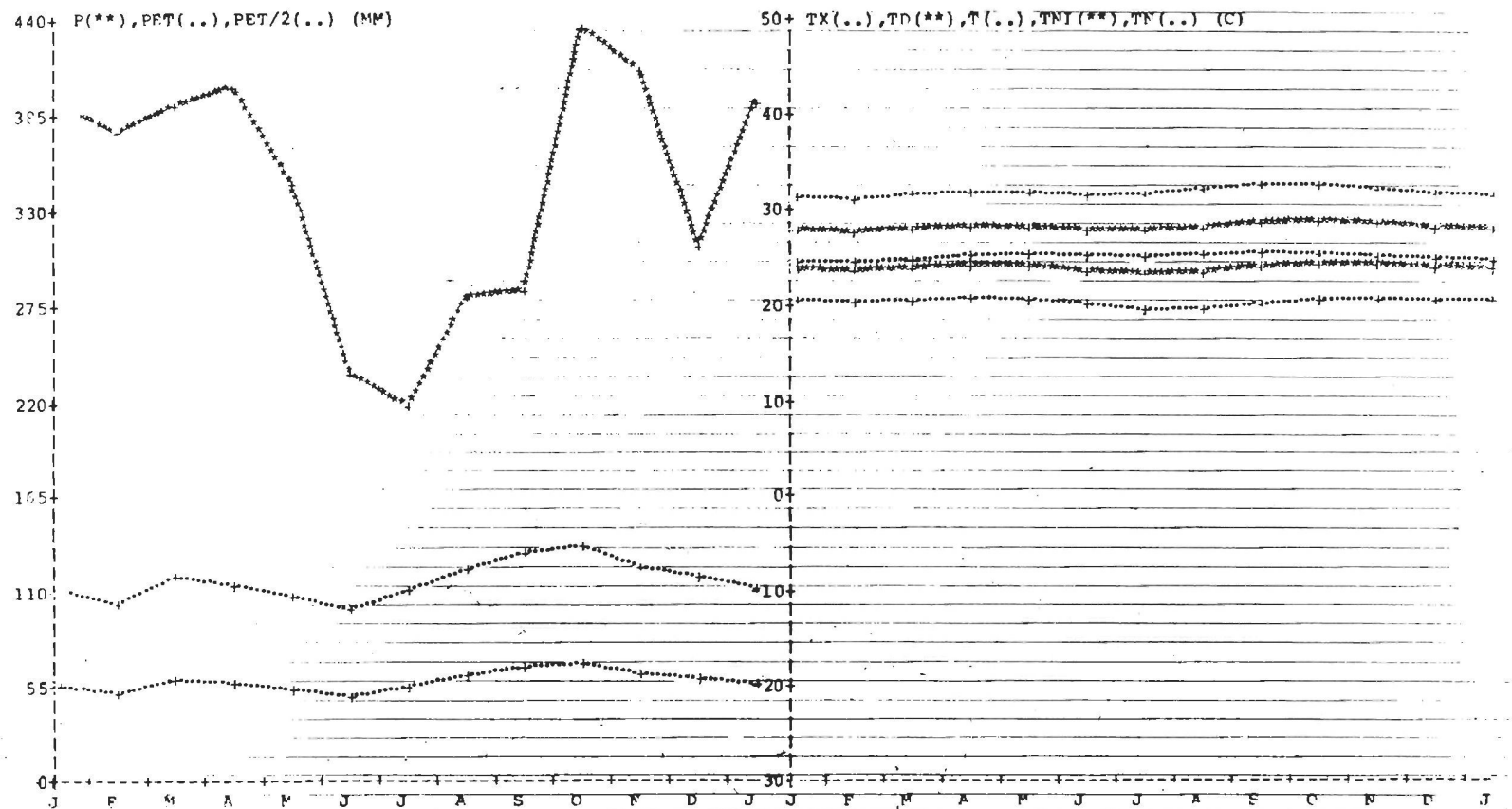


Fig. 4.5 An example of a station (Bogor, Indonesia) in major climate 1 with a growing period of 365+ days

STATION NO		LATITUDE	LONGITUDE	ALTITUDE	NO OF YEARS FOR PRECIP.		FOR OTHER DATA							
96830		-7.13	109.54	2062	9		8							
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
PRECIPITATION	(P)	292	390	382	214	126	75	48	23	25	128	165	326	2177
TEMP AVERAGE	(T)	14.0	14.3	14.5	14.4	14.3	13.9	13.3	12.7	13.6	14.2	14.9	14.5	14.0
TEMP MEAN MAX	(TX)	19.1	19.6	19.5	19.2	19.5	19.6	19.3	19.7	19.5	19.7	20.0	19.7	19.5
TEMP MEAN MIN	(TN)	8.1	9.3	9.0	7.8	6.4	5.9	4.2	2.6	4.4	5.9	3.2	4.4	6.7
TEMP MEAN DAY	(TD)	15.6	16.3	16.1	15.5	15.3	15.2	14.4	14.2	14.6	15.2	16.2	15.1	15.4
TEMP MIN NIGHT	(TNI)	11.5	12.5	12.2	11.3	10.4	10.1	8.3	7.9	9.0	10.1	11.9	11.9	10.6
VAPOUR PRESS		13.7	14.3	14.7	14.6	14.0	13.3	12.3	11.7	12.3	12.9	13.3	14.2	13.5
REL. HUMIDITY		36	48	39	89	86	84	81	90	79	90	32	36	84
WIND SPEED 2M		.9	.8	.9	.8	.8	.8	.8	.8	.8	.8	.3	.8	.3
SUNSHINE		27	29	30	41	49	54	60	54	59	54	45	29	45
TOT. RADIATION		374	384	377	389	381	376	402	448	468	472	446	379	409
EVAPOTRANSPI.	(PET)	82	75	80	73	70	63	67	75	81	93	88	83	931

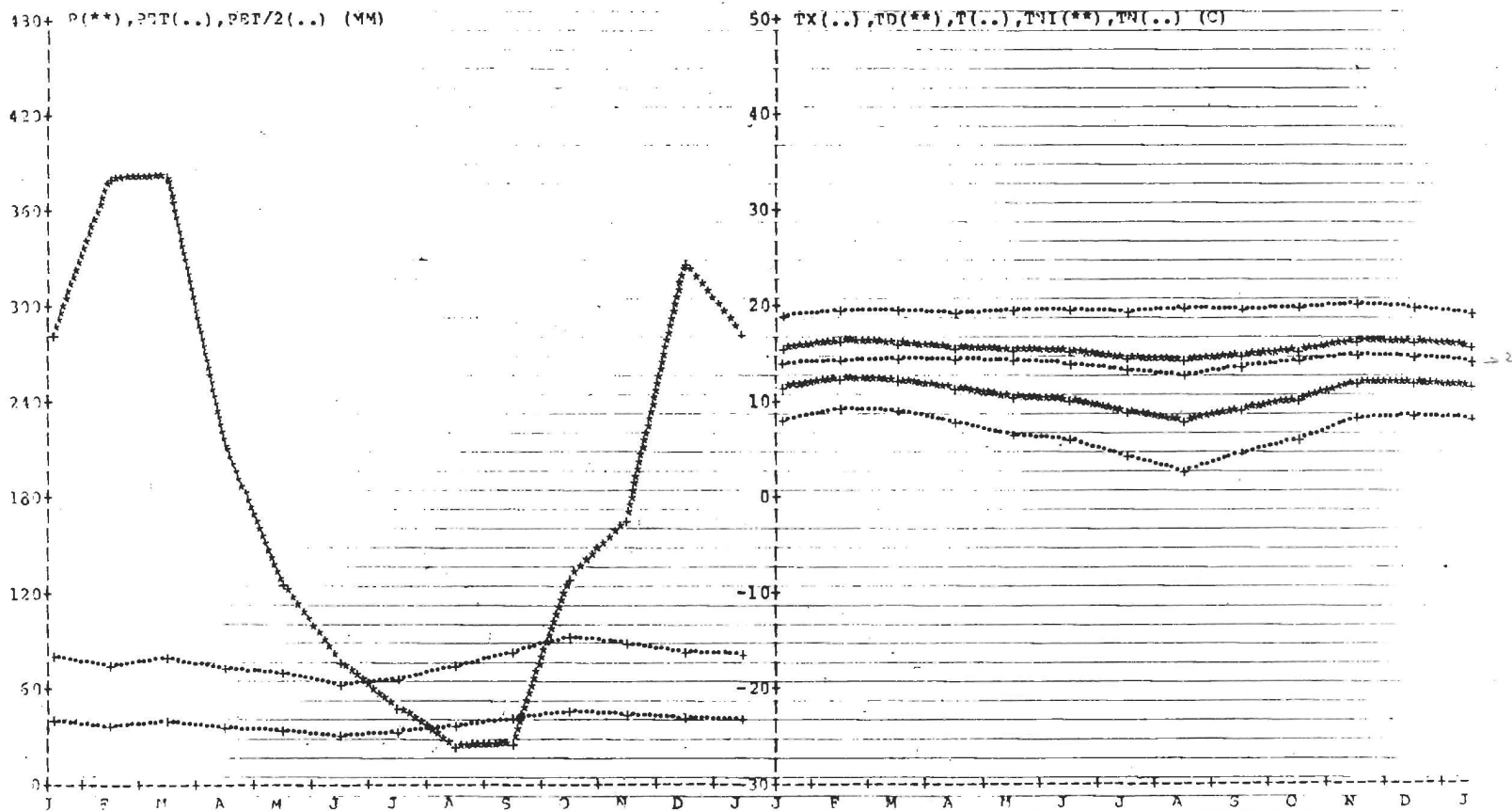


Fig. 4.6 An example of a station (Dieng Plateau, Indonesia) in major climate 2 with a growing period of 365- days

	STATION NO 42571	LATITUDE 24.34	LONGITUDE 80.50	ALTITUDE 317	NO OF YEARS FOR PRECIP. 30				FOR OTHER DATA 30				
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
PRECIPITATION (P)	36	23	14	10	11	126	356	320	176	47	13	6	1137
TEMP AVERAGE (T)	16.8	19.2	26.8	32.8	37.0	34.1	28.5	27.6	27.9	26.3	21.4	18.0	26.4
TEMP MEAN MAX (TX)	24.7	27.3	33.1	38.4	42.1	39.1	31.9	30.5	31.5	31.8	28.9	25.8	32.1
TEMP MEAN MIN (TN)	9.0	11.1	16.0	21.7	26.9	28.0	25.1	24.5	23.8	18.8	11.6	8.4	18.7
TEMP MEAN DAY (TD)	19.7	22.2	27.7	33.1	37.3	35.6	29.7	28.6	29.1	27.7	23.4	20.3	27.9
TEMP ME NIGHT (TNI)	14.6	16.8	22.1	27.6	32.3	31.9	27.5	26.6	26.5	23.4	17.7	14.6	23.5
VAPOUR PRESS	11.2	11.2	11.0	12.3	14.6	23.6	30.2	30.0	28.6	20.3	12.7	11.2	18.0
WIND SPEED 2M	.7	1.0	1.1	1.2	1.4	1.8	1.5	1.3	1.1	.7	.5	.6	1.0
SUNSHINE ?	75	80	81	80	78	56	34	33	53	77	83	82	68
TOT. RADIATION	350	427	508	564	588	508	414	393	431	447	392	350	448
EVAPOTRANSPI. (PFT)	61	86	153	193	232	197	136	122	123	113	74	59	1549

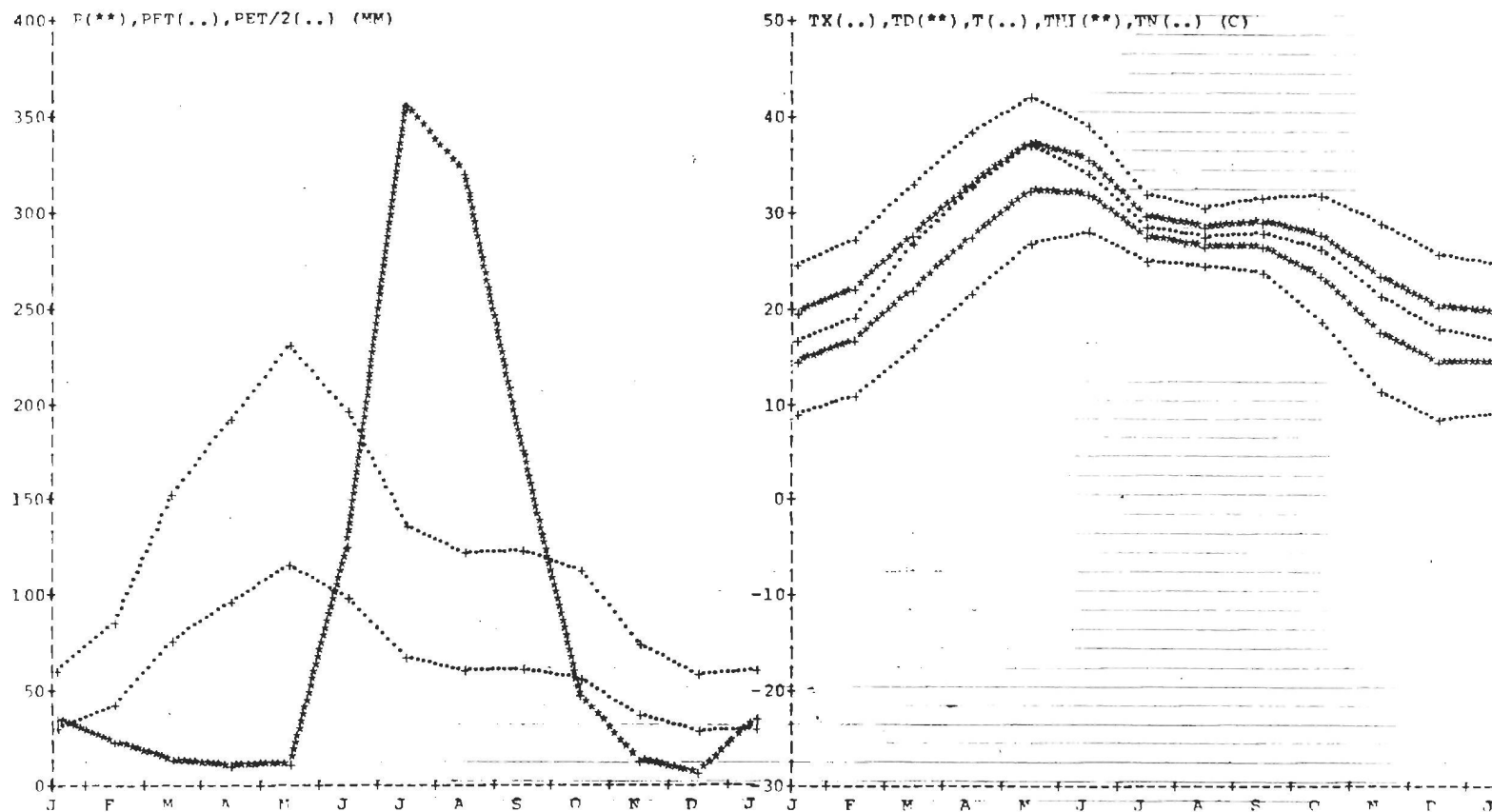


Fig. 4.7 An example of a station (Satna, India) in major climate 7 with a growing period of 157 days

	STATION NO 42147	LATITUDE		LONGITUDE		ALTITUDE		NO OF YEARS FOR PRECIP.					FOR OTHER DATA	
		29.28	79.39	2311									30	30
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YFAP	
PRECIPITATION (P)	58	56	45	34	51	143	332	338	197	79	4	23	1359	
TEMP AVFPAGE (T)	4.7	6.4	10.6	14.4	18.3	18.7	16.9	16.6	15.9	13.5	10.0	6.6	12.7	
TEMP MEAN MAX (TX)	9.7	11.4	15.8	20.1	23.5	23.2	20.5	20.1	19.9	18.4	15.8	12.5	17.6	
TEMP MEAN MIN (TN)	1.9	3.1	6.4	10.7	13.9	14.8	14.7	14.5	13.1	9.9	6.6	3.8	9.5	
TEMP MEAN DAY (TD)	7.2	8.8	12.8	17.1	20.5	20.5	18.7	18.3	17.8	15.7	12.9	9.8	15.0	
TEMP MN NIGHT (TNI)	4.7	6.1	9.8	14.1	17.4	17.8	16.8	16.5	15.6	13.0	9.9	7.0	12.4	
VAPOR PRESS	5.7	5.3	5.9	6.5	8.9	13.8	17.9	17.8	15.8	9.9	6.0	4.7	9.8	
WIND SPEED 2M	3.4	3.2	3.2	3.6	4.1	3.9	3.5	2.5	2.5	2.5	2.6	2.5	3.1	
SUNSHINE %	60	69	70	76	76	62	34	26	52	80	83	80	64	
TOT. RADIATION	277	362	448	540	584	541	419	364	413	425	351	302	419	
EVAPOTRANSP. (PPT)	42	59	101	137	174	148	98	84	82	77	55	41	1100	

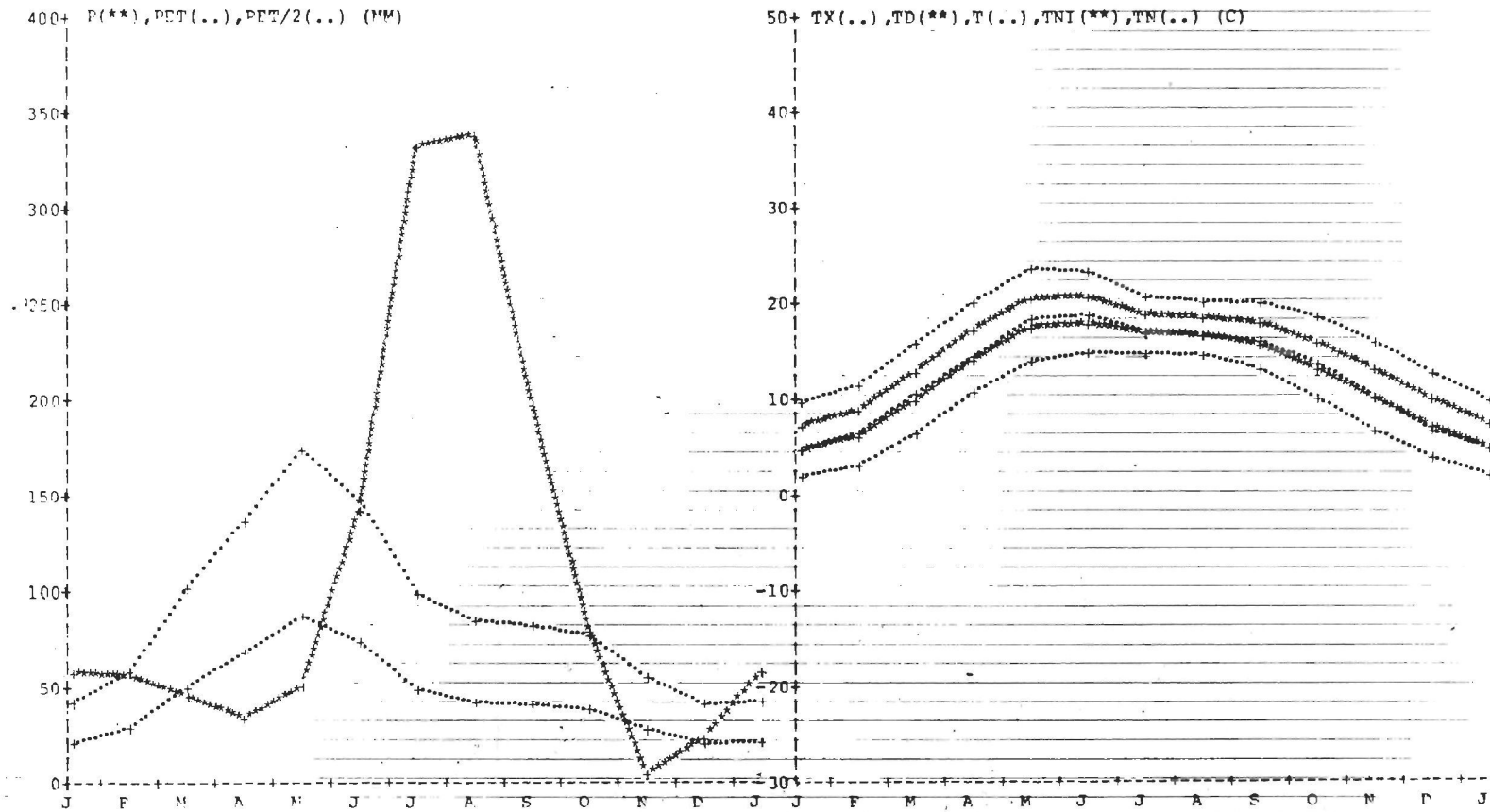


Fig. 4.8 An example of a station (Mukteshwar, India) in major climate 8 with a growing period of 165 days

Because of the regional nature of the present study, and the scale of publication, it is not possible to distinguish small areas with significant differences in temperature and length of growing period. Furthermore, in Fig. 4.1 cartographic considerations have necessitated some changes in the position of the length of the growing period isolines in comparison with the original base compilation at 1:5 million scale.

## 5. SOIL INVENTORY AND RATINGS

The 1:5 million FAO/Unesco Soil Map of the World was the source of information for the soil inventory used in the study. Comprised of a total of 19 map sheets, the Soil Map of the World coverage of Southeast Asia is contained in map sheets VII<sub>2</sub> and IX. Together with the accompanying texts, these map sheets inventory a total of 542 soil mapping units in the 17 countries covered by the present report.

The soil mapping units are associations of soil units and are usually composed of a dominant soil and of associated soils. Each of the latter occupies at least 20 percent of the area of a mapping unit; important soils which cover less than 20 percent of the area of a mapping unit are added as inclusions. A total of 73 soil units occur in the region as dominant soils, associated soils or inclusions.

In addition to providing data on the composition and extent of each soil mapping unit, the Soil Map of the World also provides information on the texture class of the dominant soil and the main slope class in the mapping unit. Three texture classes (coarse, medium and fine) and three slope classes (0 - 8 percent, 8 - 30 percent and greater than 30 percent) are recognized. Additionally the map provides information on land characteristics which are not reflected by the composition of the soil mapping units but which are significant to the use or management of the land. This information is presented as phase overprints on the soil mapping units, e.g. stony phase. A total of 12 phases are recognized.

Full description, abstracted from Volume 1 of the Soil Map of the World, of the definitions of the soil units, slope classes, texture classes, phases and composition of the soil mapping units are given in Volume 1 of the Agro-ecological Zones Project report.

The initial stage of the soil inventory, for Southeast Asia, comprised a computer input of the extent and composition of each soil mapping unit in the region. This data was then computer-listed by countries and presented in the form of a 'turnaround' document for incorporation of areas of each soil mapping unit by major climates and growing period zones. Such area calculations were effected by superimposing the climatic inventory on the Soil Map of the World and measuring the extent of each soil mapping unit in each major climate and growing period zone.

The second stage of the inventory was computer conversion of this basic data into extents of individual soil units, by phase, slope and texture class, in each major climate and growing period zone. This conversion, from areas of soil mapping units to areas of soil units, was achieved by applying the mapping unit composition rules and texture, slope and phase distribution rules described in Volume 1.

A summary of the results is presented in Table 5.1 (extents of soil units combined for all major climates, slopes, textures and phases) by growing period zones. A complete breakdown of the extents of the soil units by countries, by slope, texture and phase, by major climate and growing period zone, is available at FAO.

Table 5.1

EXTENTS (000 HA) OF SOIL UNITS BY GROWING PERIOD ZONES

SOIL UNIT	TOTAL EXTENT (000 HA)	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
A - 8 Area	38	19	16	3											
AF	29256	4115	3187	5270	2789	315									
	2905	1105	3108	5552	844										66
AG	13631	1547	1104	1512	1331	118									
	3210	415	1223	2654	517										
AH	33146	4882	3702	2917	2177	305									
	11226	1699	2215	2959	665										399
AO	113342	13188	14057	16336	16194	910									
	17423	3323	11954	15152	2638	199									1468
AP	8246	1187	592	1565	614	137									
	650	334	1236	1728	203										
B	2211				4	12	28	33	12						
						8	41							1	2072
BC	14327	330	196	149	3542	2104	191								
	2789	6	52	412	3252	1200	68								36
BD	32100	3986	4289	3387	2285	133									
	8939	1380	2857	3283	723	202									636
BE	28415	519	1057	1865	3038	5276	492								
	271	246	1921	2090	4349	4720	530								2041
BF	9444	325	674	1286	1176	529									
	879	198	1379	2372	633	131									2
BG	2873	125	117	942	136	115	34								
	130	56	381	626	18	150	43								
BH	13055	1931	786	1117	526	110									
	3052	383	1098	1776	179	44									2053
BK	3487	73	124	279	722	250	30								
		4	39	249	560	1135	3								19
BV	16426		76	100	1201	7058	927								
		40	56	66	4064	2564	274								
BD	1715		389	164	182										
			20	284	130	168									378
DE	2							2							
E	2778	704	189	196	107	138									
	441	245	148	297	80										163
F	530	8	28	151	67										
	4	8	186	76	2										
FA	156		30	72											
			104												
FH	5002	1224	209	20	86										
	2578	646	110	36	93										
FO	5483	2230	504	69	91	50									
	1522	251	382	141	243										
FP	972		76	140	460	48									
			24	192	32										
FR	2822	539	503	147	140	187									
	158	36	668	170	261	13									
FX	931	464	64												
	112	291													
G	5573	42	228	366	1039	740	140								
	1	46	641	536	1232	473	16								73
GC	1677		156	733	43										
			110	566	89										
GD	9347	1715	1253	680	604	30									
	1688	531	1491	1209	146										
GE	18261	537	2334	5909	1501	184									
	97	554	3848	2780	375	65	2	9							66
GH	10812	2119	1756	1250	245	301									
	1928	816	1073	1127	108	85									4
GM	2747	8	23	1402	379	4									
		4	175	613	139										
GP	972		30	142	464	32									
			26	194	34										

N = Normal growing period.

Table 5.1 (cont.)

SOIL UNIT	TOTAL EXTENT (000 HA)															
		-	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
GX	110															110
HG	67	10	6	8	10	4	6	9								
HH	1667	44	2	4	10	20	86	162	228	391	56	75	10		433	
I	90462	2717	3439	1344	4726	3740	5615	6085	7305	6359	4342	1640	6487	7956	20319	
J	141	11	6	9	11	47	31	22	4							
IC	12220			18	491	446	704	1054	1828	1103	998	286	1633	2602		
JD	14486	3369	4851	1691	1943	1380	580	359	104	70	54				76	
JF	21034	1588	775	345	1860	2161	3816	2309	2734	2241	2130	425	141	223	233	
JT	6711	502	731	290	774	1395	2196	796	107	35	30			35		
KH	1646							6	25	600	822	142	51			
L	1199	1032	112		4	8	4	8	27							
LC	43615	844	924	463	773	584	1254	1352	6876	11535	6214	1654	467		48	
LF	19778				200	122	340	10160	1773	6254	593	336				
LG	10485	154	123	67	154	712	1263	2081	3868	1746	190	66	8		48	
LK	2330	95	130	52	36	50	82	358	280	642	331	274				
LO	17856	733	720	689	678	1040	1168	1550	1741	3072	3163	2576	71		655	
LP	909						14	40	579	256	15	5				
LV	1472	4	66	284	453	316	178	74	13	35	49					
NO	22165	675	1310	765	3211	4890	5153	3366	2010	431	265	55			34	
NE	14397	195	274	117	426	1740	1157	1314	6247	2004	514	207				
NH	972	324	107	38	28	39	46	92	283	13					2	
O	333					36	70	90	40	24	37				36	
OD	18057	4655	6259	1776	3248	1155	491	259	10						294	
OE	4973	2545	564	184	654	227	372	307	106						14	
P	176	41	11		24	23	14	2	25						36	
PG	1336	149	837	191	153	6										
PH	1522	54	997	141	197										227	
PL	1183				773	42	50								318	
PO	1909	426	1379	47	37	20										
PP	216	3	166	22	20											
PA	3352	719	2097	111	136	89	38	32	14	57	33	16	11			
PC	17290	1043	554	406	376	141	86	56	11		62	342	4449	7739	8	

Table 5.1 (cont.)

SOIL UNIT	TOTAL EXTENT (000 HA)	A	B	C	D	E	F	G	H	I	J	K	L	M	Z
QF	3015	668	1448	326	245	81	74	107	12	49	12				
QL	1176	6	9	10	108	126	262	383	154	98	21				
R	1579	720	527	60	177	18									77
RC	17118				68	113	262	135	138	204	332	226	7844	1575	
RD	4219	264	479	158	619	639	316	477	736	254	196	50	15		16
RF	4572	224	486	250	342	254	265	374	379	560	1096	172	123	97	30
S	124		2			3	4	77	18	20					
SG	1036		2	9	59	253	232	230	62	13	8				
SO	1567					17	9	63	114	554	329	53	428		
TH	1669	587	547	206	102	83	40	34	17	12	45				
TM	422	14	111	132	94	20	21	8	8	14					
TO	2568	60	231	324	337	602	417	343	58	96	110				
TV	2695	494	626	466	358	261	105	100	50	97	120		18		
U	5672	414	207	45	177	124	185	397	110	86	156	12	2	3687	
V	228		12		116	93	7								
VC	44655	56	281	96	261	223	279	285	4297	10940	16601	7450	2916	1040	
VP	13015	29	100	57	562	563	1101	519	1966	2871	1971	2537	746		
WD	584		109	69	15	10	35	212	72	34	8				
WE	1979				134	58	840	327	102	70	288	160			
WF	132						13	2	92	11	11	3			
X	992										12	68	360	480	72
XH	6070										216	877	1108	3815	54
XX	5300									18	214	1533	993	2524	18
XL	213									36	78	99			
Y	1631														1631
YH	13665											258	358	5352	7697
YK	14637											4	44	5663	7092
YY	206												8	192	6
Z	3232					1	10	3	43	98	259	155	22	1258	1387
ZG	3645	242	247	27	141	226	245	127	42	28	91	21	51	1793	371
ZH	30					30									
ZQ	9977					51	63	121	365	362	1569	1476	244	1979	3643
ZT	381												5	20	356
ICECAPS	5910														5910
GRAND TOTALS	897615	85733	73659	23827	62866	60661	78236	74907	94888	75218	70566	42490	13406	46570	47172



The results show the following extents of major soil units in the region, listed in decreasing order of importance with regard to area of occurrence:

<u>Position</u>	<u>Major Soil Unit</u>	<u>Extent (million ha)</u>	<u>(Percent of Total)</u>
1.	(A) Acrisols	197.7	(22.0)
2.	(B) Cambisols	122.3	(13.6)
3.	(L) Luvisols	97.6	(10.9)
4.	(I) Lithosols	90.5	(10.1)
5.	(V) Vertisols	57.9	(6.4)
6.	(J) Fluvisols	54.6	(6.1)
7.	(G) Gleysols	49.5	(5.5)
8.	(N) Nitosols	37.5	(4.2)
9.	(Y) Yermosols	30.1	(3.4)
10.	(R) Regosols	27.5	(3.1)
11.	(Q) Arenosols	24.8	(2.7)
12.	(O) Histosols	23.4	(2.6)
13.	(Z) Solonchaks	17.3	(1.9)
14.	(F) Ferralsols	15.9	(1.8)
15.	(X) Xerosols	12.6	(1.4)
16.	(T) Andosols	7.4	(0.8)
17.	(P) Podzols	6.3	(0.7)
18.	(U) Rankers	5.6	(0.6)
19.	(S) Solonetz	2.7	(0.3)
20.	(E) Rendzinas	2.7	(0.3)
21.	(W) Planosols	2.7	(0.3)
22.	(D) Podzoluvisols	1.7	(0.2)
23.	(H) Phaeozems	1.7	(0.2)
24.	(K) Kastanozems	1.6	(0.2)
25.	Icecaps	5.9	(0.7)
	<b>Total</b>	<b>897.6</b>	<b>(100.0)</b>

Distribution of the various slope classes, texture classes and phases in the region, combined for all major climates, lengths of growing periods and soil units, is as follows:

<u>Slope</u>	<u>Extent (million ha)</u>	<u>(Percent of Total)</u>
'a' slopes 0 - 8 percent	361.2	(40.2)
'b' slopes 8 - 30 percent	273.8	(30.5)
'c' slopes >30 percent	<u>262.6</u>	<u>(29.3)</u>
<b>Total</b>	<b>897.6</b>	<b>(100.0)</b>
<u>Texture</u>		
'light' texture	90.6	(10.1)
'medium' texture	502.8	(56.0)
'heavy' texture	<u>304.2</u>	<u>(33.9)</u>
<b>Total</b>	<b>897.6</b>	<b>(100.0)</b>
<u>Phase</u>		
Lithic	78.0	(8.7)
Petric	7.0	(0.8)
Petroferric	9.6	(1.1)
Saline	27.3	(3.0)
Sodic	0.7	(0.1)
Stony	13.7	(1.5)
'no' phase	<u>761.1</u>	<u>(84.8)</u>
<b>Total</b>	<b>897.6</b>	<b>(100.0)</b>

The suitability of the soils inventoried, for crop production, was assessed by matching the crops' soil requirements with the properties of the soil units. This resulted in the rating of all soil units for the production of each crop at two levels of inputs. The soil requirements for all 11 crops used in the assessment are detailed in Volume 1. Modifications to the soil unit ratings, according to any significant limitations imposed by slope, texture and phase conditions, are also described in detail, in the same volume.

The ratings employed are based on how far the soil conditions of a soil unit meet the crop requirements under a specified level of inputs. The appraisal was effected in three basic classes for each input level, i.e. very suitable or suitable ( $S_1$ ), marginally suitable ( $S_2$ ) and unsuitable (N). A rating of  $S_1$  indicates that there are no, or only minor, soil limitations to the growth of the crop, provided climatic conditions are suitable. The rating  $S_2$  indicates that soil limitations are such that they will adversely affect the growth of the crop but not to the extent of making the land unsuitable. A rating of N was given when the soil limitations are so severe that crop production is not possible or, at best, very limited.

These soil ratings are used in the final land suitability assessment to modify the agro-climatic suitability classification according to soil conditions, as described in Section 7.

## 6. NET BIOMASS, YIELD POTENTIAL AND THE AGRO-CLIMATIC SUITABILITY CLASSIFICATION

The agro-climatic suitability classification used in the study is derived in three steps, namely:

- (1) matching of the attributes of the major climates with the crop adaptability groups for determination of which crops qualify for further consideration in the different major climates;
- (2) calculation of net biomass and constraint-free yield potential of all qualifying (in suitable major climates) crops in respect of the effect of the prevailing temperature and radiation regimes on crop photosynthesis and growth in the various lengths of growing period zones; and
- (3) amendment of the <sup>calculated</sup> constraint-free potential yields by reduction ratings reflecting yield losses that occur due to agro-climatic constraints, e.g. pests, diseases and weeds, according to their severity for each crop in each length of growing period zone and for each level of inputs.

Full details of the methodology for calculation of net biomass and constraint-free crop yields by suitable major climates and all lengths of growing periods are presented in Volume 1. This account includes tables of the crop characteristics considered in the potential net biomass and yield calculations, as well as tables of the calculated potential net biomass and yield data. An example of the latter, for groups II and III crops in major climates 1 and 7, is included in the present report as Table 6.1.

In arriving at the agro-climatic suitability classification from such data, yield losses likely to occur due to agro-climatic constraints (i.e. constraints that have their origin primarily due to the prevailing climate) are deducted from the constraint-free yields. Such constraints, causing direct or indirect losses in yield and quality of produce, are grouped as follows:

- a. yield losses due to water stress constraints on crop growth;
- b. yield losses due to the effects of pests, diseases and weed constraints on crop growth;
- c. yield losses due to water stress, pests and diseases, and climatic constraints on yield components, yield formation and quality of produce; and
- d. yield losses due to workability constraints.

For the assessment of the severity of the four sets of constraints by crop, growing period zones and level of inputs, the following ratings are applied:

rating 0 - no (or only slight), resulting in no significant yield losses;

rating 1 - moderate, resulting in yield losses of the order of 25 percent;

rating 2 - severe, resulting in yield losses of the order of 50 percent.

Application of the appropriate reduction factors, according to the occurrence and severity of the agro-climatic constraints, to the constraint-free yields, allows quantification of attainable yields with agro-climatic constraints for the agro-climatic suitability assessment. The reductions are made consecutively according to the presence or absence of the constraint and the severity of the occurrence in each growing period zone and at each level of input. The computations are made in the order of presentation of the four sets of constraints, i.e. group 'a' constraints are applied first and group 'd' constraints are applied last.

Tables showing details of the constraints applied and their rating by major climate, crop, length of growing period and level of inputs are presented in full in Volume 1. Changes effected (cf. Africa) for the Southeast Asia agro-climatic classification comprise:

- a. inclusion of the 330-364 day length of growing period constraints in the 365-day growing period zone which was not previously reported/inventorized in Volume 1;
- b. deletion of the constraint of virus mosaic in cassava under the low level of inputs (cassava virus mosaic is of minor importance in Southeast Asia); and
- c. an additional group 'c' rating constraint in millet in all lengths of growing periods between 150 days and 239 days to take account of increased 'ergot' susceptibility.
- d. **for white potato in the 240-269 day length of growing period zone for both levels of inputs, there is no group 'd' constraint and the constraints in this zone are also applied to the 270-299 day zone. In the 300-364 day length of growing period zones the constraints, at both levels are 0211.**

The resultant anticipated yields at each level of inputs are presented in Table 6.2 (groups II and III crops in major climates 1 and 7) and Table 6.3 (groups I and IV crops in major climates 2, 3, 8 and 9). The anticipated yields used for the assessment of the relatively small area of major climate 11 are the same as those used for South America, i.e. those reported in Volume 3.

Table 6.1

POTENTIAL NET BIOMASS ( $B_n$ ) AND YIELD ( $B_y$ ) IN T/HA DRY WEIGHT OF GROUPS II AND III  
CROPS FOR TROPICAL AND SUBTROPICAL (SUMMER RAINFALL) AREAS

CROP	Growing period (days)												
	75-89	90-119	120-149	150-179	180-209	210-239	240-269	270-299	300-329	330-364	365-	365+	
Phaseolus bean	$B_n$	6.5-8.1	8.3-11.5	8.2-11.2	8.1-11.2	8.2-11.1	7.8-10.9	7.8-11.0	7.6-10.8	7.5-10.5	7.4-10.4	7.4-10.4	7.5-10.4
	$B_y$	1.3-2.3	2.5-3.4	2.6-3.4	2.4-3.4	2.4-3.3	2.3-3.3	2.3-3.3	2.3-3.2	2.2-3.1	2.2-3.1	2.2-3.1	2.2-3.1
Soybean	$B_n$	6.5-8.1	8.3-11.5	8.2-11.2	8.1-11.2	8.2-11.1	7.8-10.9	7.8-11.0	7.6-10.8	7.5-10.5	7.4-10.4	7.4-10.4	7.5-10.4
	$B_y$	1.3-2.3	2.5-3.4	2.6-3.4	2.4-3.4	2.4-3.3	2.3-3.3	2.3-3.3	2.3-3.2	2.2-3.1	2.2-3.1	2.2-3.1	2.2-3.1
Rice	$B_n$	13.3-17.4	13.4-17.6	13.2-17.4	13.0-17.2	12.8-16.9	12.5-16.5	12.5-16.5	12.3-16.2	12.2-16.0	11.9-15.7	11.9-15.7	12.1-15.6
	$B_y$	4.2-5.2	4.0-5.3	4.0-5.2	3.9-5.2	3.8-5.1	3.7-4.9	3.7-4.9	3.7-4.9	3.7-4.8	3.6-4.7	3.6-4.7	3.6-4.7
Cotton	$B_n$	5.0-6.9	6.9-11.1	11.1-15.4	15.3-15.9	15.0-15.8	14.6-15.4	14.6-15.4	14.3-15.0	14.2-14.9	13.9-14.6	13.9-14.6	14.1-14.8
	$B_y$	0 -0.07	0.07-0.44	0.44-1.08	1.07-1.11	1.05-1.11	1.02-1.08	1.02-1.08	1.00-1.05	0.99-1.04	0.97-1.02	0.97-1.02	0.99-1.04
Sweet potato	$B_n$	7.1-9.5	9.6-14.4	14.3-18.6	14.0-18.3	13.8-18.1	13.5-17.7	13.6-17.7	13.2-17.3	13.1-17.1	12.9-16.8	12.9-16.8	13.0-17.0
	$B_y$	1.7-3.2	3.3-7.8	7.9 10.2	7.7-10.1	7.6-9.9	7.4-9.7	7.4-9.7	7.3-9.5	7.2-9.4	7.1-9.2	7.1-9.2	7.1-9.3
Cassava	$B_n$	3.3-4.2	4.7-7.8	7.7-10.9	10.9-14.3	14.2-17.7	18.7-20.7	20.7-22.6	21.7-23.4	23.1-24.8	24.1	24.1	24.4
	$B_y$	0.5-0.8	0.9-2.4	2.4-4.7	4.7-7.9	7.8-9.7	10.3-11.4	11.4-12.4	11.9-12.9	12.7-13.6	13.3	13.3	13.4
Pearl millet	$B_n$	12.0-16.7	11.8-16.6	11.6-16.2	11.4-15.7	10.9-15.3	10.9-15.3	10.8-15.3	10.5-14.8	10.4-14.6	10.4-14.6	10.4-14.6	10.3-14.5
	$B_y$	3.0-4.2	2.9-4.1	2.9-4.0	2.8-3.9	2.7-3.8	2.7-3.8	2.7-3.8	2.6-3.7	2.6-3.6	2.6-3.6	2.6-3.6	2.6-3.6
Sorghum	$B_n$	11.3-14.5	14.7-21.0	14.3-20.6	13.9-20.3	13.7-20.1	13.3-19.5	13.4-19.5	13.1-18.9	12.7-18.7	12.7-18.7	12.7-18.7	12.6-18.5
	$B_y$	1.3-3.4	3.7-5.2	3.6-5.1	3.5-5.1	3.4-5.0	3.3-4.9	3.3-4.9	3.3-4.7	3.2-4.7	3.2-4.7	3.2-4.7	3.1-4.6
Maize	$B_n$	11.3-14.5	14.7-21.0	14.3-20.6	13.9-20.3	13.7-20.1	13.3-19.5	13.4-19.5	13.1-18.9	12.7-18.7	12.7-18.7	12.7-18.7	12.6-18.5
	$B_y$	1.9-4.9	5.1-7.3	5.0-7.2	4.9-7.1	4.8-7.0	4.6-6.8	4.7-6.8	4.6-6.6	4.4-6.5	4.4-6.5	4.4-6.5	4.4-6.5

Table 6.2

AGRO-CLIMATIC SUITABILITY CLASSIFICATION AND YIELD (WITH CONSTRAINTS) IN T/HA OF CROPS BY  
LENGTHS OF GROWING PERIOD  
GROUPS II AND III CROPS IN TROPICAL AND SUBTROPICAL AREAS

Crops	Input level	Growing period (days)	75-89	90-119	120-149	150-179	180-209	210-239	240-269	270-299	300-329	330-364	365 <sup>-</sup>	365 <sup>+</sup>			
PELLEL	High	Yield	1.1-1.6	2.2-3.1	2.9-4.0	2.1-2.9	1.5-2.1	0.8-1.2	0.3-0.5	0.3-0.5	0.3-0.4	0.3-0.4	0.3-0.4	0.3-0.4	0.3-0.4		
		% of max. 1/	28	41	57	79	100	73	53	30	12	12	10	10	10	10	
		Suit. 2/	MS	S	VS	S	S	MS					NS				
	Low	Yield	0.3-0.4	0.5-0.8	0.7-1.0	0.5-0.7	0.4-0.5	0.3-0.4	0.2-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2		
		% of max.	29	40	56	78	100	73	53	40	19	17	17	17	17		
		Suit.	MS	S	VS	S	S	MS					NS				
SORGHUM	High	Yield	0.5-1.3	1.8-2.6	2.7-3.8	3.5-5.1	3.4-5.0	1.8-2.7	0.8-1.2	0.6-0.9	0.4-0.6	0.4-0.6	0.4-0.6	0.4-0.6			
		% of max.	10	25	35	51	53	74	100	98	53	23	18	12	12	12	
		Suit.	NS	MS	S	VS	S	MS					NS				
	Low	Yield	0.1-0.2	0.3-0.5	0.5-0.7	0.9-1.3	0.9-1.3	0.5-0.7	0.2-0.3	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2		
		% of max.	7	19	27	39	40	56	100	98	54	27	17	17	17	16	
		Suit.	NS	MS	S	VS	S	MS					NS				
MAIZE	High	Yield	0.5-1.2	1.9-2.7	3.7-5.4	4.9-7.1	4.8-7.0	3.4-5.1	2.3-3.4	1.7-2.5	1.6-2.4	1.2-1.8	1.2-1.8	0.5-0.8			
		% of max.	7	17	27	38	52	76	100	98	72	48	35	34	25	25	11
		Suit.	NS	MS	S	VS	S	S	MS				MS		NS		
	Low	Yield	0.1-0.2	0.4-0.5	0.7-1.0	1.2-1.8	1.2-1.7	0.9-1.3	0.7-1.0	0.7-0.9	0.6-0.9	0.5-0.7	0.5-0.7	0.5-0.7	0.2-0.3		
		% of max.	5	13	20	29	39	57	100	99	72	54	52	51	38	38	17
		Suit.	NS	MS	S	VS	S	S	MS				MS		NS		
SOYBEAN	High	Yield	0.3-0.6	0.9-1.3	1.9-2.5	2.4-3.4	2.4-3.3	1.7-2.5	1.1-1.6	0.9-1.2	0.6-0.9	0.4-0.6	0.4-0.6	0.3-0.4			
		% of max.	9	18	28	38	56	73	100	97	73	47	35	26	18	18	12
		Suit.	NS	MS	S	VS	S	MS					MS		NS		
	Low	Yield	0.1-0.1	0.2-0.3	0.5-0.6	0.6-0.8	0.4-0.6	0.3-0.5	0.3-0.5	0.2-0.3	0.1-0.2	0.1-0.1	0.1-0.1	0.1-0.1	0.1-0.1		
		% of max.	10	18	28	38	58	75	100	72	54	54	40	26	12	12	12
		Suit.	NS	MS	S	VS	S	MS					MS		NS		

P H A S E A N O L U S	High	Yield	0.3-0.6	0.9-1.3	1.9-2.5	2.4-3.4	2.4-3.3	1.7-2.5	1.1-1.6	0.9-1.2	0.6-0.9	0.4-0.6	0.4-0.6	0.3-0.4									
		% of max.	9	18	28	38	56	73	100	97	73	47	35	26	18	18	12						
		Suit.	NS	MS	S	VS	S	MS	NS														
	Low	Yield	0.1-0.1	0.2-0.3	0.5-0.6	0.6-0.8	0.4-0.6	0.3-0.5	0.2-0.3	0.2-0.3	0.2-0.2	0.1-0.2	0.1-0.1	0.1-0.1	0.1-0.1								
		% of max.	10	18	28	38	56	75	100	72	54	36	26	26	12	12	12						
		Suit.	NS	MS	S	VS	S	MS	NS														
C O T T O N	High	Yield	0.0-0.0	0.0-0.2	0.3-0.8	1.1-1.1	1.0-1.1	0.6-0.6	0.5-0.5	0.3-0.3	0.2-0.2	0.1-0.1	0.1-0.1	0.1-0.1									
		% of max.	0	3	3	20	30	72	96	100	100	54	41	27	18	9	9	9					
		Suit.	NS	MS	S	VS	S	MS	NS														
	Low	Yield	.00-.01	.01-.03	.05-.11	.15-.16	.15-.16	.14-.15	.14-.15	.07-.07	.05-.05	.03-.03	.03-.03	.03-.03									
		% of max.	0	4	4	11	18	39	54	57	57	54	54	25	18	9	9	9					
		Suit.	NS	MS	S	VS	S	MS	NS														
S P O T A T O	High	Yield	0.6-1.2	1.2-2.9	3.9-5.1	7.7-10.1	7.6-9.9	7.4-9.7	7.4-9.7	5.5-7.1	2.7-3.5	2.7-3.4	2.7-3.4	1.8-2.3									
		% of max.	6	12	12	29	39	50	76	100	98	96	96	70	35	34	34	23					
		Suit.	NS	MS	S	VS	S	MS	NS														
	Low	Yield	0.2-0.3	0.3-0.7	1.0-1.3	1.9-2.5	1.9-2.5	1.8-2.4	1.4-1.8	1.4-1.8	1.4-1.8	0.9-1.2	0.9-1.2	0.7-0.9									
		% of max.	6	12	12	29	39	51	76	100	98	96	72	71	46	46	46	36					
		Suit.	NS	MS	S	VS	S	MS	NS														
C A S S A V A	High	Yield	0.2-0.3	0.3-0.9	1.0-2.0	2.6-4.4	7.8-9.7	10.3-11.4	11.4-12.4	11.9-12.0	12.7-13.6	7.4	7.4	5.0									
		% of max.	1	2	2	7	7	15	19	33	57	71	76	84	84	91	88	95	93	100	54	54	37
		Suit.	NS	MS	S	VS	S	MS	NS														
	Low	Yield	0.1-0.1	0.1-0.2	0.2-0.5	0.7-1.1	2.0-2.4	2.6-2.9	2.9-3.1	3.0-3.2	3.2-3.4	2.5	2.5	2.0									
		% of max.	1	3	3	6	6	15	21	32	59	71	76	85	85	91	88	94	94	100	74	74	59
		Suit.	NS	MS	S	VS	S	MS	NS														

1/ Throughout this table % of maximum refers to the yields of the respective growing period; expressed as a percentage of the maximum yield attainable from any growing period, without permanent constraints.

2/ Suitability: NS = not suitable; MS = marginally suitable; S = suitable; VS = very suitable.

Table 6.3

AGRO-CLIMATIC SUITABILITY CLASSIFICATION AND YIELD (WITH CONSTRAINT) IN T/HA OF CROPS BY LENGTHS OF GROWING PERIOD

GROUPS I AND IV CROPS IN TROPICAL AND SUBTROPICAL AREAS

Crops	Input level	Growing period (days)	75-89	90-119	120-149	150-179	180-209	210-239	240-269	270-299	300-329	330-364	365-	365+			
			<p>9.606 7.5% 10 ←</p>														
SPRING	High	Yield 1/	0.1-0.3	0.4-1.4	1.9-3.1	3.9-5.0	4.4-5.6	3.1-4.0	1.8-2.3	0.5-0.8	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7		
		% of max. 2/	0	0	29	44	69	79	100	100	56	41	19	12	12	12	
		Suit. 3/	NS	MS	S	VS	S	MS	NS								
	Low	Yield	0-0.1	0.1-0.3	0.5-0.8	1.0-1.3	1.1-1.4	0.9-1.1	0.6-0.7	0.2-0.3	0.2-0.3	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2		
		% of max.	0	0	29	44	67	79	100	100	75	55	19	12	12	12	
		Suit.	NS	MS	S	VS	S	MS	NS								
WHEAT	High	Yield	0-0.2	0.3-1.4	1.9-2.6	2.9-3.8	3.6-4.9	2.7-3.7	2.7-3.6	-	-	-	-	-			
		% of max.	0	4	5	27	39	52	58	78	100	75	73	-	-	-	
		Suit.	NS	MS	S	VS	S	-	-	-	-	-	-	-			
	Low	Yield	0-0.6	0.1-0.3	0.5-0.6	0.7-1.0	0.9-1.2	0.7-0.9	0.7-0.9	-	-	-	-	-			
		% of max.	0	4	6	28	39	52	58	77	100	75	73	-	-		
		Suit.	NS	MS	S	VS	S	-	-	-	-	-	-	-			
POTATO	High	Yield	1.0-1.7	1.7-2.8	2.8-5.5	4.9-9.7	4.7-9.4	2.6-5.3	2.6-5.3	2.6-5.3	2.0-4.0	1.3-2.6	1.3-2.6	0.6-1.2			
		% of max.	10	17	18	29	30	56	100	97	54	54	54	41	28	28	12
		Suit.	NS	MS	S	VS	S	MS	NS								
	Low	Yield	0.3-0.4	0.4-0.7	0.7-1.4	1.2-2.4	1.2-2.4	0.9-1.8	0.7-1.3	0.7-1.3	0.5-0.1	0.4-0.7	0.4-0.7	0.1-0.3			
		% of max.	10	17	18	29	30	56	100	97	72	54	54	41	28	28	12
		Suit.	NS	MS	S	VS	S	MS	NS								

P H A S E O L U S	High	Yield	0.1-0.3	0.4-0.6	0.9-1.3	1.9-2.7	2.1-3.0	1.8-2.5	1.6-2.3	0.8-1.1	0.6-0.8	0.4-0.6	0.4-0.6	0.3-0.4						
		% of max.	3	7	8	15	27	39	71	100	97	73	73	36	27	18	18	12		
		Suit.	NS		MS	S	VS	S		MS		NS								
	Low	Yield	0	-0.1	0.1-0.2	0.2-0.3	0.5-0.7	0.4-0.6	0.3-0.4	0.2-0.3	0.2-0.2	0.2-0.2	0.1-0.1	0.1-0.1	0.1-0.1					
		% of max.	4	8	8	15	27	39	71	100	97	54	36	27	27	12	12	12		
		Suit.	NS		MS	S	VS	S		MS		NS								
M A I Z E	High	Yield	0	-0.2	0.3-1.0	1.9-2.5	3.4-4.6	4.5-5.6	5.7-6.5	5.4-6.2	5.3-6.1	4.5-4.8	2.8-3.0	2.8-3.0	1.3-1.3					
		% of max.	0	0	0	3	3	10	22	42	58	73	94	100	100	75	38	28	28	12
		Suit.	NS			MS	S	VS	S		MS		NS							
	Low	Yield	0	0	0.1-0.2	0.4-0.5	0.8-1.2	1.1-1.4	1.4-1.6	1.4-1.6	1.4-1.7	1.4-1.5	0.7-0.8	0.7-0.8	0.3-0.3					
		% of max.	0	0	0	3	3	8	22	42	58	73	95	100	100	75	56	28	28	12
		Suit.	NS			MS	S	VS	S		MS		NS							
S O R G H U M	High	Yield	0	-0.1	0.2-0.1	1.3-1.7	2.3-2.3	3.2-4.1	3.6-4.1	2.8-3.3	2.2-2.3	1.5-1.6	0.9-1.0	0.9-1.0	0.9-1.0					
		% of max.	0	0	0	3	3	10	22	42	57	75	94	100	75	38	19	13	13	13
		Suit.	NS			MS	S	VS	S		MS		NS							
	Low	Yield	0	0	0	-0.1	0.3-0.3	0.6-0.8	0.8-1.0	0.9-1.0	0.7-0.8	0.7-0.8	0.5-0.5	0.2-0.2	0.2-0.2	0.2-0.2				
		% of max.	0	0	0	3	3	7	15	42	57	75	94	100	75	42	19	12	12	12
		Suit.	NS			MS	S	VS	S		MS		NS							

- 1/ Yield for the entire temperature range considered, i.e. mean temperature range 10.0-20.0°C for spring wheat, potato and phaseolus bean; mean temperature range 15.0-20.0°C for maize and sorghum; 5.8-20.0°C for winter wheat.
- 2/ % of maximum refers to the yields of the respective growing periods expressed as a percentage of the maximum yield attainable from any growing period without permanent constraints. For spring wheat, phaseolus bean, maize and sorghum, the values are for the mid-altitude range. For winter wheat and potato, the values are for the whole altitude range.
- 3/ Suitability: NS = not suitable; MS = marginally suitable; S = suitable; VS = very suitable.



In Tables 6.2 and 6.3 the anticipated yields are subdivided into those attainable under (a) high inputs and (b) low inputs. Because of the yield reducing effects of low fertility and management limitations inherent to low input level conditions, the constraint-free yields for this level have been assumed as 25 percent of the constraint-free yields under high input conditions.

Further, in these tables the anticipated yield from each growing period zone is shown as a percentage of the maximum yield attainable, i.e. in the case of cassava at the high input level, the maximum attainable yield is 13.6 t/ha (in the 300-329 day zone). The yield of 12.0 t/ha from the 270-299 day zone is therefore as shown, 95 percent of the maximum.

When a growing period zone completely accommodates the crop with the longest growth period, the upper yield figure reflects the full potential of that zone and, therefore, only one corresponding percentage of maximum yield figure is presented.

The coloured entries in Tables 6.2 and 6.3 are the agro-climatic suitability assessment bar charts. This suitability assessment is based on a comparison of attainable crop yields in the lengths of growing period zones, in terms of percentage of maximum attainable. If the yield of a crop from a particular zone is more than 80 percent of the maximum attainable, that zone has been assessed as agro-climatically 'very suitable' (VS) for that crop. Zones with yields of 40 to less than 80 percent have been classified as 'suitable' (S); 20 to less than 40 percent as 'marginally suitable' (MS); and less than 20 percent as 'not suitable' (NS). On the bar charts, dividing lines between agro-climatic suitability classes have been located at the nearest 15-day position in relation to the growing period zone.

The application of the agro-climatic suitability assessment to the land suitability classification is described in the following section.

## 7. THE LAND SUITABILITY CLASSIFICATION

The result of the study is the land suitability classification. This takes account of all the inventoried attributes of land and compares them with crop requirements to give an easily understood picture of the suitability of land for the production of the crops of the study. Four land suitability classes are employed, each linked to anticipated yields for the two levels of inputs considered. For each level of inputs, the land suitability classes (as for the agro-climatic suitability classes) are: very suitable - 80 percent or more of the maximum attainable yield; suitable - 40 to less than 80 percent of the maximum attainable yield; marginally suitable - 20 to less than 40 percent of the maximum; and not suitable - less than 20 percent.

The study thus provides concise data on the locations and extents of land variously suited to the production of 11 crops, under two levels of inputs, and the production potential of these areas.

In essence, the suitability classification has been compiled by modifying the computed extents of lands in the four agro-climatic suitability classes by the ratings of the various soils inventoried in those areas, i.e. knowing the area of each growing period zone, its agro-climatic suitability and the extent and degree of soil limitations to crop production, it is possible to compute the areas of land variously suited to the crops at each of the two levels of inputs.

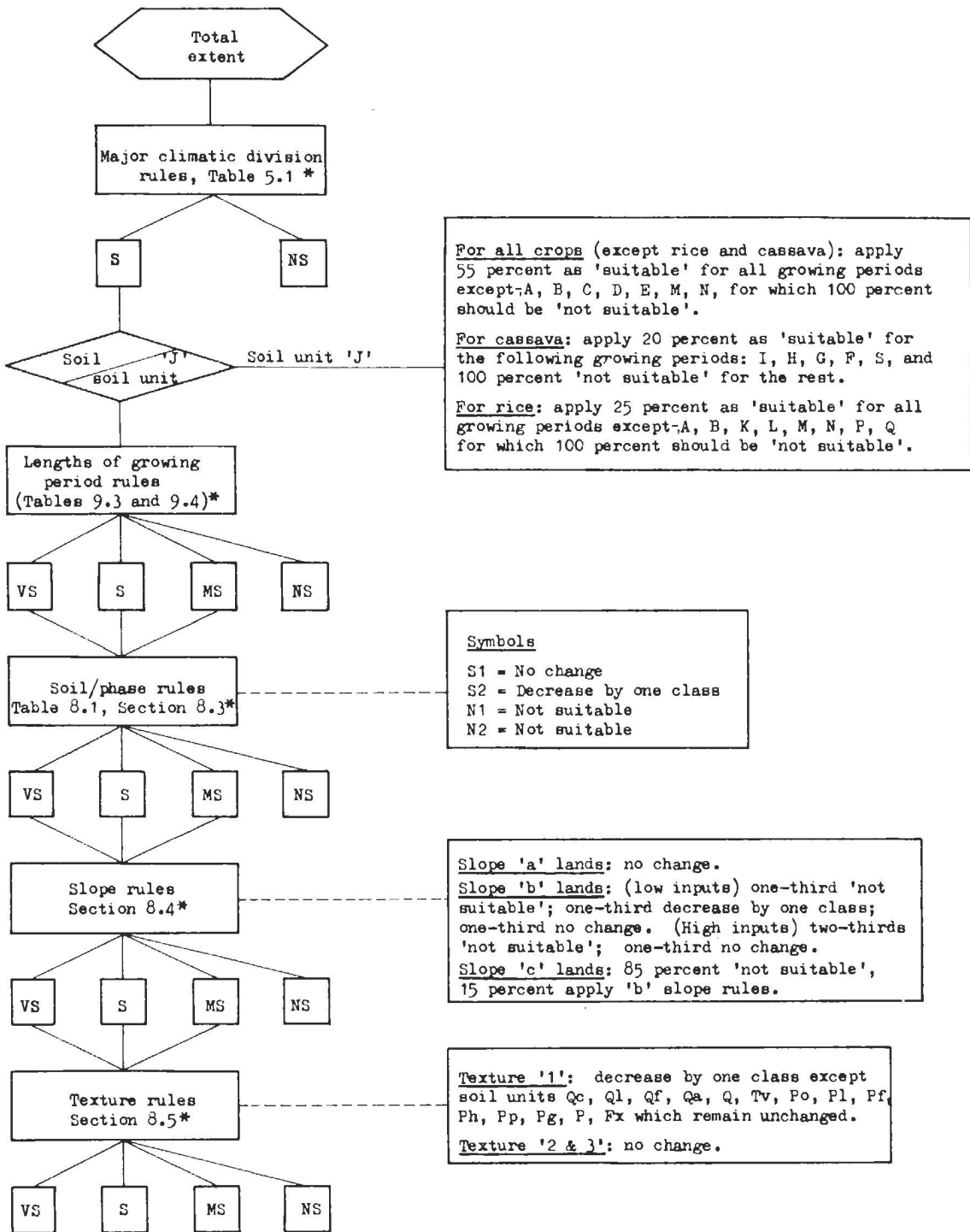


Fig. 7.1: Agro-ecological Zone Data Base - Schematic Outline of the Land Suitability Assessment Programme

\* These table and section numbers refer to material in Volume 1.

This has been achieved by applying the programme illustrated in Fig. 7.1. Firstly the crops' photosynthesis and growth temperature requirements are compared with the prevailing temperature conditions of each major climate in the region. If they do not accord, all the growing period zones in that major climate are classified as 'not suitable'. If the temperature conditions of a major climate do accord with the crops' photosynthesis and growth temperature requirement, all the growing period zones in that major climate are considered for further suitability assessment.

This further assessment, except for areas of Fluvisols, comprises application of the agro-climatic suitability classification to the computed areas of the various growing period zones. Thus, if a particular growing period zone is agro-climatically 'very suitable' (VS) for the production of a crop, then all areas of this growing period zone are classified, in the first instance, as 'very suitable' from the agro-climatic viewpoint. If half the areas of a growing period zone are agro-climatically 'very suitable' (VS) and half 'suitable' (S), then half of the extent of that growing period zone is computed as 'very suitable' and half as 'suitable'.

The next step is an appraisal of the soil units present in each growing period zone. The rating of the soil units, for the crop and level of inputs under consideration, is applied to the computed area of the growing period zone occupied by each soil unit (agro-ecological zone). This appraisal is undertaken on the basis of the formulated soil ratings and leads to appropriate modifications of the agro-climatic suitability assessment. Subsequently the ratings for different soil phases, soil slope classes and soil texture classes are consecutively applied to arrive at the final land suitability appraisal for each crop under one of the two levels of inputs.

Exception to this general methodology for the land suitability assessments are necessary to deal with the particular circumstances of rice and Fluvisols. The rules governing suitability of Fluvisols are summarized in Figure 7.1.

The results of the land suitability assessment for all crops are presented in Part B, Section 8.

The special rules, governing the suitability assessment for rice, meet the following conditions:

- rice yields in climatically suited areas are, to a large degree, dependent on complete water control. This is considered not possible under purely rainfed conditions and therefore no 'very suitable' (VS) land should be recognized for this crop from the climatic viewpoint;
- lengths of growing periods in excess of 180 days approximate to rainfall regimes of 1 000 mm or more. These, in turn, may be assumed to provide three consecutive months with more than 200 mm precipitation per month, which is the minimum acceptable distribution for cultivation of paddy rice under bunded conditions;

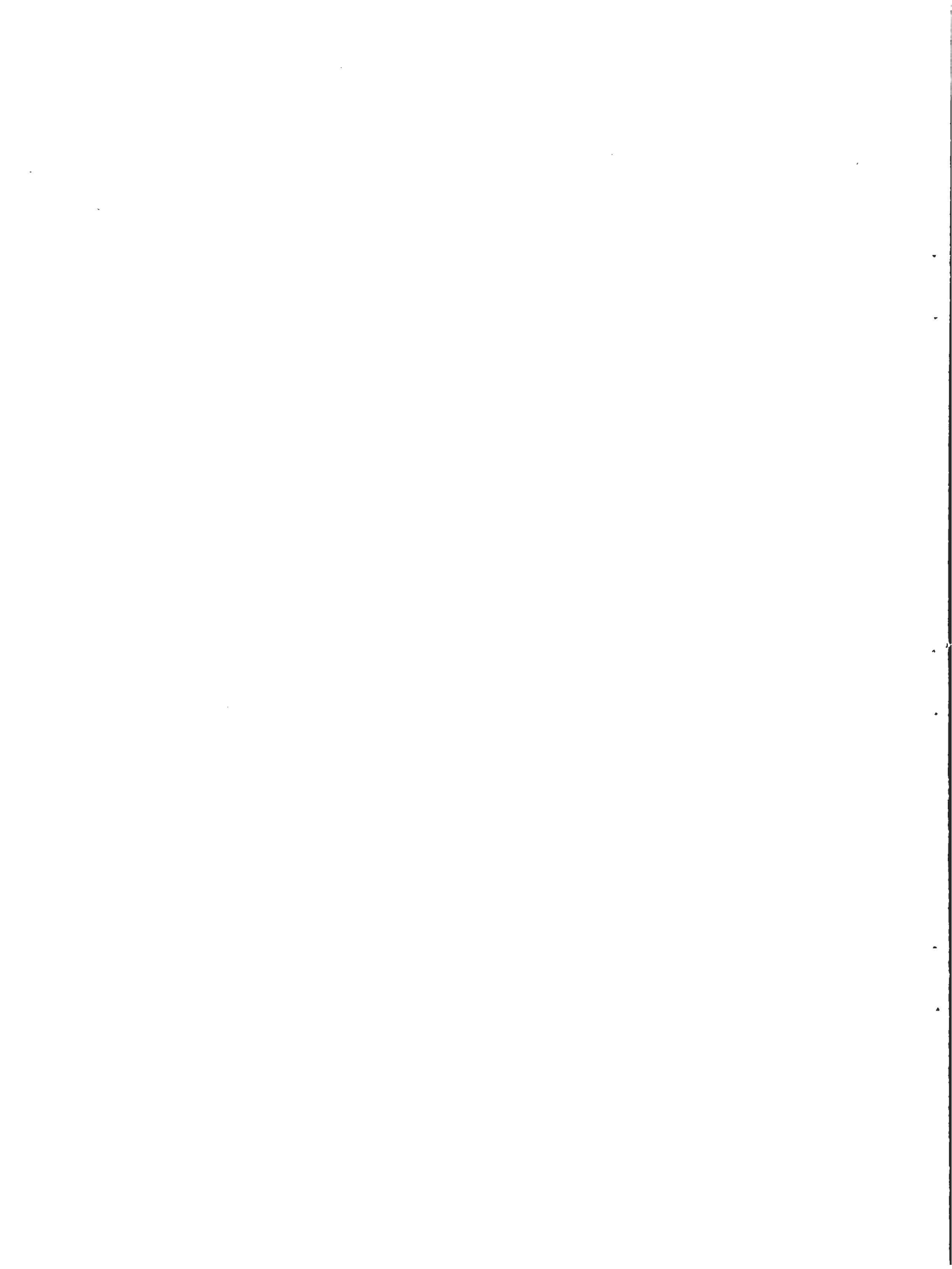
To meet these conditions the following rules were applied for the land suitability assessment of rice at both levels of inputs:

- classify lands into two suitability classes only, i.e. 'suitable' and 'not suitable'; <sup>1/</sup>

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<sup>1/</sup> Because only one 'suitable' class is recognized for rice, no agro-climatic suitability map is presented for this crop in the subsequent section.

- classify all areas of major climates 1 and 7 as 'suitable'; the remaining major climates as 'not suitable';
- classify all areas of lengths of growing period zones of more than 180 days as 'suitable', the remainder as 'not suitable';
- apply the soil unit, slope, texture and phase ratings for the rice crop to the agro-climatically 'suitable' areas, for all soils except Fluvisols;
- apply Fluvisol/rice rules.



PART B - RESULTS

8. LAND SUITABILITY DATA

The results of the assessment, combined for all countries in Southeast Asia, are presented in the following maps and tables.

Two triple fold-out pages are devoted to each of ten of the eleven crops considered in the assessment. (Only one triple fold-out page is devoted to rice for the reason given on page 34). The initial triple page for each of the ten crops is a generalized map of agro-climatic suitability for the crop under consideration and shows the location and extent of the three suitability classes combined for both levels of inputs. These maps, because of scale limitations, are only very generalized versions of the agro-climatic crop suitability maps generated at the 1:5 million base scale. The five-fold reduction imposed to bring to triple-page size does not permit location specific interpretation even although the 1:5 million base map locations of appropriate isolines have been used whenever possible in compiling the triple-page size presentations. For the above reason, average suitabilities have had to be employed in the maps where, on the original 1:5 million version, two or more suitability classes occur in a small area. The maps therefore should be read in conjunction with the agro-climatic crop suitability bar charts presented in Tables 6.2 and 6.3. Additionally it should be appreciated that the maps show rainfed agro-climatic crop suitabilities and do not indicate a) areas where particular soil conditions, e.g. as in Vertisol areas, may modify the agro-climatic suitability assessment and b) all areas agro-climatically suited to irrigated production of the crop.

The triple fold-out page opposite each map show the results of the land suitability assessment, presenting data on the extents (000 ha) of land variously suited to the rainfed production of each crop, by major climates and by lengths of growing period zones. Anticipated yields from the four land suitability classes employed are given for each major climate where the crop can be grown. The data is also presented by the two levels of inputs used in the assessment. In the computations, no account is taken of fallow period requirements (dependent on level of inputs) or of non-arable land requirements (i.e. rangeland and land for forestry, urban areas, transportation, recreation and wildlife, reservoirs and surface mining). Additionally no account is taken of the special country specific land attributes mentioned in page 8, e.g. typhoon hazard in northern Philippines and long duration flooding in Bangladesh.

The land suitability data presented is non-additive (i.e. the land areas suitable for one crop cannot be added to the land areas suitable for another crop), as the figures show the extents of land suitable for the production of one crop or the extents of land suitable for another crop. Estimates of the total extent of land suited to rainfed crop production, in general, can be arrived at by adding the maximum area suitable for production of some crop in each individual length of growing period zone in each major climate.

The results of this exercise for Southeast Asia are presented below:

Maximum Extents of Land 'Suitable' to the Rainfed  
Cultivation of Some Crop of the Assessment  
(million ha)

	Very Suitable and Suitable Land	Very Suitable, Suitable and Marginally Suitable Land
Low Inputs	184.0 (20.5)	281.8 (31.4)
High Inputs	226.3 (25.2)	271.0 (30.2)

Figures in parenthesis show the results as a percentage of the total land area (897.6 million ha) in Southeast Asia.

The assessed area of potentially rainfed 'cultivable' land for annual crops under low inputs, i.e. 281.8 million ha, is somewhat lower than the estimate of 331.0 million ha compiled from various country sources (FAO 1979). The reason for this difference of 49.2 million ha is that country returns on extents of 'cultivated' lands for annual crops include some areas which are considered as not suitable for cultivation in the present assessment.

In particular, cultivation is presently taking place on lands with a length of growing period of less than 75 days duration. The total extent of such lands in Southeast Asia is 94.0 million ha (Table 4.2). Applying the assumption that only 33 percent of this land is cultivable, results in a figure of 31.0 million ha, excluded from cultivation by the present study. As reported in Volume 2 (Results for Southwest Asia), 'inputs' used for production in these areas, if transferable, would have a higher yield response in zones assessed, by the present study, as suitable for cultivation. The hazard of cultivation in such dry areas in Southeast Asia and in Africa and Southwest Asia are well known.

Additionally, the present study has applied the general global assumption that half of vertisol areas in length of growing period zones less than 135 days are too heavy for cultivation of crops climatically classified as suitable for these areas. The total extent of Vertisols in Southeast Asia is 57.9 million ha (Table 5.1). Of these, 23.9 million ha are in the growing period zones with less than 135 days and are fully cultivated under the special circumstances of the Southeast Asia region where animal power is commonly used for cultivation (either in the dry season on residual moisture or in the rainy season). This accounts for an additional 12.0 million ha of the 'cultivable' land area,

Application of these additional extents i.e. 31.0 plus 12.0 = 43.0 million ha, to the assessed potentially rainfed 'cultivable' land estimate of 281.8 million ha results in a figure of 324.8 million ha of potentially rainfed cultivable land.

Present land use data (Table 2.1) for countries covered in the Southeast Asia study is as follows:

	<u>million ha</u>
Annual harvested area, all crops (rainfed and irrigated)	270.5
Estimated area under tree crops on land too steep for annual crops	8.0
	<hr/>
Extent of annually harvested land suitable for annual crops	<u>262.5</u>

Comparison of the estimate of 281.8 million ha of potentially cultivable rainfed land with the presently harvested area (262.5 million ha) provides an estimate of the available land reserve for annual crops i.e. 19.3 million ha (7.4 percent). Inclusion of the additional cultivable vertisol area of 12.0 million ha increases the reserve to 31.3 million ha (11.9 percent). It is not considered realistic to include areas of less than 75 days growing period as part of land reserve estimates because of their very low and variable production potential.

As cultivable land estimates are also available by individual countries, total extents of land suited to crop production and land reserve can also be computed for individual countries, if required. Such computations however are not the objective of the study, and the presentation of the results in the present section is specific to both crop and level of inputs.

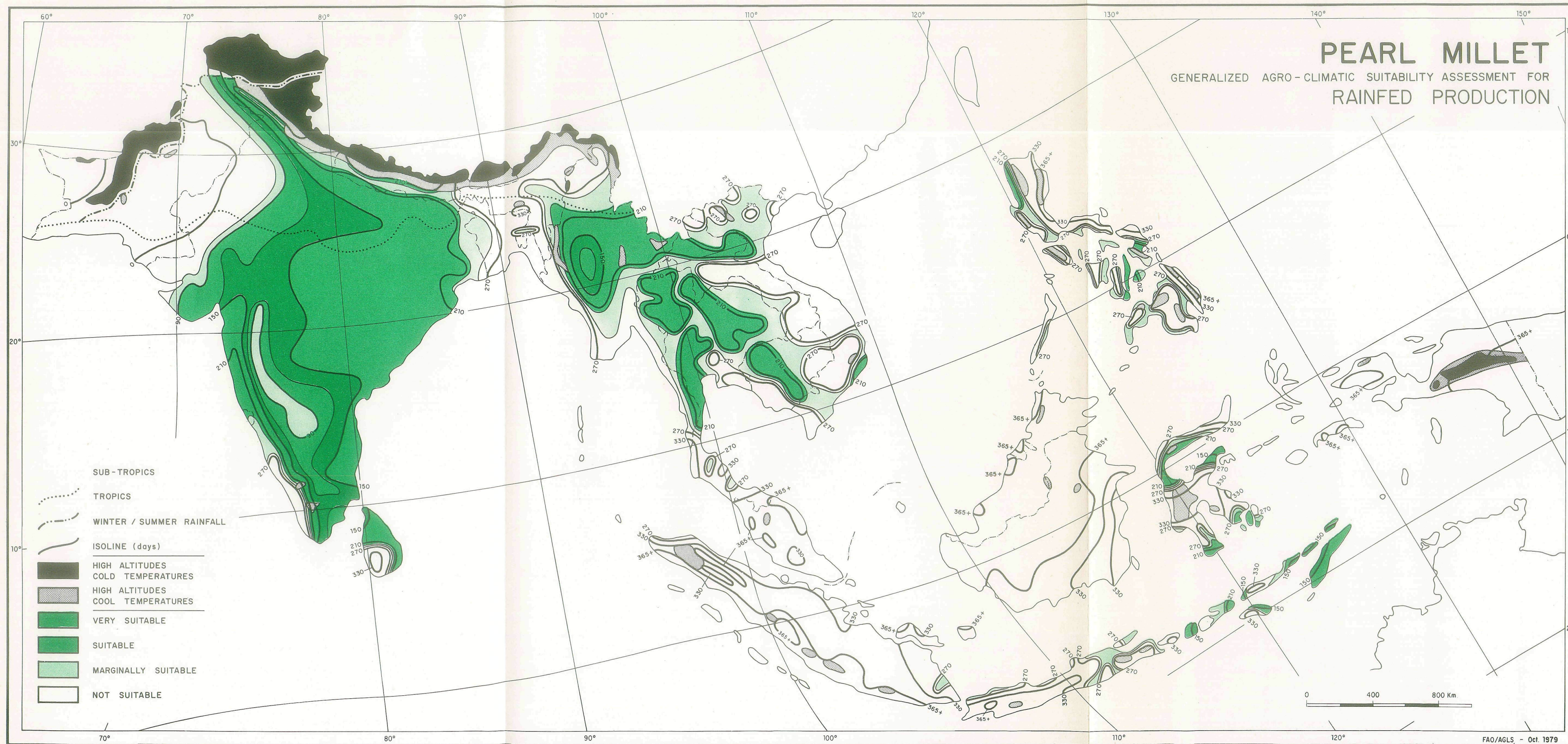
While the study and the presented results are for Southeast Asia as a whole, the data generated by the project can also be used for general appraisals of optimum land use at most country levels. This can be achieved by using the individual country climatic/soil inventory printouts and applying the agro-climatic suitability classification (Tables 6.2 and 6.3) and the soil unit/crop ratings for each crop in order of priority with regard to required increases in individual crop production. Accordingly, copies of the data base (climatic/soil inventory printouts), as well as the crop suitability assessments, by individual countries, can be made available to Government Agencies on request. It must be emphasized however that while the methodology is scale neutral, additional and more precise climatic and soil inputs are necessary to achieve specific land use interpretations suitable for planning purposes at individual country levels.

Interpretation of the results presented in this section, with regard to regional and global significance for rainfed agriculture, will be undertaken on completion of the global assessment.



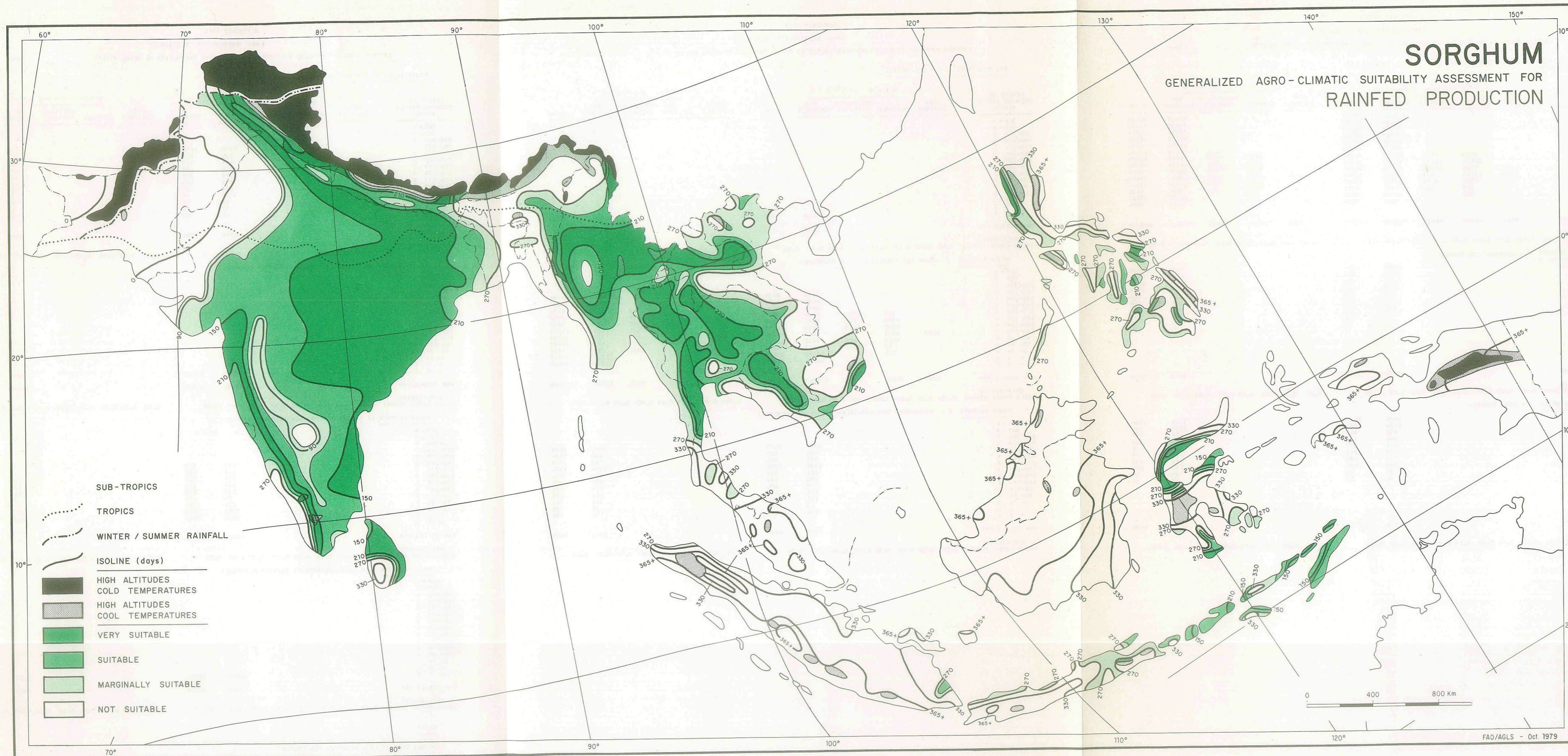


Fig. 8.1



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.

Fig. 8.2



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF PEARL MILLET

TABLE 8.1a

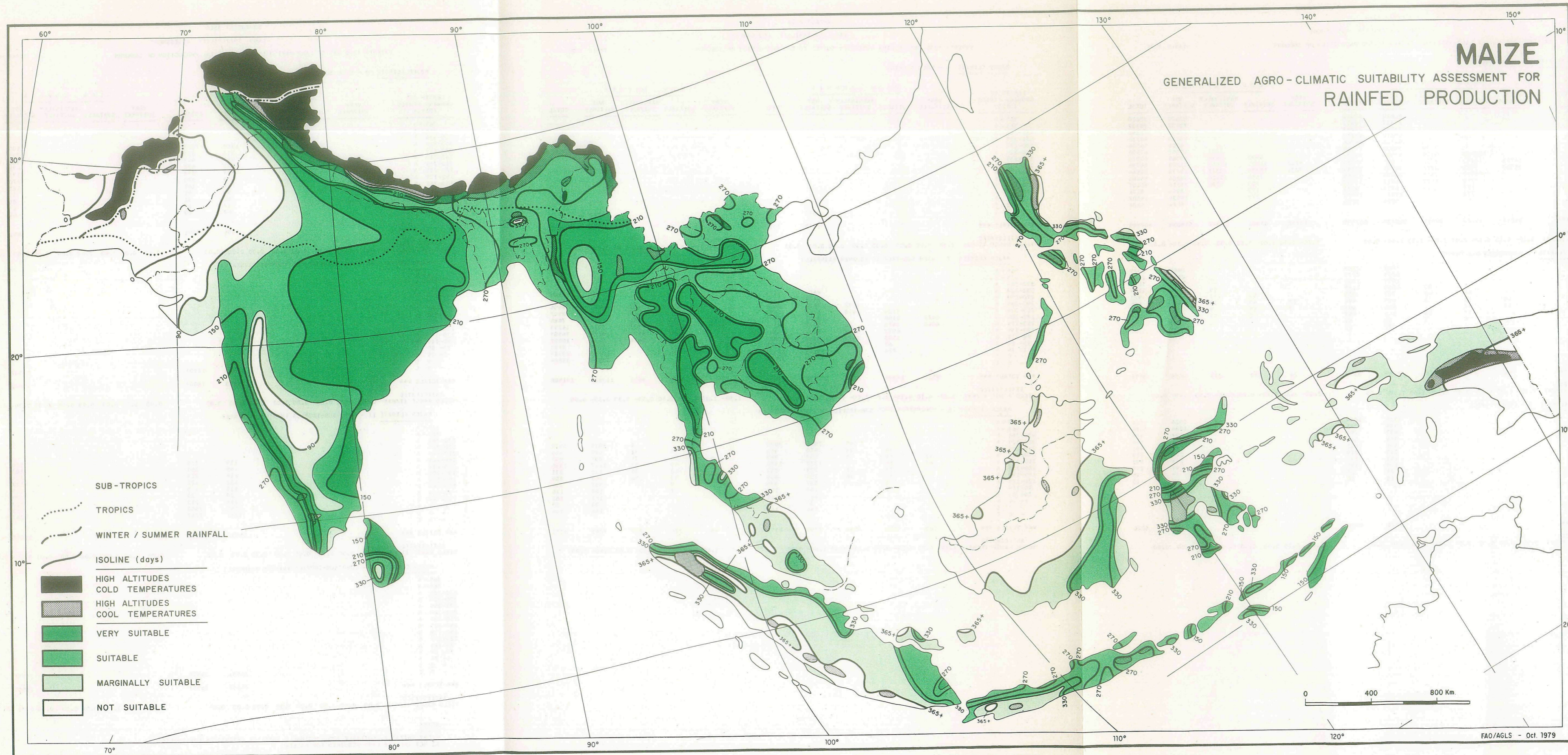
LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				TOTAL	LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE		VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N					82620				
365 - N				70302				70302		
330-364 N				22298				22298		
300-329 N				48210				48210		
270-299 N				54206				54206		
240-269 N				67300				67300		
210-239 N		2127	7780	53171	3627	1152		61448		
180-209 N		10131	15225	59600	6052	14590		63078		
150-179 N		9184	17676	32684	7913	13396		67300		
120-149 N	7528	13762	147	26029	14600	2933		53466		
90-119 N		6386	9239	15782	6382	7450		31407		
75-89 N		177	1413	7581	177	1413		9171		
1-74 N		272		15535	272			15807		
- 0 C				5224				5224		
- 0 C										
*** TOTALS ***	7528	48039	51480	560542	667589	7036	39023	46911	574619	667589
ANTICIPATED YIELD RANGE (T/HA)	3.90- 3.10	3.10- 1.60	1.60- 0.80	0.80- 0.00		1.00- 0.80	0.80- 0.40	0.40- 0.20	0.20- 0.00	
MAJOR CLIMATE	2 - MODERATELY COOL TROPICS					7 - WARM SUB-TROPICS (SUMMER RAINFALL)				
365 + N				2089	2089				2089	2089
365 - N				2273	2273				2273	2273
330-364 N				1032	1032				1032	1032
300-329 N				1129	1129				1129	1129
270-299 N				923	923				923	923
240-269 N				496	496				496	496
210-239 N				407	407				407	407
180-209 N				447	447				447	447
150-179 N				55	55				55	55
120-149 N				21	21				21	21
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***				8872	8872				8872	8872
ANTICIPATED YIELD RANGE (T/HA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAJOR CLIMATE	3 - COOL TROPICS					8 - MODERATELY COOL SUB-TROPICS (SUMMER RAINFALL)				
365 + N				1024	1024				1024	1024
365 - N				1084	1084				1084	1084
330-364 N				497	497				497	497
300-329 N				544	544				544	544
270-299 N				431	431				431	431
240-269 N				219	219				219	219
210-239 N				193	193				193	193
180-209 N				199	199				199	199
150-179 N				25	25				25	25
120-149 N				10	10				10	10
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***				4226	4226				4226	4226
ANTICIPATED YIELD RANGE (T/HA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF PEARL MILLET

TABLE 8.1b

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				TOTAL	LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE		VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N					82620				
365 - N				70302				70302		
330-364 N				22298				22298		
300-329 N				48210				48210		
270-299 N				54206				54206		
240-269 N				67300				67300		
210-239 N				53171	3627	1152		66148		
180-209 N				59600	6052	14590		63078		
150-179 N				32684	7913	13396		67300		
120-149 N				26029	14600	2933		53466		
90-119 N				15782	6382	7450		31407		
75-89 N				7581	177	1413		9171		
1-74 N				15535	272			15807		
- 0 C				5224				5224		
- 0 C										
*** TOTALS ***				82620	7036	39023	46911	574619	667589	
ANTICIPATED YIELD RANGE (T/HA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MAJOR CLIMATE	4 - COLD TROPICS					9 - COOL SUB-TROPICS (SUMMER RAINFALL)				
365 + N				8404	8404				8404	8404
365 - N				4424	4424				4424	4424
330-364 N				8694	8694				8694	8694
300-329 N				8992	8992				8992	8992
270-299 N				7888	7888				7888	7888
240-269 N				8461	8461				8461	8461
210-239 N				892	892				892	892
180-209 N				791	791	1039			1830	1830
150-179 N				4266	4266	475			4741	4741
120-149 N				6555	6555	1520			8075	8075
90-119 N				3992	3992	147			4139	4139
75-89 N	4887			3972	3972	977			4949	4949
1-74 N				62	62	1011			1073	1073
- 0 C				774	774				774	774
- 0 C										
*** TOTALS ***	4887	20659	4893	111067	141506	4845	20412	5402	110847	141506
ANTICIPATED YIELD RANGE (T/HA)	3.90- 3.10	3.10- 1.60	1.60- 0.80	0.80- 0.00		1.00- 0.80	0.80- 0.40	0.40- 0.20	0.20- 0.00	
MAJOR CLIMATE	5 - MODERATELY COOL TROPICS					10 - COOL SUB-TROPICS (SUMMER RAINFALL)				
365 + N				3079	3079				3079	3079
365 - N				464	464				464	464
330-364 N				945	945				945	945
300-329 N				1396	1396				1396	1396
270-299 N				811	811				811	811
240-269 N				809	809				809	809
210-239 N				396	396				396	396
180-209 N				116	116				116	116
150-179 N				161	161				161	161
120-149 N				30	30				30	30
90-119 N				146	146				146	146
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***				8353	8353				8353	8353
ANTICIPATED YIELD RANGE (T/HA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAJOR CLIMATE	6 - MODERATELY COOL SUB-TROPICS (SUMMER RAINFALL)					11 - COOL SUB-TROPICS (WINTER RAINFALL)				
365 + N				119	119				119	119
365 - N				163	163				163	163
330-364 N				214	214				214	214
300-329 N				122	122				122	122
270-299 N				115	115				115	115
240-269 N				29	29				29	29
210-239 N				213	213				213	213
180-209 N				7650	7650				7650	7650
150-179 N				7287	7287				7287	7287
120-149 N										
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***				15912	15912				15912	15912
ANTICIPATED YIELD RANGE (T/HA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAJOR CLIMATE	7 - WARM SUB-TROPICS (SUMMER RAINFALL)					12 - COOL SUB-TROPICS (WINTER RAINFALL)				
365 + N				26551	26551				26551	26551
365 - N										
330-364 N										
300-329 N										
270-299 N										
240-269 N										
210-239 N										
180-209 N										
150-179 N										
120-149 N										
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***				26551	26551				26551	26551
ANTICIPATED YIELD										

Fig. 8.3



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.



Fig. 8.4



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF MAIZE

TABLE 8.3a

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				LOW INPUTS				TOTAL	
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE		
	365 + N				82620					82620
365 - N			6140	64162			1113	69189	70302	
330-364 N			2269	20029		317	1813	20168	22298	
300-329 N			4901	43309		1147	5771	41292	48210	
270-299 N		3210	5174	45822		2180	7401	44625	54206	
240-269 N		6511	5151	55638		2350	7985	56965	67300	
210-239 N		3340	8416	3900	47422	1467	7633	6482	47496	63078
180-209 N	13489	11413	4058	59596	5092	15556	12052	52256	84956	
150-179 N	21049	5618	2389	30488	8050	14553	6840	30101	59544	
120-149 N		25360	1685	26421		9606	14349	29511	53466	
90-119 N		705	13890	16812		705	2864	27338	31407	
75-89 N		177		8994		177		8994	9171	
1-74 N		272		15935		272		15935	15807	
- 0 C				5224				5224	5224	
- 0 C										
*** TOTALS ***	37878	61682	49557	518472	14609	54496	66670	531814	667589	

ANTICIPATED YIELD RANGE (T/HA) 7.10- 5.70 5.70- 2.80 2.80- 1.40 1.40- 0.00 1.80- 1.40 1.40- 0.70 0.70- 0.40 0.40- 0.00

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N				2089				
365 - N			131	2142			42	2231	2273
330-364 N			61	971			18	1014	1032
300-329 N		72	95	962		55	129	945	1129
270-299 N	78	99	22	724	35	130	109	649	923
240-269 N	39	14	2	441	16	52	17	411	496
210-239 N	17	8	2	380	7	15	9	376	407
180-209 N		61	43	343		2	89	356	447
150-179 N		5	5	45			5	50	55
120-149 N				21				21	21
90-119 N									
75-89 N									
1-74 N									
- 0 C									
- 0 C									
*** TOTALS ***	134	259	361	8118	58	254	418	8142	8872

ANTICIPATED YIELD RANGE (T/HA) 10.90- 8.70 8.70- 4.40 4.40- 2.20 2.20- 0.00 2.70- 2.20 2.20- 1.10 1.10- 0.60 0.60- 0.00

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N				1024				
365 - N				1084				1084	1084
330-364 N				497				497	497
300-329 N				544				544	544
270-299 N				431				431	431
240-269 N				219				219	219
210-239 N				193				193	193
180-209 N				199				199	199
150-179 N				25				25	25
120-149 N				10				10	10
90-119 N									
75-89 N									
1-74 N									
- 0 C									
- 0 C									
*** TOTALS ***				4226				4226	4226

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF MAIZE

TABLE 8.3b

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N				82620				
365 - N				69189				70302	
330-364 N				20168		317	1813	22298	
300-329 N				41292		1147	5771	48210	
270-299 N				44625		2180	7401	54206	
240-269 N				56965		2350	7985	67300	
210-239 N				47496		1467	7633	63078	
180-209 N				52256		5092	15556	84956	
150-179 N				30101		8050	14553	59544	
120-149 N				29511		9606	14349	53466	
90-119 N				27338		705	2864	31407	
75-89 N				8994		177		9171	
1-74 N				15935		272		15807	
- 0 C				5224				5224	
- 0 C									
*** TOTALS ***				1812				1812	1812

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N				2089				
365 - N				2273				2273	
330-364 N				1032				1032	
300-329 N				1129				1129	
270-299 N				923				923	
240-269 N				496				496	
210-239 N				407				407	
180-209 N				447				447	
150-179 N				55				55	
120-149 N				21				21	
90-119 N									
75-89 N									
1-74 N									
- 0 C									
- 0 C									
*** TOTALS ***				8872				8872	

ANTICIPATED YIELD RANGE (T/HA) 7.10- 5.70 5.70- 2.80 2.80- 1.40 1.40- 0.00 1.80- 1.40 1.40- 0.70 0.70- 0.40 0.40- 0.00

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N				8404				
365 - N				4424				4424	
330-364 N				8694				8694	
300-329 N				8992				8992	
270-299 N				7888				7888	
240-269 N				14293				14293	
210-239 N				16383				16383	
180-209 N				10887				10887	
150-179 N				3780				3780	
120-149 N				23917				23917	
90-119 N				33844				33844	
75-89 N									
1-74 N									
- 0 C									
- 0 C									
*** TOTALS ***				141506				141506	

ANTICIPATED YIELD RANGE (T/HA) 10.90- 8.70 8.70- 4.40 4.40- 2.20 2.20- 0.00 2.70- 2.20 2.20- 1.10 1.10- 0.60 0.60- 0.00

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N				3079				
365 - N				464				464	
330-364 N				945				945	
300-329 N				1396				1396	
270-299 N				811				811	
240-269 N				809				809	
210-239 N				396				396	
180-209 N				116				116	
150-179 N				161				161	
120-149 N				30				30	
90-119 N				146				146	
75-89 N									
1-74 N									
- 0 C									
- 0 C									
*** TOTALS ***				8353				8353	

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

NOTES  
-VERY SUITABLE, SUITABLE AND MARGINALLY SUITABLE EXTENTS OF LOW INPUTS DO NOT INCLUDE LAND REQUIRED FOR FALLOW  
-AREAS SHOWN AS 'SUITABLE', IN 'NOT SUITABLE' LENGTHS OF GROWING PERIODS, CORRESPOND TO EXTENTS OF FLUVIOLS

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF MAIZE

TABLE 8.3c

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
	365 + N				1500				
365 - N				1500				1500	
330-364 N				213				213	
300-329 N				463				463	
270-299 N				678				678	
240-269 N				373				373	
210-239 N				370				370	
180-209 N				181				181	
150-179 N				51				51	
120-149 N				81				81	
90-119 N				12				12	
75-89 N				69				69	
1-74 N									
- 0 C									
- 0 C									
*** TOTALS ***				3991					



Fig. 8.5

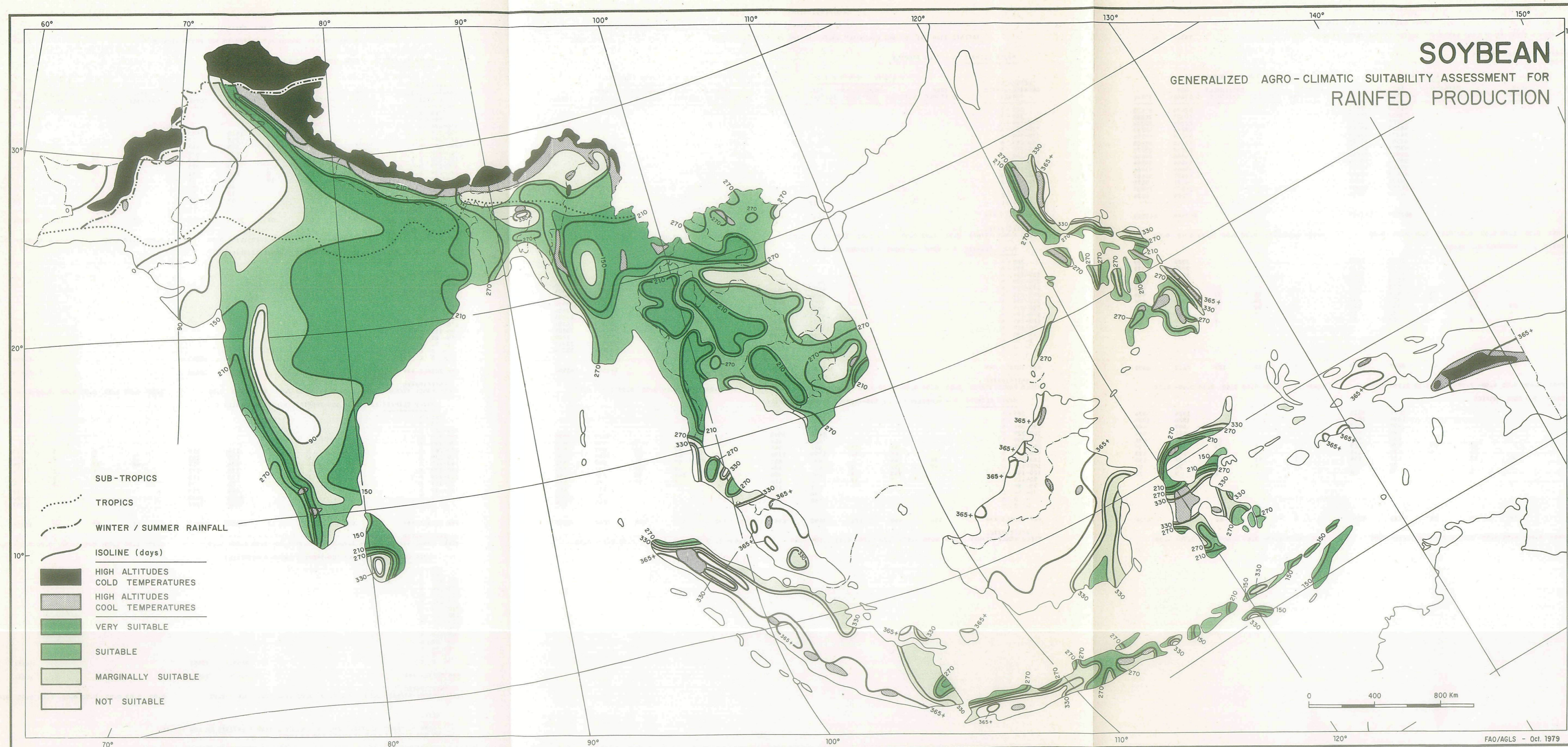
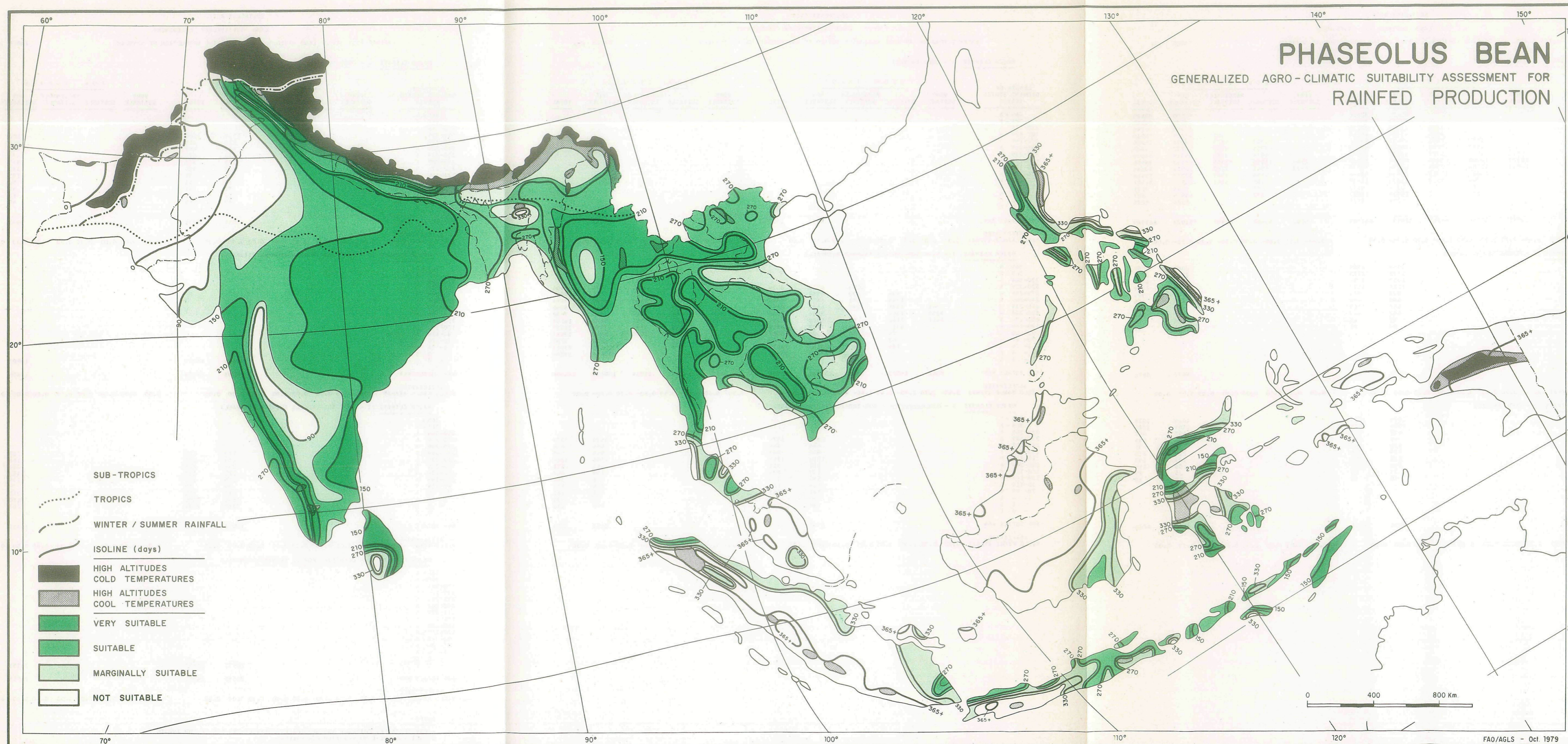




Fig. 8.6



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF SOYBEAN  
TABLE 8.5a

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS					LOW INPUTS				
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
	365 + N				82620	82620				82620
365 - N				70302	70302				70302	70302
330-364 N			1220	21078	22298				22298	22298
300-329 N			4840	43370	48210			981	47229	48210
270-299 N		3382	5191	45633	54206		1057	4873	48276	54206
240-269 N		6572	5266	55462	67300		2251	8342	56707	67300
210-239 N	3512	8532	3727	47307	63078		4974	8275	49829	63078
180-209 N	11177	13948	3830	56001	84956	2369	11030	13365	58192	84956
150-179 N	14562	12138	2358	30486	59544	6923	15341	7262	30259	59544
120-149 N		16820	10212	26434	53466		7660	15547	30259	53466
90-119 N		705	9617	21085	31407		705	5162	25540	31407
75-89 N		177		8994	9171		177		8994	9171
1-74 N		272		15535	15807		272		15535	15807
- 0 C				5224	5224				5224	5224
*** TOTALS ***	29251	62546	46261	529531	667589	9292	43467	63807	551023	667589

ANTICIPATED YIELD RANGE (T/HA) 3.40- 2.70 2.70- 1.40 1.40- 0.70 0.70- 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

MAJOR CLIMATE 2 - MODERATELY COOL TROPICS										
365 + N				2089	2089				2089	2089
365 - N				2273	2273				2273	2273
330-364 N				1032	1032				1032	1032
300-329 N				1129	1129				1129	1129
270-299 N				923	923				923	923
240-269 N				496	496				496	496
210-239 N				407	407				407	407
180-209 N				447	447				447	447
150-179 N				55	55				55	55
120-149 N				21	21				21	21
90-119 N										
75-89 N										
1-74 N										
- 0 C										
*** TOTALS ***				8872	8872				8872	8872

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJOR CLIMATE 3 - COOL TROPICS										
365 + N				1024	1024				1024	1024
365 - N				1084	1084				1084	1084
330-364 N				497	497				497	497
300-329 N				544	544				544	544
270-299 N				431	431				431	431
240-269 N				219	219				219	219
210-239 N				193	193				193	193
180-209 N				199	199				199	199
150-179 N				25	25				25	25
120-149 N				10	10				10	10
90-119 N										
75-89 N										
1-74 N										
- 0 C										
*** TOTALS ***				4226	4226				4226	4226

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF SOYBEAN  
TABLE 8.5b

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS					LOW INPUTS				
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
	365 + N				82620	82620				82620
365 - N				70302	70302				70302	70302
330-364 N				22298	22298				22298	22298
300-329 N				48210	48210				48210	48210
270-299 N				54206	54206				54206	54206
240-269 N				67300	67300				67300	67300
210-239 N				63078	63078				63078	63078
180-209 N				84956	84956				84956	84956
150-179 N				59544	59544				59544	59544
120-149 N				53466	53466				53466	53466
90-119 N				31407	31407				31407	31407
75-89 N				9171	9171				9171	9171
1-74 N				15807	15807				15807	15807
- 0 C				5224	5224				5224	5224
*** TOTALS ***				1812	1812				1812	1812

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJOR CLIMATE 7 - WARM SUB-TROPICS (SUMMER RAINFALL)										
365 + N				2089	2089				2089	2089
365 - N				2273	2273				2273	2273
330-364 N				1032	1032				1032	1032
300-329 N				1129	1129				1129	1129
270-299 N				923	923				923	923
240-269 N				496	496				496	496
210-239 N				407	407				407	407
180-209 N				447	447				447	447
150-179 N				55	55				55	55
120-149 N				21	21				21	21
90-119 N										
75-89 N										
1-74 N										
- 0 C										
*** TOTALS ***				8872	8872				8872	8872

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJOR CLIMATE 8 - MODERATELY COOL SUB-TROPICS (SUMMER RAINFALL)										
365 + N				2089	2089				2089	2089
365 - N				2273	2273				2273	2273
330-364 N				1032	1032				1032	1032
300-329 N				1129	1129				1129	1129
270-299 N				923	923				923	923
240-269 N				496	496				496	496
210-239 N				407	407				407	407
180-209 N				447	447				447	447
150-179 N				55	55				55	55
120-149 N				21	21				21	21
90-119 N										
75-89 N										
1-74 N										
- 0 C										
*** TOTALS ***				8872	8872				8872	8872

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

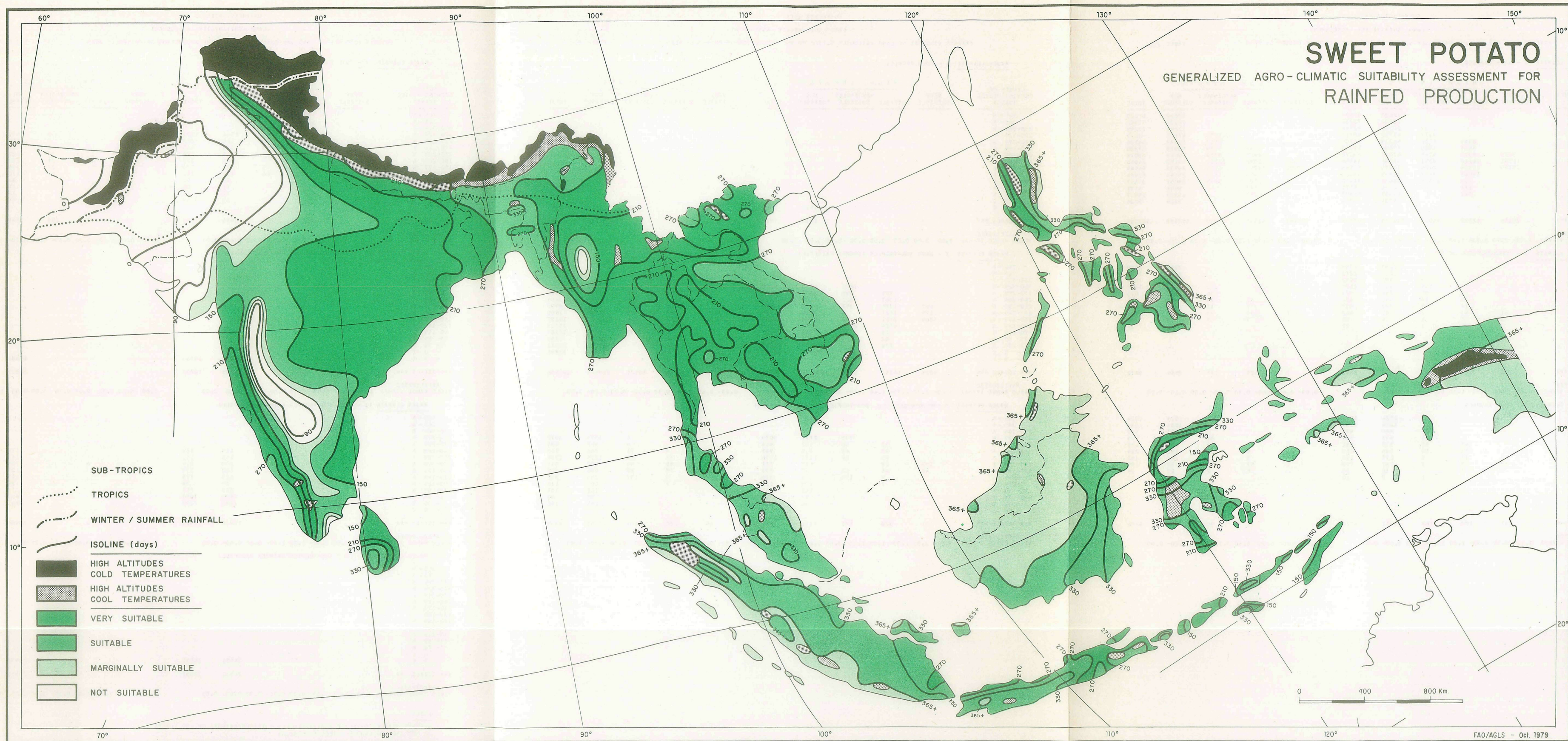
SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF SOYBEAN  
TABLE 8.5c

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS					LOW INPUTS				
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
	365 + N				82620	82620				82620
365 - N				70302	70302				70302	70302
330-364 N				22298	22298				22298	22298
300-329 N				48210	48210				48210	48210
270-299 N				54206	54206				54206	54206
240-269 N				67300	67300				67300	67300
210-239 N				63078	63078				63078	63078
180-209 N				84956	84956				84956	84956
150-179 N				59544	59544				59544	59544
120-149 N				53466	53466				53466	53466
90-119 N				31407	31407				31407	31407
75-89 N				9171	9171				9171	9171
1-74 N				15807	15807				15807	15807
- 0 C				5224	5224				5224	5224
*** TOTALS ***				1812	1812				1812	1812

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJOR CLIMATE 9 - COOL SUB-TROPICS (SUMMER RAINFALL)										
365 + N				2089	2089				2089	2089
365 - N				2273	2273				2273	2273
330-364 N				1032	1032				1032	1032
300-329 N				1129	1129				1129	1129
270-299 N				923	923				923	923
240-269 N				496	496				496	496
210-239 N				407	407				407	407
180-209 N				447	447				447	447
150-179 N				55	55				55	55
120-149 N				21	21				21	21
90-119 N										
75-89 N										

Fig. 8.7



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF PHASEOLUS BEAN  
TABLE 8.6a

MAJOR CLIMATE 1 - WARM TROPICS

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				TOTAL	LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE		VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
365 + N				82620	82620				82620	82620
365 - N				70302	70302				70302	70302
330-364 N			1087	22298	22298				22298	22298
300-329 N			4477	43733	48210			1107	47103	48210
270-299 N		3049	5138	46019	54206			2117	52089	54206
240-269 N		5537	5949	55694	67300		1182	4915	63078	67300
210-239 N	3075	8397	4168	47438	63078			3314	49849	63078
180-209 N	10751	14118	4091	55996	84956	2539	11066	13201	58150	84956
150-179 N	15330	11334	2409	30471	59544	7902	14748	6910	29984	59544
120-149 N		18443	8678	26345	53466		9496	14526	29444	53466
90-119 N		705	10016	20686	31407		705	5645	25057	31407
75-89 N		177		8994	9171		177		8994	9171
1-74 N		272		15535	15807		272		15535	15807
- 0 C				5224	5224				5224	5224
- 0 C										
*** TOTALS ***	29156	62132	46033	530268	667589	10441	42561	57099	557488	667589

ANTICIPATED YIELD RANGE (T/HA) 3.40- 2.70 2.70- 1.40 1.40- 0.70 0.70- 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

MAJOR CLIMATE 2 - MODERATELY COOL TROPICS

365 + N				2089	2089				2089	2089
365 - N				2273	2273				2273	2273
330-364 N			39	1032	1032				1032	1032
300-329 N			134	995	1129			42	1087	1129
270-299 N		78	99	746	923			56	867	923
240-269 N		39	14	443	496			29	457	496
210-239 N		43	17	382	407		10	12	388	407
180-209 N	61	43	2	341	447	2	105	33	307	447
150-179 N	5	5	1	44	55		7	5	43	55
120-149 N			1	20	21				21	21
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***	66	182	298	8326	8872	2	129	177	8564	8872

ANTICIPATED YIELD RANGE (T/HA) 3.10- 2.50 2.50- 1.20 1.20- 0.60 0.60- 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

MAJOR CLIMATE 3 - COOL TROPICS

365 + N				1024	1024				1024	1024
365 - N				1084	1084				1084	1084
330-364 N			28	469	497			21	523	544
300-329 N			71	473	544			30	401	431
270-299 N		49	52	330	431			22	192	219
240-269 N		23	10	186	219		5	8	182	199
210-239 N		11	5	177	193		3	13	128	199
180-209 N	32	23	2	142	199	1	57	2	17	25
150-179 N	5	2		18	25		6		10	10
120-149 N			1	9	10					
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***	37	108	169	3912	4226	1	71	96	4058	4226

ANTICIPATED YIELD RANGE (T/HA) 3.10- 2.50 2.50- 1.20 1.20- 0.60 0.60- 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF PHASEOLUS BEAN  
TABLE 8.6b

MAJOR CLIMATE 4 - COLD TROPICS

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				TOTAL	LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE		VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
365 + N				82620	82620				82620	82620
365 - N				70302	70302				70302	70302
330-364 N				22298	22298				22298	22298
300-329 N				47103	48210				47103	48210
270-299 N				54206	54206				54206	54206
240-269 N				67300	67300				67300	67300
210-239 N				49849	63078				49849	63078
180-209 N				58150	84956				58150	84956
150-179 N				29984	59544				29984	59544
120-149 N				29444	53466				29444	53466
90-119 N				25057	31407				25057	31407
75-89 N				8994	9171				8994	9171
1-74 N				15535	15807				15535	15807
- 0 C				5224	5224				5224	5224
- 0 C										
*** TOTALS ***				1812	1812				1812	1812

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

MAJOR CLIMATE 7 - WARM SUB-TROPICS (SUMMER RAINFALL)

365 + N				2089	2089				2089	2089
365 - N				2273	2273				2273	2273
330-364 N				1032	1032				1032	1032
300-329 N				995	1129			42	1087	1129
270-299 N				746	923			56	867	923
240-269 N				443	496			29	457	496
210-239 N				382	407			12	388	407
180-209 N	61	43	2	341	447	2	105	33	307	447
150-179 N	5	5	1	44	55		7	5	43	55
120-149 N			1	20	21				21	21
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***	9225	14352	9450	108479	141506	6373	14064	10521	110548	141506

ANTICIPATED YIELD RANGE (T/HA) 3.40- 2.70 2.70- 1.40 1.40- 0.70 0.70- 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

MAJOR CLIMATE 8 - MODERATELY COOL SUB-TROPICS (SUMMER RAINFALL)

365 + N				1024	1024				1024	1024
365 - N				1084	1084				1084	1084
330-364 N				497	497				497	497
300-329 N				473	544			21	523	544
270-299 N				330	431			30	401	431
240-269 N				186	219			22	192	219
210-239 N				177	193		5	8	182	199
180-209 N	32	23	2	142	199	1	57	13	128	199
150-179 N	5	2		18	25		6	2	17	25
120-149 N			1	9	10				10	10
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***	151	320	571	7311	8353	85	220	407	7641	8353

ANTICIPATED YIELD RANGE (T/HA) 3.10- 2.50 2.50- 1.20 1.20- 0.60 0.60- 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF PHASEOLUS BEAN  
TABLE 8.6c

MAJOR CLIMATE 9 - COOL SUB-TROPICS (SUMMER RAINFALL)

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS				TOTAL	LOW INPUTS				TOTAL
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE		VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	
365 + N				1590	1590				1590	1590
365 - N				1590	1590				1590	1590
330-364 N				1590	1590				1590	1590
300-329 N				1590	1590				1590	1590
270-299 N				1590	1590				1590	1590
240-269 N				1590	1590				1590	1590
210-239 N				1590	1590				1590	1590
180-209 N				1590	1590				1590	1590
150-179 N				1590	1590				1590	1590
120-149 N				1590	1590				1590	1590
90-119 N				1590	1590				1590	1590
75-89 N				1590	1590				1590	1590
1-74 N				1590	1590				1590	1590
- 0 C				1590	1590				1590	1590
- 0 C				1590	1590				1590	1590
*** TOTALS ***	79	165	291	3456	3991	44	107	199	3641	3991

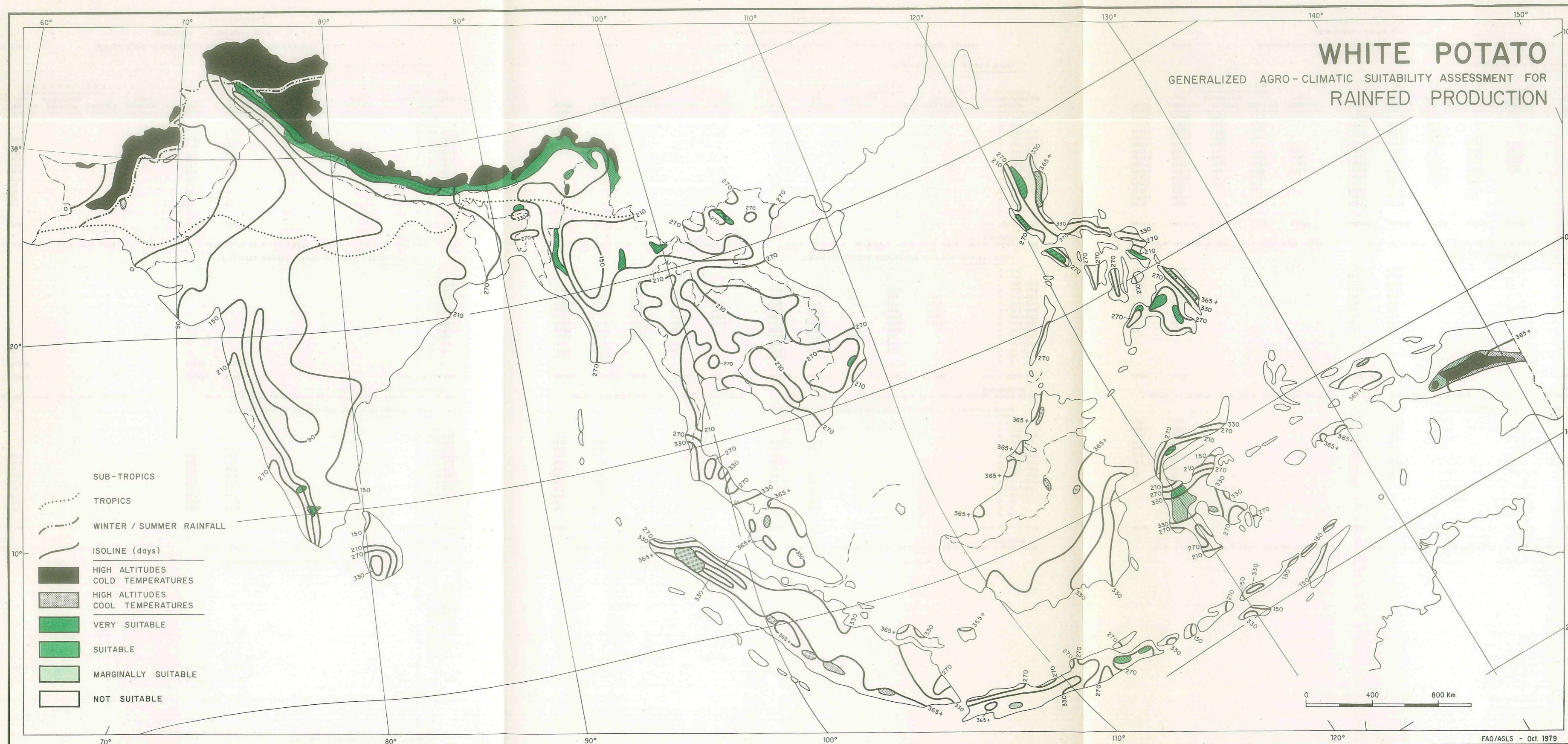
ANTICIPATED YIELD RANGE (T/HA) 3.10- 2.50 2.50- 1.20 1.20- 0.60 0.60- 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

MAJOR CLIMATE 10 - COLD SUB-TROPICS (SUMMER RAINFALL)

365 + N				18803	18803				18803	18803
365 - N				18803	18803				18803	18803
330-364 N				18803	18803				18803	18803
300-329 N				18803	18803				18803	18803
270-299 N				18803	18803				18803	18803
240-269 N				18803	18803				18803	18803
210-239 N				18803	18803				18803	18803
180-209 N				18803	18803				18803	18803
150-179 N				18803	18803				18803	18803
120-149 N				18803	18803				18803	18803
90-119 N				18803	18803				18803	18803
75-89 N				18803	18803				18803	18803
1-74 N				18803	18803				18803	18803
- 0 C				18803	18803				18803	18803
- 0 C				18803	18803				18803	18803
*** TOTALS ***	18803	18803	18803	18803	18803	18803	18803	18803	18803	18803

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.80- 0.60 0.60- 0.30 0.30- 0.20 0.20- 0.00

Fig. 8.8



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF SWEET POTATO TABLE 8.7a

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS					LOW INPUTS				
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
	365 + N			6596	76024	82620			1696	80924
365 - N			7476	62826	70302	1133	9809	59360	70302	70302
330-364 N			2265	20033	22298	531	3107	18660	22298	22298
300-329 N		2213	3629	42368	48210	1044	5626	41740	48210	48210
270-299 N	3215	4532	1519	44940	54206	2117	6789	45300	54206	54206
240-269 N	5842	3337	542	57529	67300	1322	4515	56418	67300	67300
210-239 N	6030	5762	1044	50242	63078	2984	8674	47140	63078	63078
180-209 N	7360	12881	3401	61314	84956	4791	11897	8384	84956	84956
150-179 N	7755	16339	2202	33248	59544	7022	9306	4080	40136	59544
120-149 N		8246	18496	26724	53466		7932	6560	38974	53466
90-119 N		705	2713	27989	31407		705	28007	31407	31407
75-89 N		177		8994	9171		177		8994	9171
1-74 N		272		15535	15807		272		15535	15807
- 0 C				5224	5224				5224	5224
- 0 C										
*** TOTALS ***	30202	54514	49883	532990	667589	16119	47303	57871	546296	667589

ANTICIPATED YIELD RANGE (T/HA) 10.10- 8.10 8.10- 4.00 4.00- 2.00 2.00- 0.00 2.50- 2.00 2.00- 1.00 1.00- 0.50 0.50- 0.00

MAJOR CLIMATE 2 - MODERATELY COOL TROPICS										
LENGTH OF GROWING PERIOD (DAYS)	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
365 + N				2089	2089				2089	2089
365 - N				2273	2273				2273	2273
330-364 N				1032	1032				1032	1032
300-329 N				1129	1129				1129	1129
270-299 N				923	923				923	923
240-269 N				496	496				496	496
210-239 N				407	407				407	407
180-209 N				447	447				447	447
150-179 N				55	55				55	55
120-149 N				21	21				21	21
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***				8872	8872				8872	8872

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJOR CLIMATE 3 - COOL TROPICS										
LENGTH OF GROWING PERIOD (DAYS)	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
365 + N				1024	1024				1024	1024
365 - N				1084	1084				1084	1084
330-364 N				497	497				497	497
300-329 N				544	544				544	544
270-299 N				431	431				431	431
240-269 N				219	219				219	219
210-239 N				193	193				193	193
180-209 N				199	199				199	199
150-179 N				25	25				25	25
120-149 N				10	10				10	10
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***				4226	4226				4226	4226

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF SWEET POTATO TABLE 8.7b

LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS					LOW INPUTS				
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
	365 + N									
365 - N										
330-364 N										
300-329 N										
270-299 N										
240-269 N										
210-239 N										
180-209 N										
150-179 N										
120-149 N										
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***									1812	1812

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJOR CLIMATE 7 - WARM SUB-TROPICS (SUMMER RAINFALL)										
LENGTH OF GROWING PERIOD (DAYS)	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
365 + N										
365 - N										
330-364 N										
300-329 N										
270-299 N	417	1021	1407	5976	8404			969	1568	5867
240-269 N	1203	467	124	3342	4424			308	713	3403
210-239 N	1548	699		6745	8992			985	6518	8694
180-209 N	3532	1059		3297	7888			957	1529	603
150-179 N	5173	2945	47	6128	14293			3364	1454	197
120-149 N		5660	3354	7369	16383			5129	2508	662
90-119 N		75	1395	9417	10887				5670	2384
75-89 N		62		3718	3780				75	1317
1-74 N		774		23143	23917				62	3718
- 0 C				33844	33844				774	23143
- 0 C										33844
*** TOTALS ***	11873	13303	6327	110003	141506	9725	14265	8429	109087	141506

ANTICIPATED YIELD RANGE (T/HA) 10.10- 8.10 8.10- 4.00 4.00- 2.00 2.00- 0.00 2.50- 2.00 2.00- 1.00 1.00- 0.50 0.50- 0.00

MAJOR CLIMATE 8 - MODERATELY COOL SUB-TROPICS (SUMMER RAINFALL)										
LENGTH OF GROWING PERIOD (DAYS)	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
365 + N										
365 - N										
330-364 N										
300-329 N										
270-299 N										
240-269 N										
210-239 N										
180-209 N										
150-179 N										
120-149 N										
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***									8353	8353

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF SWEET POTATO TABLE 8.7c

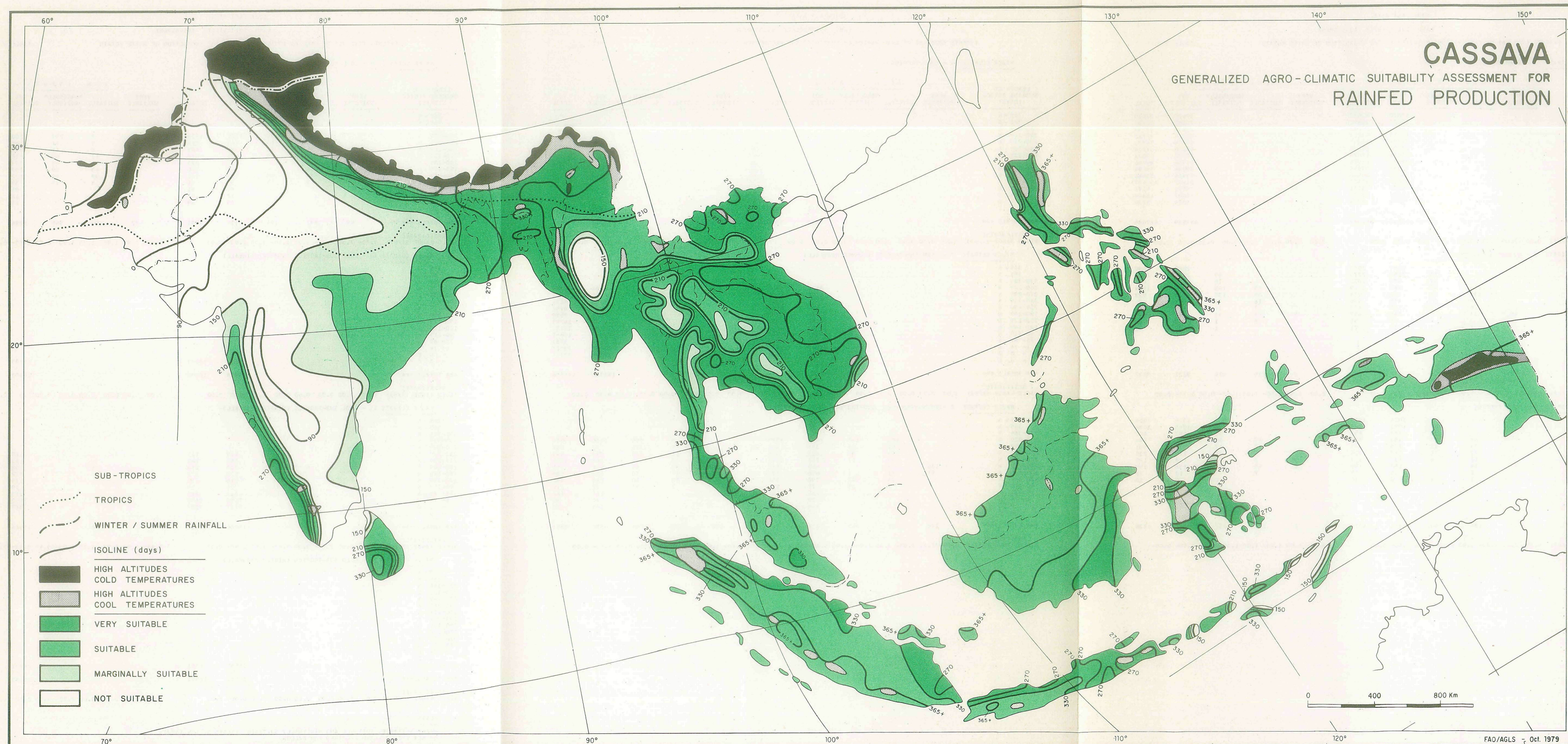
LENGTH OF GROWING PERIOD (DAYS)	HIGH INPUTS					LOW INPUTS				
	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
	365 + N									
365 - N										
330-364 N										
300-329 N										
270-299 N										
240-269 N										
210-239 N										
180-209 N										
150-179 N										
120-149 N										
90-119 N										
75-89 N										
1-74 N										
- 0 C										
- 0 C										
*** TOTALS ***									3991	3991

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJOR CLIMATE 9 - COOL SUB-TROPICS (SUMMER RAINFALL)										
LENGTH OF GROWING PERIOD (DAYS)	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL	VERY SUITABLE	SUITABLE	MARGINALLY SUITABLE	NOT SUITABLE	TOTAL
365 + N										
365 - N										
330-364 N										
300-329 N										
270-299 N										
240-269 N										
210-239 N										



Fig. 8.9



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF WHITE POTATO

TABLE 8.8a

MAJOR CLIMATE 1 - WARM TROPICS  
Length of growing period (days) vs Very, Marginally, and Not suitable areas for High and Low inputs.  
MAJOR CLIMATE 2 - MODERATELY COOL TROPICS  
MAJOR CLIMATE 3 - COOL TROPICS  
Anticipated yield range (t/ha)

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF WHITE POTATO

TABLE 8.8b

MAJOR CLIMATE 4 - COLD TROPICS  
Length of growing period (days) vs Very, Marginally, and Not suitable areas for High and Low inputs.  
MAJOR CLIMATE 7 - WARM SUB-TROPICS (SUMMER RAINFALL)  
MAJOR CLIMATE 8 - MODERATELY COOL SUB-TROPICS (SUMMER RAINFALL)  
Anticipated yield range (t/ha)

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF WHITE POTATO

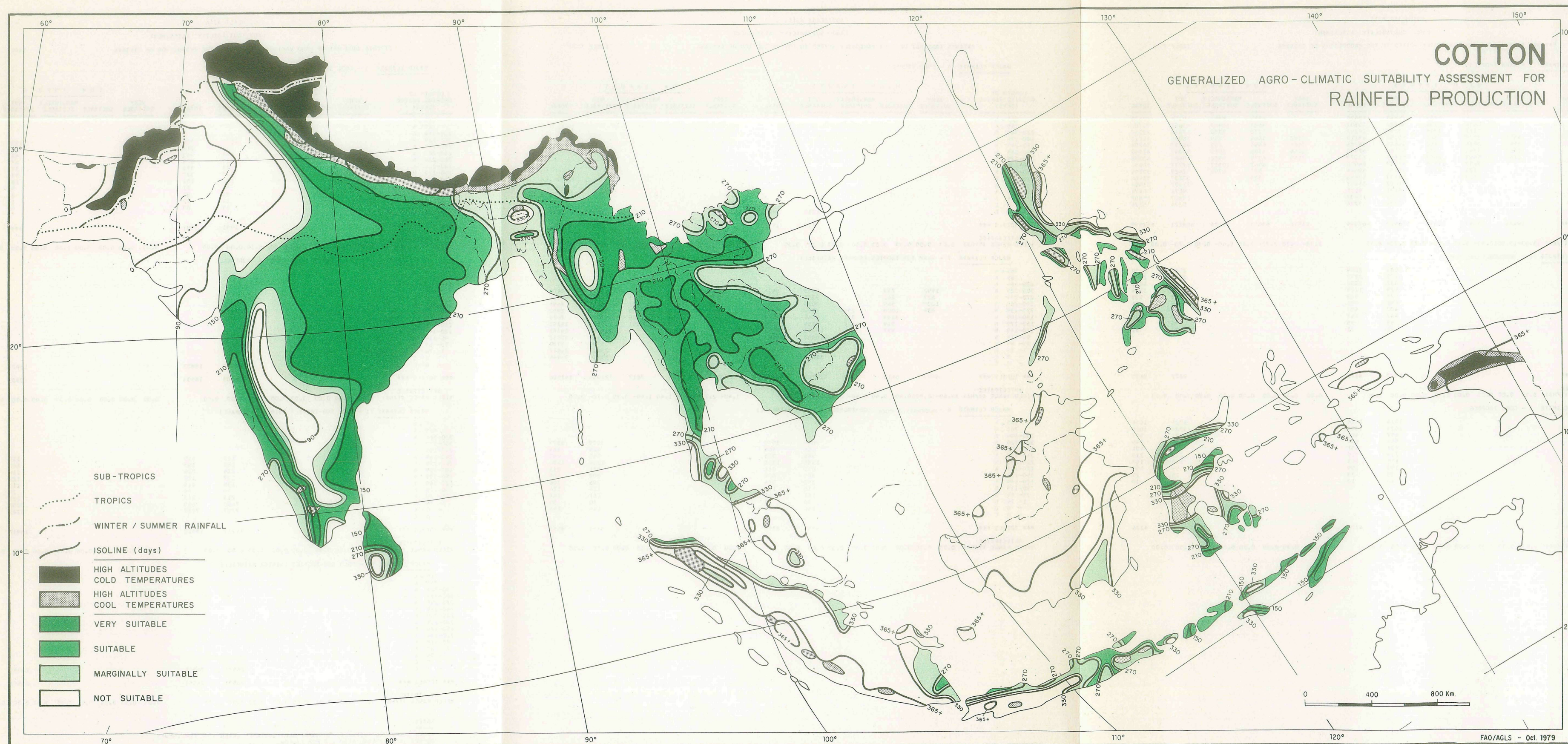
TABLE 8.8c

MAJOR CLIMATE 9 - COOL SUB-TROPICS (SUMMER RAINFALL)  
Length of growing period (days) vs Very, Marginally, and Not suitable areas for High and Low inputs.  
MAJOR CLIMATE 10 - COLD SUB-TROPICS (SUMMER RAINFALL)  
MAJOR CLIMATE 11 - COOL SUB-TROPICS (WINTER RAINFALL)  
MAJOR CLIMATE 12 - COLD SUB-TROPICS (WINTER RAINFALL)  
Anticipated yield range (t/ha)

NOTES

-VERY SUITABLE, SUITABLE AND MARGINALLY SUITABLE EXTENTS OF LOW INPUTS DO NOT INCLUDE LAND REQUIRED FOR FALLOW  
-AREAS SHOWN AS 'SUITABLE', IN 'NOT SUITABLE' LENGTHS OF GROWING PERIODS, CORRESPOND TO EXTENTS OF FLUVISOLS

Fig. 8.10



NOTE: THE ASSESSMENT IS FOR RAINFED PRODUCTION ONLY. A SEPARATE ASSESSMENT IS NECESSARY FOR PRODUCTION INVOLVING IRRIGATION AND OTHER FARMING TECHNIQUES USING ADDITIONAL WATER.

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF CASSAVA

TABLE 8.9a

MAJCR CLIMATE 1 - WARM TROPICS

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 13.60-10.90 10.90-5.40 5.40-2.70 2.70-0.00

MAJCR CLIMATE 2 - MODERATELY COOL TROPICS

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJCR CLIMATE 3 - COOL TROPICS

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF CASSAVA

TABLE 8.9b

MAJCR CLIMATE 4 - COLD TROPICS

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJCR CLIMATE 7 - WARM SUB-TROPICS (SUMMER RAINFALL)

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 13.60-10.90 10.90-5.40 5.40-2.70 2.70-0.00

MAJCR CLIMATE 8 - MODERATELY COOL SUB-TROPICS (SUMMER RAINFALL)

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00

SOUTHEAST ASIA  
LAND SUITABILITY ASSESSMENT  
EXTENTS (000 HA) OF LAND VARIOUSLY SUITED TO THE PRODUCTION OF CASSAVA

TABLE 8.9c

MAJCR CLIMATE 9 - COOL SUB-TROPICS (SUMMER RAINFALL)

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJCR CLIMATE 10 - COLD SUB-TROPICS (SUMMER RAINFALL)

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJCR CLIMATE 11 - COOL SUB-TROPICS (WINTER RAINFALL)

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00

MAJCR CLIMATE 12 - COLD SUB-TROPICS (WINTER RAINFALL)

Table with columns for Length of Growing Period (Days) and categories: High Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total) and Low Inputs (Very Suitable, Marginally Suitable, Not Suitable, Total).

ANTICIPATED YIELD RANGE (T/HA) 0.00 0.00 0.00 0.00 0.00 0.00 0.00

NOTES: -VERY SUITABLE, SUITABLE AND MARGINALLY SUITABLE EXTENTS OF LOW INPUTS DO NOT INCLUDE LAND REQUIRED FOR FALLOW; -AREAS SHOWN AS 'SUITABLE', IN 'NOT SUITABLE' LENGTHS OF GROWING PERIODS, CORRESPOND TO EXTENTS OF FLUVISOLS





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