La Niña 1998-99
Challenges and Opportunities for Indonesia

Report on the ADPC-NOAA-BAKORNAS PB Mission
to pre-assess the possible impacts of La Niña 1998-99

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EXECUTIVE SUMMARY

I. BACKGROUND

This report presents the findings and recommendations of a pre-assessment mission carried out at the joint initiative of ADPC, NOAA and BAKORNAS PB from 31 August to 10 September 1998 to assess the possible impacts of a La Niña event in Indonesia.

In 1997-98 El Niño related dry conditions on one hand led to large scale degradation of the natural environment, particularly the forest cover, and on the other hand caused a loss of rice production to the extent of 3 million tons. This, coupled with a protracted economic crisis, led to serious food security concerns in many parts of the country. At present, most climate forecast models are indicating a strong possibility of La Niña, the cold climate event. This may have significant implications for the agriculture and food security sector in Indonesia and may affect the communities experiencing the effects of an economic crisis. It is also likely to have an impact on the natural environment already degraded by the forest fires of last year and may lead to excessive soil erosion and resultant flooding and landslides.

Climate of Indonesia

The climate of Indonesia is generally characterized by two seasons: the dry and the wet seasons. The wet season starts in late August in the northwest part of Indonesia and later (December) in the southeast part of Indonesia. The time of onset of monsoon broadly determines the length of wet and dry seasons. The early onset and late withdrawal of monsoon results in a lengthy wet season. While in El Niño years the onset of the monsoon is late than normal, during La Niña years the onset is earlier than normal in most of the areas. Therefore, an El Niño event causes delayed planting and consequently delayed and reduced harvest. A La Niña year has potential for advancing planting season and an early increased harvest as well as free land for undertaking one additional crop. The La Niña forecast, therefore, assumes significant importance in planning and restructuring of cropping pattern to take maximum advantage of increased precipitation and minimizing the damage.

Past La Niña Years

In this century, starting from 1900 to 1998, there were 19 La Niña years. The salient features of monsoons in Indonesia during past La Niña years are:

- Around 80% of the Indonesian archipelago received normal or above normal rainfall.

- The areas that received below normal rainfall were mostly agriculturally insignificant.

- The temporal distribution of rainfall during wet season was either uniformly distributed over the monsoon season or few concentrated spells of heavy precipitation leading to localized floods.

- The early onset of monsoon ensured a lengthy rainy season normally starting from September-October. The termination of rainy season either occurred as late as in June or abruptly happened in the first week of May in Jawa region.

Climate Forecasts for the Current Wet Season

Most climate forecast models are indicating the possibility of a La Niña event, which will affect the rainfall pattern across the country. According to the International Research Institute (IRI) climate forecast guidance for Indonesia, 'rainfall probabilities for the season September-October-November 1998 for [most of Indonesia] are 55% above-normal, 30% near normal, and 15% below-normal. For December-January-February, rainfall probabilities over the whole of Indonesia are 40% above-normal, 35% near-normal, and 25% below-normal."

Bureau of Meteorology and Geophysics (BMG) Forecasts for the wet season indicate that 'in 1998/1999 wet season entire Indonesia will experience high rainfall with the above 115% of normal rainfall, except in South East Maluku and South Minahasa which will encounter medium rainfall between 85%-115% of normal rainfall'.

In this context, the **key objectives** of the mission were:

- to make a rapid assessment of the implications of La Niña 1998-99 for Indonesia with focus on two main sectors of the economy: agriculture and food security; and natural resources and the environment; and

- to make broad countrywide recommendations to mitigate the impact of increased risk of disasters and maximize potential benefits of early onset of rains and increased precipitation.

II. STRUCTURE OF THE MISSION

The mission was undertaken by a team of four experts including one disaster management expert and team leader, one agriculture and food security expert, one forestry and natural resources management expert and one flood mitigation expert. The mission held extensive consultations and collected secondary information from the officials of a number of ministries, departments and agencies of the Government of Indonesia in Jakarta, Bogor and Bandung. The mission made field visits to Central Jawa and East Kalimantan provinces. The field visits included collection of secondary information at provincial level, extensive consultations with provincial authorities and field observations at district, subdistrict and village levels. Preliminary conclusions drawn from the analysis of secondary information were validated through field observations.

III. SUMMARY OF FINDINGS

Agriculture and Food Security

- The La Niña forecast information has created widespread awareness among policy makers and implementers about the possibility of floods in various parts of the country. Actions are being taken by the Public Works Department and the Ministry of Agriculture at district, provincial and national levels to mitigate the impact of floods.

- Based on precipitation patterns during past La Niña events, there is a possibility of flood damages to up to 40,000 hectares of paddy crop area. This may lead to a loss of less than 0.16 million tons of paddy production. The possible losses to secondary crops will be even lesser.

- The current policy planning and implementation process in Indonesia is not taking into account the potential *benefits* of La Niña and the opportunity to increase crop production (especially rice) and hence ease the current food insecurity situation in Indonesia.

- If appropriate strategies are adopted at an early stage, there is a potential to increase the production of paddy by 5 to 6 million tons compared to the previous year. These strategies should include:

    - enhancing paddy yield from 43.3 quintal per hectare to 45.0 quintal per hectare;
    - restructuring the cropping pattern to take advantage of early onset of monsoon; and

- bringing idle cultivable lands under paddy production.

Please refer to sections 3.4.2 and 3.4.3 for more details.

- The National Logistics Agency (BULOG) has planned to import 3.42 million tons of rice in the next fiscal year. This plan does not take into account the possibility of additional production of 5.0 million tons of paddy if appropriate strategies are adopted to take La Niña factor into account. If additional production of paddy is achieved, import requirements can be reduced to a considerable extent.

Natural Resources and the Environment

- An assessment of the state of the forest reveals a serious degradation of the land base. In the context of forest resources management in Indonesia, erosion and sedimentation are serious issues affecting the fire-degraded landscape. It proved difficult to obtain definitive data on the spatial extent of the fires: there appears to be a discrepancy between government and independent estimates.

- The region is characterized by high rainfall intensities that will only be worsened by a La Niña event, leaving unprotected, sloping, forest soils subject to extreme rates of accelerated erosion.

- The nature of extreme rainfall events, and limited data from field research, implies that predicting large-scale processes at the watershed scale would be inappropriate at this time.

- Any programs of conservation must be developed to be compatible with the prevailing conditions at the watershed scale and related problems at the sub-drainage scale. The effect of logging practices, current land use and extent of fire damage all control rates of erosion and sedimentation on the landscape: their cumulative effects are not entirely clear. Additionally, individual watersheds respond in a unique manner according to their geology, surficial geomorphology, soils and vegetation cover.

- To compound this state of the forest resource, the economic crisis has left the country of Indonesia with very limited financial resources to address the situation.

IV SUMMARY OF RECOMMENDATIONS

IMMEDIATE

Agriculture and Food Security

Recommendation I: The possibility La Niña forecast information should be incorporated into the paddy crop production program for the wet season 1998-99. The Food Crop Production Directorate of the Ministry of Agriculture would be an appropriate choice to take the lead in this direction. This will translate into a special La Niña year paddy production program with specific components:

- A comprehensive communication strategy to inform the policy makers and program implementers as well as the agrarian communities. At the local level, implementation of such a strategy may include extensive dissemination of information in local dialects through a variety of media such as communication brochures, radio and television programs.

- Short, focused training of agriculture extension personnel.

- Incentive packages to encourage support for farmers.

- Effective coordination mechanism between irrigation water reservoir management authorities and the agriculture department.

- Advance warning to farmers engaged in paddy cultivation in flood-prone zones of possible flooding.

Please refer to sections 6.2.1, 3.4.2 and 3.4.3 for details.

Recommendation II: Strengthened dialogues between the Food Crop Production Directorate of the Ministry of Agriculture and the BULOG and other relevant departments and ministries would be beneficial. This will help in formulating an appropriate rice procurement policy and assessing, validating and if necessary, modifying the Rice Import Plan for fiscal year 1999-2000.

Natural Resources and the Environment

<u>Recommendation III</u>: **A validation of the spatial extent of the fires using remote sensing techniques is recommended, to include assessments of the percentage of land use type that has been burned (production forest, protection forest, non-convertible forest etc.).** The Ministry of Forests is well suited to take the lead on this task. The objective should be the development of a new land use inventory map for decision support in preparation of targeted rehabilitation plans.

<u>Recommendation IV</u>: **Facilitated workshops should be considered for integrated resources management at the provincial level in provinces where the natural environment has been severely degraded by last year's forest fires.** These short, focused workshops could be used to explore issues of timber and non-timber values, together with those of biodiversity, with the forest sector stakeholders. The intent would be to help prioritize the emerging forest rehabilitation and regeneration plans.

<u>Recommendation V</u>: **There may be benefits to be gained from development of a strategic plan for salvage logging of some burned areas. This is to prevent a loss of merchantable timber. Given the current values of the international log markets, such a strategic plan might usefully address factors such as the timing of salvage logging operations to maximize returns and minimize environmental degradation of the burned areas.** The Ministry of Forests could take the lead in this task, perhaps working in partnership with the Directorate of Environmental Geology. The work could also involve a review of the role of conversion forests.

MEDIUM TERM

Agriculture and Food Security

<u>Recommendation VI</u>: **Institutional mechanisms should be developed to promote restructured cropping pattern during extreme climate events.** Concerted action by the Crop Production Directorate of the Ministry of Agriculture, BMG and Central Agricultural Research Institute can help develop mechanisms to promote appropriate restructured cropping pattern during extreme climate events.

Natural Resources and the Environment

<u>Recommendation VII</u>: **The health of the most vulnerable watersheds would benefit from newly developed, and prioritized, forest rehabilitation and regeneration plans.** This will enable finite resources to be directed at the most critical sites, thereby optimizing the investment in rehabilitation of the degraded environment and mitigation of rainfall-induced erosion, landslides, sedimentation and floods.

Recommendation VIII: Consideration should be given to development of a forest practices guidebook for mapping and assessing environmentally sensitive terrain. Regionally-based training could then be included to disseminate the findings. One objective would be the identification of areas of the land base that should never be logged, and if burned should always be rehabilitated immediately. These environmentally sensitive sites may, for example, be susceptible to erosion and landslides, may be the natural buffer in a community watershed, or may provide valuable habitat. This recommendation follows sequentially from the workshop proposed in the immediate recommendations, and is related to development of a strategy for salvage logging in burned areas. The Ministry of Forests would be well-suited to take the lead on this task, perhaps with assistance from the Ministry of Environment and the Directorate of Environmental Geology where it is felt appropriate.

LONG TERM

Agriculture and Food Security

Recommendation IX: It will be beneficial for the long term National Agriculture Development Planning to take into account the extreme climate events.

Natural Resources and the Environment

Recommendation X: In-country resources and expertise should be further developed and integrated for natural resources management. This development will likely occur as a consequence of support for the immediate and medium term recommendations.

Chapter 1

INTRODUCTION

1.1 BACKGROUND

In 1997-98, El Niño related drought conditions caused large scale degradation of the natural environment, particularly the forest cover, and led to significant reduction in rice production in Indonesia. Coupled with a protracted economic crisis this has caused serious food security concerns in many parts of the country.

This year, most of the regional climate forecast models are indicating a strong possibility of La Niña, the cold climate event. In general, this is likely to cause an above normal precipitation in Indonesia (a detailed discussion on this aspect is presented in Chapter 2). This may have severe impact on the natural environment already degraded by the forest fires of last year and may lead to increased soil erosion and resultant flooding and landslides. This will have implications for agriculture and food-security and may affect the communities already experiencing the effects of an economic crisis.

In order to mitigate the impact of disasters related to increased precipitation associated with La Niña and at the same time assess the potential benefits, it was considered imperative to carry out a pre-assessment of the likely scenarios. In this context, a joint initiative was taken by ADPC, NOAA and BAKORNAS PB of the Government of Indonesia to undertake a mission to Indonesia to carry out such pre-assessment. The mission was undertaken by a team of four experts including one disaster management expert and team leader, one agriculture and food security expert, one forestry and natural resources management expert and one flood mitigation expert.[1]

1.2 THE KEY OBJECTIVES

In this context, the main objectives of this short mission were:

- to make a rapid assessment of the implications of La Niña 1998-99 for Indonesia with focus on two main sectors of the economy: agriculture and food security; and natural resources and the environment; and

- to make broad countrywide recommendations to mitigate the impact of increased risk of disasters and maximize potential benefits of early onset of rains and increased precipitation.

[1] The mission was designed and coordinated by Kamal Kishore of ADPC. Other experts on the mission included A. R. Subbiah (Agriculture and Food Security), Jonathan Fannin (Forestry and Natural Resources Management), and Ricardo Miranda (Flood Mitigation).

1.3 METHODOLOGY

In order to meet its objectives within the short time duration, the mission divided its time between meeting a number of departments, agencies and ministries of the Government of Indonesia to collect secondary information and making field trips to some of the most vulnerable areas of the country. The field trips were made to the provinces of Central Java and East Kalimantan.

Given the short duration of the mission, the nature of the assessment carried out by the mission was essentially rapid and indicative. The mission drew heavily on secondary information provided by various departments, agencies and ministries of the Government of Indonesia to construct an overall picture of the situation in Indonesia. Extensive consultations were held with officials in Jakarta, Bogor and Bandung. The preliminary conclusions drawn from analysis of the secondary information were validated by field trips to Central Jawa and East Kalimantan provinces. The field visits included extensive consultations with provincial authorities, collection of secondary information, and field observations at district, subdistrict and village levels. Extensive consultations were held with the personnel of various line departments such as flood control commands and agricultural extension departments. The field visits also included extensive consultations with farmers in different part of Central Jawa province.

At end of the mission to Indonesia, the members met with a number of government officials, the UN Disaster Management Team and donor agencies based in Jakarta to report their findings and preliminary recommendations. This helped in prioritizing and finalizing the recommendations.

1.4 SCOPE AND LIMITATIONS

An extreme climate event such as La Niña can have wide ranging implications on different sectors of the society such as agriculture and food security, public health and population welfare, industry and the economy, and natural resources and the environment sectors. However, in view of limited time and resources, this study focuses on the two of the most critical sectors: agricultural and food security; and natural resources and the environment.

Similarly, the treatment of the above mentioned two sectors is also far from comprehensive. Within the agriculture and food security sector the study has focussed almost entirely on the most important aspect viz. rice production. Reference has been made to secondary crops only with respect to the main rice crops. In natural resources and the environment sector the focus has been mainly on forestry and related issues.

As mentioned earlier, this study relies heavily on the secondary information collected from various departments and agencies. This information has often been incomplete, unprocessed and scattered across more than one office. Based on the information collected, the team has made an effort to construct as complete a picture as possible. There may be assumptions implicit in this report, made on the basis of past experiences or expert judgment. Effort has been made to document all these assumptions as far as possible. Given the nature of this assessment, the quantitative estimates presented in this report should be considered only indicative of the order of magnitude to the finest degree possible.

In both, agriculture and food security, and natural resources and the environment sectors effort has been made to validate the findings by primary source information. However, the primary source research involved in this study has been minimal and therefore study has all the limitations of a rapid assessment.

Chapter 2

THE CONTEXT

2.1 THE CURRENT INDONESIAN CONTEXT

2.1.1 Introduction to Indonesia

Indonesia is the largest archipelago in the world consisting of 5 main islands and about 30 smaller archipelagos totaling 13,667 islands and islets of which approximately 6,000 are inhabited. The estimated area of the Republic of Indonesia is 5,193,250 sq. km, which consists of a land territory of 2,027,087 sq. km and a sea territory of 3,166,163 sq. km. Indonesia's five main islands are: Sumatra (473,606 sq. km); Jawa and Madura (132,187 sq. km), the most fertile and densely populated islands; Kalimantan or 2/3 of the island of Borneo (539,460 sq. km); Sulawesi (189,216 sq. km); and Irian Jaya (421,981 sq. km) which forms part of the world's second biggest island of New Guinea. The Indonesian archipelago forms a crossroad between two oceans, the Pacific and Indian oceans and a bridge between two continents, Asia and Australia. Because of its strategic position, therefore, Indonesia's cultural, social, political and economic patterns have always been conditioned by its geographic position.

2.1.2 Agriculture and Food Security Sector in Indonesia

Over the past three decades, the agricultural sector in Indonesia has grown at 4% annually and contributed significantly to reducing poverty in rural areas from over 40% in 1976 to 14% in 1997. Within the agriculture sector, the food crops sub-sector, particularly rice and maize, has received focused attention in the development planning of the country. As a result, paddy production reached the level of around 51 million tons in 1996.

Indonesia's per capita food availability increased from just 2000 calories per day at the end of the 1960s to approximately 2700 calories per day at the beginning of the 1990s. The status of household food security improved significantly during this period. Part of the success can be attributed to the integrated approach adopted by the government whereby marketing interventions were complemented by research on and dissemination of high yield varieties (HYVs) of rice as well as the provision of the requisite modern input packages.

However, the El Niño induced drought cycle in 1997-98 coupled with a protracted economic crisis has adversely affected the food security situation in the country. Annual Paddy production fell from around 51 million tons to 46 million tons, forcing the Government to import around 3.5 million tons. Reduced economic capacity to import food grain and institutional weaknesses of food distribution system have caused an increase in prices of rice from Rupiah 900 per kg to Rupiah 4,000 per kg by early September 1998.

The economic crisis has stimulated an awakening of the need to reform the institutional framework in Indonesia to enable it to respond more effectively to emerging challenges. The reform process is underway in various sectors. However, initial capital investment constraint to putting in place alternate systems has proved to be an obstacle, and, as such the pace of reform process is rather slower than the expectations of the citizens.

2.1.3 Natural Resources and the Environment Sector in Indonesia

Indonesia possesses substantial natural resources, which primarily include:

- energy resources, including petroleum and coal, plus the potential for increased hydro and geothermal energy;

- rich soils in Jawa and Bali, and good soils in parts of Sumatra, Sulawesi and many other islands; and,

- closed canopy forest in an extensive part of the country, notably Kalimantan and Irian Jaya, which represents a larger proportion than any other big Asian country.

This wealth of natural resources has, with good macroeconomic management, sustained impressive rates of growth and achieved substantial reductions in poverty in the period 1970 to 1989.[2]

Indonesia also has a firm commitment to the basic concepts of environmental management, as evidenced by recent legislation requiring an environmental impact assessment for all major projects. The demands on the environment are driven by population growth and spatial patterns of development.

2.1.4 The Current Economic Crisis

Indonesia is currently experiencing a very difficult period characterized by surging unemployment and inflation. Much of this new unemployment is occurring in sectors of the economy that are highly indebted through loans or a dependence on imports. Currency devaluation of the Rupiah has rendered debt repayment a major burden. The Gross Domestic Product (GDP) of the country fell by more than 12% in the first six months of 1998, the first reduction of its kind in 30 years (Asiaweek, 1998). The current economic crisis has increased the number of people living below the poverty line from

[2] Source: World Bank, 1990

22.5 million (11.3 percent of the country's total population) before the onset of the economic crisis in July 1997 to 79.4 million (39.1% of the total population) in June 1998. The International Labor Organization has predicted that the figure may further increase to 140 million (66% of the population). The increase stems mainly from job dismissals, harvest failures in drought hit areas and skyrocketing prices.

Expansion of the agriculture and natural resources sectors of the economy is an attractive proposition at this time. Given its independence of foreign currencies, capacity to absorb the unemployed, and potential to mitigate a reliance on costly food imports, the agricultural sector represents a strategic tool to address the socioeconomic impact of the crisis. Further, the currency depreciation has caused Indonesian commodities to be cheap on the international market. Exploitation of forest and mineral resources becomes very lucrative given costs in the local currency and earnings in foreign currencies.

2.2 THE CLIMATE OF INDONESIA

2.2.1 The Climate of Indonesia

The climate of Indonesia is generally characterized by two seasons: the dry and the wet season. The spatial and temporal distribution of rainfall is governed by the monsoons. The wet season starts rather abruptly when the Northwest monsoon reaches Indonesia. This occurs in late August in the northwest part of Indonesia and later (December) in the southeast part of Indonesia. The dry season starts more gradually, first in the southeastern part of Indonesia, but later also in the northwestern sections of the country. The time of onset of monsoon broadly determines the length of wet and dry seasons. The approximate time of onset and possible time of withdrawal of monsoon in various parts of Indonesia is as under:

Table 2.1: Onset and withdrawal of monsoon in various parts of Indonesia

Regions	Onset	Termination	Length of Wet Season (in months)
North Sumatra	Late August	June	9
South eastern Sumatra	First week of September	June	8
West Jawa	October-November	May	7
Central Jawa	November	April	6
East Jawa	November-December	April	5
Bali NPT	December	March	4

Source: based on The Agroclimatic maps of Jawa, Sumatra, Sulawesi, Kalimantan, Maluku, Irian Jaya and Bali

The early onset and late withdrawal of monsoon results in a lengthy wet season. Conversely, late onset and early withdrawal of monsoon entails a relatively short rainy season and a longer dry season.

2.2.2 The Agroclimatic Zones of Indonesia

In the Indonesian context, under the rainfed conditions farmers depend almost completely on precipitation for their crop cultivation. From the crop production perspective, if the amount of water required for wetland rice cultivation is at least 150 mm, then a mean monthly rainfall of 220 mm is required to satisfy this need.[3] Similarly, a mean monthly rainfall of at least 120 mm is needed to satisfy a 70 mm consumptive demand for secondary crops.

These considerations have led to the following definitions:[4]

- A wet month has a mean monthly rainfall of at least 200-mm.
- A dry month has a mean monthly rainfall of less than 100 mm.

Based on these basic definitions, the following classifications are made:[5]

Zone A has more than 9 consecutive wet months. In this zone wetland rice can be cultivated at any time of the year.

Zone B has 7 to 9 consecutive wet months. Two wetland rice crops can be cultivated in this zone.

Zone C has 5 to 6 consecutive wet months. In this zone two rice crops can be cultivated only if the first rice crop is planted (or sown) as a dry land crop (Gogorancah system).

Zone D has 3 to 4 consecutive wet months. Only one wetland rice crop is generally possible in this zone.

Zone E has less than 3 consecutive wet months. In such areas wetland rice cultivation is not recommended unless additional water from irrigation systems is available.

These five zones are further subdivided based on the length of the dry season:

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[3] The 70 mm difference is to take into account the water unavailable to rice crop due to evaporation to atmosphere as well percolation into soil.
[4] The wet and dry months are defined to reflect critical minimum water required for rice crops.
[5] Based on the work of Central Research Institute for Agriculture, Bogor.

Subzone 1 has less than 2 dry months. In such areas no restrictions are expected with regards to availability of water.

Subzone 2 has 2 to 3 dry months. In such areas careful planning is required to grow crops throughout the year.

Subzone 3 has 4 to 6 dry months. A fallow period is part of the rotation system because of water constraints.

Subzone 4 has 7 to 9 dry months. Only one crop can be successfully cultivated. The remainder of the year is too dry.

Subzone 5 has more than 9 consecutive dry months. Areas in this subzone are generally not suitable for any cultivation of arable crops.

Combination of the above two types of classifications defines the agroclimatic zones. For example, A1 means 9 consecutive wet months and less than 2 dry months. This classification system leads to 18 agroclimatic zones, of which 14 are identified in Indonesia.

Table 2.2: Percentage Occupancy of Different Agroclimatic Zones in Indonesia.

Agroclimatic Zone	A1	B1	B2	C1	C2	C3	D1	D2	D3	E1	E2	E3
Sumatra	24	46	1	6	9	0	10	2	0	0	2	0
Sulawesi	1	21	4	10	11	4	10	8	4	12	11	4
Jawa	4	16	7	0	25	14	0	5	20	0	0	9
Kalimantan	40	50	1	8	7	0	3	1	0	5	1	0

Source: Central Research Institute for Agriculture, Bogor, Indonesia

In general, A and B zones are considered climatically stable zones where two paddy crops are possible. However, from C to E agroclimatic zones are climate sensitive as the rain fluctuations can upset the established cropping pattern. The crop production in these zones is influenced by extreme climate events.

While in El Niño years the onset of the monsoon is late than normal, during La Niña years the onset is earlier than normal in most of the areas. Therefore, an El Niño event causes delayed planting and consequently delayed and reduced harvest. A La Niña year has potential for advancing planting season and an early increased harvest as well as free land for undertaking one additional crop. The La Niña forecast, therefore, assumes significant importance in planning and restructuring of cropping pattern to take maximum advantage of increased precipitation and minimizing the damage.

2.2.3 Past La Niña years and rainfall distribution in Indonesia

In this century, starting from 1900 to 1998, there were 19 La Niña years. The salient features of monsoons during past La Niña years are:

- Around 80% of the Indonesian archipelago received normal or above normal rainfall.
- The areas that received below normal rainfall were mostly agriculturally insignificant.
- The temporal distribution of rainfall during wet season was either uniformly distributed over the monsoon season or few concentrated spells of heavy precipitation leading to localized floods.
- The early onset of monsoon ensured a lengthy rainy season normally starting from September-October. The termination of rainy season either occurred as late as in June or abruptly happened in the first week of May in Jawa region.

2.2.4 IRI Climate outlook for Indonesia for the current year

The International Research Institute (IRI) climate forecast guidance for Indonesia received in end of July is presented in Appendix I. Parts of the report pertaining to rainfall probabilities are excerpted here:

"Rainfall probabilities for the season September-October-November 1998 for areas west of about 125E and south of the equator are 55% above-normal, 30% near normal, and 15% below-normal. Over New Guinea and in areas north of the equator the probabilities are 40% above-normal, 40% near-normal, and 20% below normal. For the period December-February there is much less confidence in the forecast because of the greater uncertainty in the evolution of sea-surface temperatures at the longer lead-time. For December-January-February, rainfall probabilities over the whole of Indonesia are 40% above-normal, 35% near-normal, and 25% below-normal."

2.2.5 Bureau of Meteorology and Geophysics (BMG) Forecasts for the Wet Season.

The English translations of BMG Forecasts are included in Appendix II. Part of the general forecast referring to rainfall probabilities are excerpted here:

"With the above considerations, National Season Forecasting Working Group... has prepared a forecast for 1998/1999 rainy season by considering the probability of the occurrence of natural phenomena La Niña. General Forecast of 1998/1999 rainy season is shown in the attached maps. Based on the maps, it can be stated that in 1998/1999 wet season entire Indonesia will experience high rainfall with the above 115% of normal rainfall, except in South East Maluku and South Minahasa which will encounter medium rainfall between 85%-115%. of normal rainfall."

2.2.6 Assumptions for the current study

Based on the wet season forecast issued by BMG and the regional forecast guidance issued by IRI, this study assumes that:

- An early onset of rains is likely in most parts of the country that are agriculturally important.
- Heavy concentration of rains would not extend beyond February next year.
- The study takes into account three possible rainfall distribution scenarios:
    - Early onset of monsoon in the last week of September followed by well-distributed rainfall through out the wet season and termination of rainy season in mid-June in most parts of Indonesia.
    - Early onset of monsoon followed by heavy concentration of wet spells in December and January and an early termination of rains (mid April) in Eastern Indonesia.
    - Normal onset of rains with uniform distribution in most parts of the country and uneven distribution of rains in some parts of the country

Chapter 3

AGRICULTURE AND FOOD SECURITY

3.1 BACKGROUND

The agriculture sector in Indonesia plays an important role in the economy in terms of income, employment and foreign exchange generation. As per the fifth Five-year Development Plan (1988-93), the objectives of the agricultural development were:

- to sustain and improve food self sufficiency;
- to increase the agricultural production to provide raw materials for industry for value addition and export; and
- to increase farmers' income as well as to improve their standard of living.

During 1980s, the agriculture sector grew at the rate of around 4 percent per annum, rendered strong support to the growth of agriculture based manufacturing industry, and contributed an increasing share to the country's export earnings. The most noticeable achievement has been that by mid 1980s the country shifted from being the largest rice importer to being self-sufficient in the country's main staple food.

The share of agriculture to the country's GDP was 47 percent in 1969 (the first day of the first 25 years Development Plan). This share gradually decreased to 33 percent in 1978, 21 percent in 1988 and is likely to be around 16% in 1998. However, half of the country's work force directly depends upon agriculture for livelihood.

This strong performance of agriculture sector in Indonesia can be attributed to three sets of favorable government policies (Ministry of Agriculture, 1989). First are sound macroeconomic policies, which were designed based on growth, equity and stability approaches. In this approach, agriculture is considered an engine of growth for the national economy. The second set of favorable policies is related to food crop production programs. High priority has been given to rice, soybean, and corn production. These policies are translated into various programs for increasing the production of these crops. Such programs range from providing inputs to research to extension to marketing and distribution. Along this line, price policies for food crops are also directed to assure that production increased at desirable or targeted rates. The third major set of policies is on crop investment and livestock and fishery development. Since early 1970s, the government has launched large-scale planting and rehabilitation programs for large enterprises as well as small holders. Indonesia is now a major producer and exporter of rubber products and palm oil. In the livestock sub-sector an even faster rate of growth was achieved.

Rice and maize account for some 80 percent of the food crop area; the share of rice alone is about 60 percent. The cash crop sub-sector is composed of smallholder cultivators largely privately owned commercial estates and state-owned plantations.

Food crop production is heavily concentrated in Jawa, followed by Sumatra and Sulawesi. Jawa accounts for approximately 60 percent of the country's rice and maize production, Sumatra for approximately 20 percent, and Sulawesi for approximately 10 percent. Taken together, these three islands produce 90 percent of the country's two main staple foods.

3.2 IMPACT OF EL NIÑO 1997-98 ON AGRICULTURAL PRODUCTION

The El Niño 1997-98 affected the wet season of 1997-98. The late onset of monsoon, reduced rainfall coupled with long dry spells affected rice crop production significantly.

The details of paddy production in 1998 when compared to previous years are shown in the following table:

Table 3.1: Paddy Production Area, Yield Rate and Production in Indonesia (1994 to 1998)

Year	Harvested Area (Ha)	Yield Rate (Q/ Ha)	Production Ton	Annual Growth (%)	Climate State
1994	10,733,830	43.45	46,641,524	-3.20	El Niño
1995	11,438,764	43.49	49,744,140	6.65	Normal
1996	11,569,729	44.17	51,101,506	2.73	La Niña
1997	11,140,594	44.32	49,377,054	-3.37	El Niño
1998+	10,680,898	43.34	46,290,461	-6.25	El Niño

Source: BPS - Central Bureau of Statistics, Indonesia

3.3 CURRENT FOOD SECURITY SITUATION IN INDONESIA

The reduction in rice production in 1998 by 5 million tons when compared to the previous normal year of 1996 has caused a serious threat to food security threat in the country. At the same time, the economic crisis has adversely affected the country's import capacity, as reflected mainly by the declining availability of import credits from external suppliers. The interplay of these factors has led to soaring food prices, rapidly rising unemployment, and a sharp reduction in access to food for a large segment of the

+ Second Forecast

population. It is estimated that 17 million families need support against the spiraling prices of rice commodity. [6]

The BULOG, the National Logistics agency, responsible for food grain price stabilization as well as supplying food to select budget groups appeared to be under stress to cope up with the food security problem in the country. BULOG distributes 1.8 million tons annually to budget groups and the market operations depend upon the prevailing market sentiments from time to time. Whenever, the price level shoots up beyond a ceiling price, the BULOG intervenes by releasing stocks at a lower price than the market price to stabilize prices.

During the period from 1994-95 to 1996-97, BULOG's domestic procurement averaged 1.3 million tons of milled rice per year, or about 3.4 percent of production. During the same period, BULOG's rice imports averaged 1.7 million tons per year. Its market stabilization operations involved an average annual 0.7 million tons. In 1997-98, however, the shortfall in domestic production is estimated to have reduced local procurement to 138,520 tons during January-August, 1988 as compared to 1.93 million tons during the corresponding period in 1997.

The government has increased rice imports considerably to meet the domestic deficit. About 3.5 million tons have arrived at various ports in the country. The government has also allocated Rp.15.71 trillion for the State Logistics Agency (BULOG) in the current fiscal year to fund rice price stabilization.

A stock of around 2.26 million tons of rice was available as of end of August 1998 which is enough to take care of food needs of budgetary group as well as market operations up to March 1999. The large-scale rumors about a renewed mass rioting in the mid-August, however, distorted market sentiments. The uncertainties created a panic buying situation and even rich consumers were trying to hoard the commodity. Besides the sudden increase of price attracted a large number of traders. As against the usual number of around 200 traders in Jakarta, the number of traders increased to 3000. Most of the new traders entered into rice trading after having lost their usual business opportunities due to economic crises. There were reports that the BULOG's market operation has allowed speculators to buy subsidized rice and retail it at higher prices. Local rice prices rose to as high as Rp.4000 (41 US cents per kilogram) during the first week of Sept 1998 well above the government's target price (for low quality) of between Rp.1750 and Rs.2000 per kilogram. High quality rice such as Cianjur Kepala and Rojolele sold for almost Rp.5000 per kilogram. The BULOG is undertaking a revamping of its operations amidst reports of leakage and smuggling of rice to Malaysia due to difference in rice prices between the two countries.

[6] Source: FAO Mission Report, April 1998.

The BULOG released 2.05 million tons of rice between January to August 1998 as compared to just 246,695 tons during the corresponding period last year. Considering the reduced rice production during 1998 and average market operations in the previous year, the BULOG has plans to release another 2.9 million tons under market stabilization strategies from September to March 1999.

The impression from field visit to Central Jawa and Jakarta and Semarang cities indicates the food security situation as under:

- Most of the rural households have enough stocks to meet food needs till the next harvest season.
- The farmers undertook cultivation of secondary crops in place of paddy due to El Niño imposed drought and as such have retained purchasing power and supplementary food stocks to meet basic food needs up to the next harvesting season.
- The drought affected rural areas that could not cultivate either paddy crop or secondary crop are receiving relief assistance either under Food for Work Program or under supplementary feeding program.
- The food security situation seriously affects the low-income group of families of urban consumers most of whom lost their income avenues due to economic crises.
- The Government identified 17 million families and started distributed rice at Rp.1000 per kg. Each household is provided with 10 kg of subsidized rice per month under the special market operation by BULOG.
- The Government plans to import 3.42 million tons of rice for the period April 1999 to March 2000. The Govt. anticipates procurement would be around 1 million-ton during the wet season 1999. The cost of domestic procurement is estimated to be Rp.3.89 trillion and imports about US$ 1.03 billion.

3.4 CROP PRODUCTION SCENARIOS IN THE LA Niña YEAR 1998-99

3.4.1 Agriculture Production during Past La Niña Years

Both weather and non-weather factors influence crop production. The analysis of previous year's crop production reveals that the crop production -- with other factors being equal -- is negatively influenced by El Niño and in general, favorably influenced by a La Niña event. Analysis of past data shows that in almost all La Niña years, the paddy production increased when compared to previous years. Following the previous La Niña year 1995-96, the production of paddy was around 51.02 million tons.

3.4.2 Crop Production Strategies for the Current La Niña Year

The crop production data from previous La Niña years shows that advance climate information can provide significant opportunity to increase crop production in the current year. This report identifies three distinct but inter-related strategies to increase rice production and thus minimize the need for rice imports to the country. These strategies are:

- Enhancing rice yield potential
- Increasing crop intensity through restructuring the cropping pattern
- Expanding cropping area through bringing idle fallow lands under rice cultivation

Enhancing Rice Yield Potential

The rice yield data presented in Table 3.1 shows that the yield levels in 1996, 1997 and 1998 were 44.17, 44.32 and 43.34 quintal per hectare respectively. In 1998, the yield level decreased to 43.34 due to the combined effects of El Niño induced drought and less than optimal dose utilization of inputs and pesticides by farmers due to higher costs.

It is possible to remove yield suppression as well as realize natural yield growth by utilizing La Niña induced precipitation possibilities. As against 43.3 quintal per hectare, it is possible to realize 45 quintal per hectare.[7]

Restructuring Cropping Pattern for Wet season (October to June)

Several types of cropping patterns are practiced in Indonesia. In broad terms, these cropping patterns are of following types:

Type 1	Paddy - Paddy - Fallow
Type 2	Paddy - Paddy - Secondary
Type 3	Paddy - Secondary - Fallow

[7] Yield level increases every year due to adoption of better agronomic practices such as improved irrigation, inputs and management practices. During El Nino years, water scarcity temporarily acts as a limiting factor to suppress the productivity level. During normal and La Nina years water constraint as a limiting factor is automatically removed. This is called removal of yield suppression. The degree of yield suppression depends on the severity of El Nino. In 1997-98 which was a severe El Nino year there was a significant decrease of yield due to combined effect of El Nino induced drought as well as less than optimal use of inputs due to high market prices. These factors led to a drop of 2.21% yield in 1998 when compared to the previous year. The discussions with Ministry of Agriculture confirms that it is possible to get the yield level to a minimum of 45 quintal per hectare at the current level of input management and 46 quintal per hectare if a concerted effort is made to deliver better package of inputs to farmers. This study assumes a conservative 0.2 ton /Hectare increase which is the minimum potential that could be realized.

Type 4 Paddy - Fallow

The La Niña is likely to bring extended rainy season to most of the areas. Keeping in view the rainfall availability, the following types of cropping patterns are possible:

Table 3.2: La Niña and possible rescheduling of cropping pattern in Indonesia

Type of Irrigation	**Normal Cropping Pattern**	**Suggested Cropping Pattern**		
		Type I	**Type II**	**Type III**
Semi Technical[8]	Paddy	Paddy	Paddy	Secondary
Irrigation	Paddy	Paddy	Paddy	Paddy
	Fallow	Paddy	Secondary	Paddy
Technical	Paddy	Paddy	Paddy	Secondary
Irrigation	Paddy	Paddy	Secondary	Paddy
	Secondary	Paddy	Paddy	Paddy
Non Technical	Paddy	Paddy	Paddy	Secondary
Irrigation	Secondary	Paddy	Paddy	Paddy
	Fallow	Secondary	Fallow	Fallow
Rainfed	Paddy	Paddy	Paddy	Secondary
	Fallow	Paddy	Secondary	Paddy

Note: Type I Rainfall extending up to 7-9 months
Type II Rainfall extending 7-8 months
Type III Rainfall extending 6-7 months

Quantitative estimates of potential increase in crop production as a result of restructuring of cropping patterns are presented in section 3.4.3 of this report.

Expanding Cropping Area

Inter-related to crop intensification is the strategy to expand the cropping area. Increased precipitation may provide an opportunity to do this. As a part of its ongoing program the Government plans to make use of 244,000 hectares of idle land under paddy cultivation during the forthcoming wet season.[9]

[8] The technical and semi-technical irrigation systems are classification adopted by Indonesian authorities. While in technical irrigation the entire irrigation system including the main canal, the secondary canal and the tertiary canal which feeds individual farm fields are controlled by the Government, in semi-technical irrigation only main and secondary canal systems are controlled by Government. The tertiary channels feeding individual farm fields are controlled by the farmers.

[9] Based on discussions with Ministry of Agriculture.

3.4.3 Potential Increase in Crop Production during the Current Year

Based on the three strategies suggested in the above section and secondary data available on various types of irrigation systems this study presents a quantitative estimate of the potential production scenario.

The data relating to crop intensity in respect of areas other than Jawa is not readily available. However, area served by various types of irrigation systems is given below:

Table 3.3: Distribution of wet land paddy areas with various irrigation systems in Indonesia (hectares)

Type of Irrigation	Jawa	Sumatra	BNT	Kalimantan	Sulawesi	Total Areas in hectares
Technical	1,512,324	281,854	60,494	10,241	232,237	**2,097,150**
Semi-technical	391,365	248,709	164,475	14,885	97,048	**916,482**
Non-technical	657,543	518,704	93,531	152,660	251,207	**1,673,645**
Rain fed	796,868	576,189	54,263	376,460	297,903	**2,101,683**
Valley	1,953	261,648	155	288,248	2,247	**554,251**
Others	2,293	526,345	20,906	529,793	61,678	**1,141,015**
Total	**3,362,346**	**2,413,449**	**393,824**	**1,372,287**	**942,320**	**8,484,226**

Source: Ministry of Agriculture

Potential increase in rice production as a result of increase in rice yield:

As mentioned earlier, an increase in rice yield can be achieved by approximately 0.20 tons per hectare. If this can be achieved with 8.0 million rice lands in various parts of the country, an additional production of 1.6 million tons of paddy is possible.

Potential increase in rice production as a result of increased crop intensity through restructuring the cropping pattern:

Although data pertaining to crop intensity was not readily available for entire Indonesia, the mission was able to get information on crop intensity in Jawa. Therefore, estimates for potential increase in rice production as a result of increased crop intensity have been made separately for Jawa and rest of Indonesia.

In Jawa, land area under different irrigation systems used for raising only one paddy crop per season, is as follows:

Technical Irrigation	290,870 hectares
Semi-technical Irrigation	100,319
Non-technical	181,797
Rain-fed	615,217

The early onset of rains will provide the opportunity to advance the rice planting to October instead of November. Thus it is possible to harvest the First Crop in February and the Second Crop in June. All the land areas that have some sort of irrigation facility and are currently used for only one paddy crop per season can be used for a Second Crop of paddy. Similarly, at least 70% of the rainfed lands[10] in Jawa can support Second Crop of paddy. Taking all these factors into consideration, it is estimated that in approximately 1 million hectares of agriculture area in Jawa region where presently only one paddy crop is grown, one additional paddy crops may successfully be harvested. At a minimum yield level of 3-tons/ hectare an additional 3 million tons of paddy can be produced. However, this would require dissemination of appropriate agricultural extension information along with input package incentives to the farmers.

Hence, an additional 3 million tons of paddy production is possible.

In areas other than Jawa, approximately 1.3 million hectares of land is rainfed (from Table 3.3). Of these -- if we assume a similar proportion as in Jawa -- a minimum of 1 million hectares is cultivated only once per season for paddy production. Given the forecasts for early onset and extended duration of rains, at least 50% of this area (0.5 million hectares) can be cultivated for a second paddy crop.

As shown in Table 3.3, in areas other than Jawa, there are about 4 million hectares of paddy area supported by one type of irrigation facility or the other.[11] It is assumed that 1/3rd of 4 million hectares would be used for growing paddy only once.[12] It is possible to raise additional paddy crop in at least 50 percent of 1/3rd of 4 million hectares. Hence, the irrigated land available for an additional paddy crop works out to be 0.6 million hectares.

[10] East Jawa region which accounts for about 30 % of the rain fed crop area may not support a second crop because of the forecasted termination of rain in mid-April.

[11] In areas other than Jawa particularly in Sumatra, Kalimantan and Sulawesi paddy is grown in valley and swamp areas which receive rainfall for about 7 to 9 months and are equipped with diverse types of local irrigation systems. Hence except rainfed lands all type of lands are taken into account for calculation i.e., technical, semi-technical and non-technical irrigation areas and valley and other areas. (Table 3.3)

[12] The crop intensity figures were not available for regions other than Jawa. In Jawa approximately 1/5th of the irrigated land used for paddy production is cultivated only once. Since, Jawa region is agriculturally well developed and highly intensified paddy cultivation is practiced when compared to other regions, it is very likely that in areas other than Jawa, this proportion will be more. This study assumes this proportion to be 1/3rd. This assumption was further validated in discussions with the experts from the Ministry of Agriculture.

In areas other than Jawa, a total of 1.1 million hectares of land (both irrigated and rainfed) will be available for raising an additional paddy crop. The additional paddy production at the yield level of 2 tons per hectare is estimated to be 2.2 million tons.

Hence an additional 5.2 million tons of rice can be grown as a result of change in cropping pattern and intensification in entire Indonesia.

Expanding cropping area through bringing idle fallow lands under rice cultivation

In addition to above, the Government plans to make use of 244,000 hectares of idle land under paddy cultivation during the forthcoming wet season[13] and the estimated additional production is 579,500 tons.

Total additional paddy production potential due to La Niña

If the climate forecast information for the wet season is appropriately utilized through the above-mentioned strategies, it is estimated that a total increase of 7.40 million tons of rice production over the previous year 1997-98 (46.29 tons) is possible. The following table summarizes the discussion in the above paragraphs:

Table 3.4: Additional paddy production potential during La Niña year 1998-99

Strategies	Jawa	Rest of Indonesia in million tons	Total
Potential increase in rice production as a result of increase in rice yield:	0.66	0.94	**1.60**
Potential increase in rice production as a result of increased crop intensity:	3.0	2.20	**5.20**
Expanding cropping area through bringing idle fallow lands under rice cultivation		0.60[14]	**0.60**
Total	**3.66**	**3.74**	**7.40**

Although the above estimates show that 7.4 million tons of additional paddy production is possible, it can be reasonably assumed that a minimum of 5 million tons of additional production is possible when compared to 46.29 million tons in 1998 which was an El Niño affected year. Hence, the total paddy production can be up to 51.29 million tons which is similar to 1996 La Niña year production level. Taking into account the natural growth rate of agriculture sector (a minimum of 2%) due to improved irrigation facilities, better inputs and expansion of agricultural area since 1996 these figures could be even higher.

[13] Based on discussions with the Ministry of Agriculture.
[14] This study assumes that the proposed expansion of agricultural area will be only in areas other than Jawa.

Possible losses due to incidence of flooding

In view of the climate forecast for the forthcoming wet season, two scenarios can be visualized:

1 Early onset of monsoon coupled with even temporal distribution of rainfall (causing few localized floods) and the termination of rains in June 1999.

2 Early onset of monsoon coupled with a concentrated wet spell in December and January and early termination of rains by the end of April 1999.

Based on past experiences, approximately 20,000 hectares of agricultural land may be affected by floods in Scenario 1.[15] Scenario 2 may be worse and the affected area may be up to 40,000 hectares.[16] In the worst case scenario, the production loss at a yield rate of 4 tons per hectare will be approximately 0.16 million tons, which is relatively minor compared to the potential increase in production.

3.4.4 Preconditions for Better Crop Production Potential in the Current Year

The quantitative estimates of potential increase in paddy production would be contingent upon the following factors:

- The La Niña forecasting information is incorporated into the country's agricultural development planning for the year 1998-99;

- An emergency rice production program is introduced by the Government with adequate incentives for the farmers to enable them obtain agricultural inputs[17] and take advantage of La Niña induced increased precipitation.

- Short training programs are organized in a timely fashion to enable the agricultural extension workers to use and disseminate La Niña forecasting information for agricultural purposes. This will help in providing the farmers with information on appropriate cropping pattern and agricultural inputs.

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[15] In 1988-89 La Nina year when the distribution of rainfall was somewhat even throughout the wet season, the paddy crop area affected by flooding was 15,174 hectares. Keeping in view the increasing vulnerability to floods over the years, this study assumes a conservative 20,000 hectares for La Nina 1998-99.

[16] In 1995-96 (La Nina year) the rainfall pattern was somewhat skewed with concentrated rainfall in December and January. The paddy crop area lost to flooding was 38,167 hectares, which was the highest ever in Indonesia since 1975.

[17] This study recognizes the availability of inputs, particularly seeds, as one of the critical factors in the success of this program. A detailed discussion based on the mission's findings on availability of seeds for increased paddy production in Indonesia is presented in Appendix III.

- As a follow-up of the above, location specific contingency crop plans are prepared and disseminated to enable farmers' plant and implement appropriate cropping schedule.

- An effective co-ordination mechanism is established at each reservoir project level to regulate release of water keeping in view La Niña forecasting information.

3.5 THE CASE OF CENTRAL JAWA PROVINCE

As mentioned earlier, the mission visited the Central Jawa province to obtain field level insights and validate some of the findings (Section 3.4) that were based on secondary information. The mission held detailed discussions with the provincial authorities, agriculture extension workers, reservoir managers and farmers to construct a picture as complete as possible.

3.5.1 Agriculture Sector in Central Jawa Province

Central Jawa is a transitional zone between West Jawa and East Jawa in the Jawa Island of Indonesia. The province has a land area of 34,206-sq. km. (1.78% of the total area of the country) and is inhabited by 29.65 million people accounting for 14% of the total population of the country. The population density of the province is 834 persons per sq. km. Approximately 7.1 million households depend solely on agriculture for their income. Of these, 90% households own less than one hectare of land. The regional gross domestic product (GDP) of the province was reported to be Rupiah 41,862,203.72 million (1996 constant price). The agriculture related activities account for over 20% of the regional GDP of which 64% comes from food crops.

The Province enjoys Jawa pattern of monsoon, starting in October-November and terminating in April-May. The dry season extends from June to September. The average wet season rainfall is 2,100 mm spread over 7 months starting from November to May. Various crops are cultivated through out the year. Usually, rice cultivation is done in November with the peak harvest season in April. Broadly, in low lying areas farmers grow the second paddy crop from April to August depending upon the availability of irrigation water. In the areas where there is no irrigation, farmers grow secondary crops after harvesting the first paddy crop. In upland areas farmers grow secondary crops as the first crop followed by a paddy crop as the second crop. Dry land agriculture is practiced in around 1 million hectares and wet land cultivation is practiced in around 0.9 million hectares. The irrigation status of wet land cultivation is as follows:

_Table 3.5: Crop Intensity and Irrigation Status in Central Jawa- Wet Land Paddy

Irrigation Status	Paddy Cultivated Area (in hectares)		
	Once	Twice or more	Total
Technical	48,719	326,118	374,837
Semi-technical	26,216	98,791	125,007
Non-technical	67,694	143,350	211,044
Rainfed	195,148	90,041	285,189
Valley	299	17	316
Others	770		770

Note: Once means only one crop in the wet season
Twice means two crops in the wet season
More means 3 crops during the year

(Source: Agriculture Survey - Land Area by Utilization in Jawa, BPS, 1996)

A detailed cropping pattern in the province is as under:

In areas where water availability is for more than nine months:

Type 1 Paddy - Paddy - Paddy
Type 2 Paddy - Paddy - Secondary
Type 3 Sugarcane - Paddy
Type 4 Secondary - Secondary - Paddy

Similarly, in areas where water availability is for six to nine months:

Type 1 Paddy - Paddy - Secondary
Type 2 Dry seeded paddy - Paddy - Secondary
Type 3 Paddy - Secondary - Secondary
Type 4 Secondary - Paddy - Secondary

Three different types of cropping patterns are adopted in areas where water availability is for four to six months

Type 1 Paddy - Secondary
Type 2 Dry seeded paddy - Secondary
Type 3 Secondary - Paddy

Similarly, in areas where water availability is for less than 4 months

Type 1	Paddy - Fallow
Type 2	Dry seeded paddy - Secondary
Type 3	Secondary - Secondary

The wet land paddy is grown in approximately 1.5 million hectares with a yield rate of 5.32 tons per hectare and corn is grown in approximately 0.6 million hectares with a yield rate of 27.69 quintal per hectare. The year-wise production of paddy and corn is as follows:

3.5.2 Likely Scenario for the Agriculture Sector in the Current Year

The Climate of Central Jawa Province

The Province enjoys Jawa pattern of monsoon, starting in October-November and terminating in April-May. The dry season extends from June to September. The average wet season rainfall is 2,100 mm spread over 7 months starting from November to May.

In most parts of Central Jawa during a La Niña year, the monsoon advances in the last week of September or middle of October and extends up to July and August of the next year. Hence, the length of rainy season extends from 7 to 9 months.

Dissemination of Climate Forecast Information in the Province

The provincial BMG, the Weather Forecasting Agency, has sent a communication to all concerned agencies on 12 August 1998, informing them of the possibilities of increased precipitation in the wet season of current La Niña year. The forecast includes month-wise probable rainfall for all the districts of the province.

However, the La Niña and related rainfall forecasts are being perceived mainly as a flood-inducing phenomenon. As such the Provincial Agricultural Department has sent a communication on 25 August 1998 to all the districts to undertake following measures:

- monitor the highly flood prone areas and take up suitable measures to change crops in the event of floods;
- undertake repairs of irrigation structures;
- alert farmers about the impending floods;
- ensure effective co-ordination with other departments like Public Works Department, etc.; and
- send a report to the provincial authorities as and when flood occurs.

Discussions with the district and sub-district level functionaries reveal that they have been directed to initiate action only in case of occurrence of heavy rains resulting in floods and as such they are keeping a watch on the situation.

At the individual farmer level, discussions with farmers in various parts of the province reveal that they have not received any information either about La Niña event itself or associated changes in rainfall.

Application of Climate Forecast Information in the Province

The farmers indicated that in the absence of any information about the early onset of monsoon and its distribution over the coming months, they intended to follow the usual planting in November. They expressed their inclination to plant paddy crops with full dose of agricultural inputs because of the high market price of paddy. The high market price of paddy has motivated some farmers to grow paddy in the non-flood risk zones like River Penny lake in the Central Jawa region. However, one major constraint was the initial high investment due to higher cost of inputs, which increased four times when compared to before the onset of economic crisis. At present, the cost of cultivation per hectare works is approximately Rp. 2 million as against Rp.600, 000 per hectare before. The farmers opined that if the Government makes credit arrangements, it would be easier for them to buy inputs without obtaining loan from private lenders.

Potential Increase in Crop Production for the Current Year

The 1997-98 La Niña and associated rainfall pattern will provide an opportunity to advance the planting of paddy in October in most parts of Central Jawa. The first two strategies suggested in section 3.4.2 of this report would be appropriate for Central Jawa province as well. In addition, rainfed agricultural land in the province can be used for growing an additional paddy crop.

If a comprehensive approach is adopted, it is possible to enhance paddy production by at least 1.3 million tons in Central Jawa. At the same time, there may be some losses due to potential flooding. In the past La Niña years, highest damage has been recorded to 15,000 hectares of crop area. But on the whole, when compared to normal years, paddy and corn production increased during La Niña years.

In Central Jawa 338,846 hectares of paddy crop area supports only single paddy crop. One additional crop of paddy can be cultivated keeping in view the forecast information indicating early onset of Monsoon in October instead of November. A rainfall of 75 mm in October is just enough to adopt dry sown rice method. This dry sown rice will germinate as a dry land crop, but since the fields are bunded it will gradually develop as a wetland rice crop (Gongorancah system). The farmers can harvest first paddy crop in February. These areas could again be transplanted with rice seedlings immediately after the February harvest and can be harvested 4 months later (June-July). During the La Niña year, the rainy season is likely to extend up to June. A careful water management and planning can ensure a successful harvest. A close monitoring of the rainfall pattern and dissemination of periodic advisories (such as recommending watering the crop at the critical growth stages) would be essential for the success of the harvest. The implementation of these strategies will require specific actions described under Recommendation I in section 6.2.1.

Chapter 4

NATURAL RESOURCES AND THE ENVIRONMENT

4.1 BACKGROUND

Indonesia ranks third (behind Brazil and Zaire) in its endowment of tropical rainforests, possessing 10% of what remains in the world of this resource. The approximate distribution of forest cover is as follows: Kalimantan (32% of the total); Irian Jaya (30%), Sumatra (21%); Sulawesi (10%); Maluku (5%); and other (2%), from Ministry of Forests data reported by the World Bank (1990). Management of forest resources in the outer islands is largely controlled by private concessionaires.

Based on an analysis of 1990 estimates of the standing stock of important timber species in the natural forests the ranked distribution of hardwoods by major provincial holders was as follows: Kalimantan (47%), Irian Jaya (21%), Sumatra (17%), Sulawesi (11%), and Maluku (4%). Similarly for softwoods the ranked distribution was Kalimantan (51%), Irian Jaya (18%), Sumatra (17%), Sulawesi (10%), and Maluku (4%). In summary, one-half to three-quarters of the forest resources of Indonesia are held in Kalimantan and Irian Jaya.

The recent development process has placed increasing demands on the outer islands that are the location of most of Indonesia's forest and land resources. These closed canopy forests account for over half of all forested area in Southeast Asia, and more than 95% of the forests of Indonesia. They serve both a productive and protective role in the country. Yet in the 1980s, programs were sponsored by the government to put massive tracts of land into production, promoting a rapid growth in local land use and the exploitation of timber and other forest products. The result has been a sharp increase in the rate of deforestation and an uneven land use.[18]

In the last year, the unfolding economic crisis has led to profound changes affecting the forest sector and land use in general. A complex interplay of market demand, wood supply and fluctuating prices governs the state of the commercial timber sector. Depressed markets in early 1998 had led to a situation of near-bankruptcy in the wood processing industry. However regional demand for Indonesian wood is now expected to surge following a Chinese policy to severely restrict logging. In the aftermath of the 1997/98 fires, the likely result will be increased damage in production forests and unauthorized logging in protection forests.

The conversion of forestland to agriculture also poses a threat to natural forest cover and forest-dependent peoples. Earnings from oil palm plantations, cocoa and coffee on newly

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[18] Source: World Bank, 1990.

cultivated land are very strong because of low production costs and high international prices. Indonesia is the world's second largest producer of natural rubber and palm oil, the world's third largest producer of coffee, and fourth largest producer of cocoa. Such plantations may only be established on lands designated for conversion to agriculture. There is a natural temptation in such circumstances to burn degraded production forests, where the potential for earnings is low, in order to force a reclassification to conversion forest. This is leading to pressure on the regulatory authorities, notably the Ministry of Forests.

4.1.1 Role in the Indonesian Economy

Commercial exploitation of these forests has grown rapidly in the last 30 years and Indonesia is now one of the world leaders in the export of tropical timber. By 1996, some 445 logging concessions were operating on 54 million ha. of forest land, of which close to 1 million is estimated to be logged annually. This is more than the total area logged in all other Southeast Asian countries combined. In 1994, wood and wood products produced about US$ 5.5 billion in export revenue for Indonesia, representing about 15% of the total foreign earnings and employing 700,000 people.[19]

4.1.2 Institutional Arrangements

Forestry Department boundaries in Indonesia cover about 144 million ha. representing about 75% of the land base of the country. The forests are zoned into five categories: conservation and national parks (13% of the total); watershed protection (21%); limited production forest (21%) and regular production forest (24%) in which selection logging is permitted; and conversion forest (21%) designated for change to agriculture.

The Ministry of Forestry comprises an Inspectorate and Secretariat General, two centers for education and training, an agency for research and development, and four operational Directorate Generals (D.G.), as follows:

- D.G. Forest Utilization;
- D.G. Reforestation and Rehabilitation;
- D.G. Forest Protection and Nature Conservation; and,
- D.G. Forest Inventory and Land Use Planning.

Management of the forest sector was found to be weak.[20] Jawa, which has less than 2% of all forested land, has 50% of all forestry administrative staff. Staffs in the outer islands

[19] Source: Sunderlin and Resosudarmo, 1996.
[20] Source: World Bank, 1990.

rely largely on concessionaire reports to determine annual allowable cuts, and royalties to be paid on merchantable timber. Poor logging practices and breaches of regulations are difficult to detect.

4.1.3 The Current Forest Management Practices

The forests of Indonesia are being logged at a rate of approximately 40 million cubic meters per year, a rate that is nearly twice that recommended by the Ministry of Forests for "sustainable" yields. The causes of deforestation in "old-growth" or primary forests are currently a subject of debate.[21] Contributing factors include: logging by the timber industry (clear-cut logging and selection logging); estate and plantation development (large private commercial estates and state-owned plantations); and smallholder cultivation ("shifting-cultivation" forest pioneers, tree crop smallholders, and transmigrants both "regular" and "spontaneous"). A lack of good, independent data prevents any detailed assessment of the relative growth and impact of each factor. The contribution of plantation development to deforestation requires a statement of clarification. Timber plantations are intended to supply Indonesia's emerging pulp and paper industry which currently relies on a diminishing supply of wood fiber from natural forests: the rate of plantation development is closely linked to the price of logs and the export market.

Government recognition of the need to manage the forest sector on a more sustainable basis led to items in the fifth five-year economic plan (1990/91 - 1994/5), as follows:

- no increases to targets for log extraction;
- integration of logging and processing activities;
- restriction of forest plantations to degraded forest lands;
- extended leases on forest plantations (from 20 to 35 years);
- a moratorium on new licenses for plywood and sawmill construction; and,
- extension education and training.

Yet logging activities continue to result in severe reductions in forest health and biodiversity. Standing trees are being damaged as a result of poor logging practices, and re-entry before the 35-year logging cycle elapses is compounding the losses. Slow regeneration of valuable species contributes to the reduced value of logged-over areas. Consequently many concessionaires do little to protect their holdings from encroachment and fire once they are logged.

In general, the poor logging and reforestation practices are a result of the high opportunity cost of capital, a long period for regeneration and the current system of relatively short timber concessions. Considered together, they promote a short-term perspective for

[21] Source: Sunderlin and Resosudarmo, 1996.

forest resources management, which is characterized by clear-cut logging with very little effective restoration of the natural environment. The situation has been worsened further by shortcomings in the regulatory structure that have resulted in reforestation funds being misappropriated.[22]

Although some deforestation is inevitable, the current situation represents a substantial economic loss. When compounded with influences of climate change and the current economic crisis, it may be the precursor to large scale environmental degradation.

The economic crisis will likely increase pressure on Indonesia's natural forest cover, largely through expanded agricultural production and mining, and the potential for a revived demand in wood products processing.

4.2 IMPACT OF EL NIÑO 1997-98

4.2.1 El Niño Related Dry Conditions

During an El Niño year, a weakening of the trade winds is believed to be coupled with changes in the distribution of warm water in the Pacific Ocean. Heavy rains associated with ocean temperatures move into the central Pacific Ocean, one outcome of which has been drought in Indonesia. Reports indicate the 1997-98 El Niño is unusually strong.

4.2.2 Forest Fires of 1997-98

A damaging fire season appears to occur in Indonesia with every exceptionally dry climate episode resulting from El Niño. Increasingly the fires are been attributed to large-scale forest conversion and land-clearing activities for cash crop estates and pulp wood timber plantations.[23] The more fire-susceptible islands of Indonesia (Sumatra and Kalimantan) had a dry season commencing around mid-May 1997. Early warning for East Kalimantan led to timber licenses being revoked from concessionaires, and a moderate fire activity compared with other provinces in Kalimantan and Sumatra where fires burned out of control. Air pollution resulted in a haze that covered large parts of Indonesia, Malaysia and Singapore until mid-November 1997, at which time the rains began. Normal to heavy rains in most areas, except East Kalimantan, have extinguished many of the fires. The situation for 1998 in East Kalimantan is described separately below.

[22] Source: The Jakarta Post, 1998.
[23] Source: Schindele et al., 1989 and Schindler, 1998.

A report by the Director of Forest Protection[24] specifically recognized the fires are a result of land clearing by forest companies, including natural forest concessionaires (HPH) and plantation forest concessionaires (HPHTI), estate crops and transmigration projects, as well as by local communities and individuals. Natural causes, such as smoldering coal deposits, are also acknowledged to play a role. The influence of El Niño as a multiplier is attributed to a warmer and longer drought that has dried the fallen debris on the forest floor.

4.2.3 National and International Initiatives on Fire Prevention and Protection

At the national level, the management of forest and land fires includes efforts at the field or district level by mobilization of forest rangers, army personnel and local people. At the provincial level the mobilization of human resources, equipment and funding was coordinated by the Provincial Center for Management of Forest and Land Fires and the Provincial Coordinating Board for Disaster Management. Techniques employed included localized ground response, aerial water bombing and construction of fire breaks in the forest.

As part of the response, NOAA satellite images were used to monitor hot spots by four receiver stations set up in projects assisted by the GTZ (IFFM) in Samarinda, by the EU (FFPCP) in Palembang, by the ODA in Palangkaraya and by the JICA (FFPMP) in Bogor. Further training on fire fighting was organized by the Ministry of Forests in cooperation with these donor agencies and the USDA Forest Service.[25]

4.4 THE CASE OF EAST KALIMANTAN PROVINCE

4.4.1 Background

The four provinces of Kalimantan have long been recognized as having Indonesia's largest reserve of valuable hardwoods, and the additional value of softwoods, rattans, resins and exotic woods. Most of the 20-year contracts were given to concessionaires (HPH) in the 1970's, with nearly three-quarters located in the East and Central Kalimantan where the forest resources are concentrated. One of 27 provinces, East Kalimantan comprises 10.5% of the land area of Indonesia. The population of 1.8 million in 1990 represented 1% of the entire country.

Forestland use is controlled by means of the "Agreed Forest Land Use Zones". East Kalimantan has a land area of 21.1 million ha, comprising protection forest (17% of the

[24] Source: MoF, 1998a.
[25] Source: MoF, 1998a.

land area), park and reservation forest (9%), limited production forest (23%), non-convertible production forest (26%) and conversion forest for which data were unavailable. Data for 1992 indicate the annual allowable cut in the province of East Kalimantan to be 18% of the national total. It was the second largest after Central Kalimantan, at 20% of the total. Together, the four provinces of Kalimantan accounted for 50% of the national annual allowable cut in 1992.

The Indonesian Selective Cutting System (TPI) involves a 35-year cutting cycle. Concessionaires are expected to make 20-year, 5-year and annual logging plans, dividing the license into blocks to harvested systematically. Trees of diameter-at-breast-height (dbh) greater than 50 cm may be logged, with a requirement that sufficient stems of medium size be left to secure the next cut in 35 year's time.[26] Concern has been raised that the number of, and damage to, residual stems will compromise the viability of a second cut in the future.

Land use zoning has defined the areas of protection forests, limited and regular production forests, parks and reserves, and conversion forests. Clear-cut logging is permitted where a concession boundary falls within a zone of conversion forest. Most of the recent clearing for large-scale agricultural settlements has taken place on logged-over concession land within conversion forests.[27]

4.4.2 Forest fires of 1997-98 and their impacts

Considerable work has been done by the Ministry of Forests to document the number of fires, and their location, total area, land use category and causal factors in the 1997-98 season.[28] Although concern has been raised that the total burn area may be significantly underestimated by the current assessment techniques of the Ministry, use of remote sensing data is soon expected to give a reliable measure. Consensus does exist on the causal factors, which include but are not limited to:

- land clearing by concessionaires;
- the development of logged over areas by legal transmigrants;
- Illegal occupation of land by farmers;
- revenge against concessionaires by evicted local people;
- deliberate actions by log thieves to divert the attention of forest rangers; and,
- human ignorance.

Ministry of Forests data suggests 505,732 ha. have been burned in East Kalimantan in the five-month period to May 1998. However, preliminary estimates from remote sensing

[26] Source: Sumantri et al., 1981.
[27] Source: Potter, 1996.
[28] Source: MoF, 1998b.

suggest the aerial extent may be much greater and perhaps has large as 3 million ha. The greatest damage has occurred on production forests, rather than plantation forests. Additional damage has been sustained in Kutai National Park, estimated at 30% of the park area.[29] In this regard the impact of the 1998 fires are comparable to the 1982/83 fires, which destroyed 3.2 million ha, of which 2.7 million ha. were tropical rainforests. The ecological and economic damage of those fires was enormous: ecosystems were destroyed, species diversity lost, forest structures changed and long-lasting impacts sustained by the soil, hydrology and wildlife.[30] The greatest damage occurred in logged-over forests with an accumulation of highly combustible logging waste.

Following the 1982/83 fires a natural succession has established secondary forests of different types, ranging from comparatively well-structured forests of wide species diversity to almost one-storey stands of pioneer species. In the latter case, for severely burned areas, the dense lower storey of pioneer species makes it very difficult for hardwoods to grow up naturally. These stands are also much more sensitive to drought than the primary forests. Experience suggests that burned land which classified as conversion forest, and which is easily accessible, will soon be turned over to other land uses. In 1982, 85% of East Kalimantan had some kind of forest cover. By 1990, it had diminished to 69%.[31]

4.4.3 Forest Regeneration and Rehabilitation

Forests are a renewable resource. Maintaining a sustainable yield requires attention to silivicultural practices involving regeneration and replanting. This is especially difficult in the case of hardwood species given the nature of the seeding pattern. While techniques have been established in research programs, implementing them in a commercial setting has yet to be done in a viable way.

Concessionaires have been required, since 1989/90, to replant cutblocks within five years of logging. Completion allows the reclaiming of a “replanting deposit”. However the value of this deposit is generally considered too low to finance replanting, and little has been done outside demonstration plots. Although replanting efforts should be targeted at the hardwood species, the substitution of faster-growing exotics is often made by those concessionaires who have committed in principal to silvicultural treatment of logged forests. From the Ministry of Forests’ perspective, degraded scrub-land is a priority location for reforestation in East Kalimantan, with 35-year leases offered as an incentive to trigger investment.

[29] Source: Ishak, 1998.
[30] Source: Schindele et al., 1989.
[31] Source: Potter, 1996.

4.4.4 Implications for related environmental degradation

Since concepts of weathering and landform development were formed, mainly, in the semi-humid tropics, relatively little is known about the geomorphology of the permanently humid tropics characteristic of East Kalimantan. To address this uncertainty Besler (1987) undertook a study at the margin of the Central Kalimantan Mountains, to address the risk of soil erosion. The landform of the area is relatively young and was covered by undisturbed primary rainforest receiving an annual total precipitation of approximately 4100 mm. The vegetation consisted of trees and saplings with a dense root mat. The forest floor litter cover was found to be very thin, but consistent with similar hardwood forests of the region.

The processes of weathering and erosion were found to be in dynamic equilibrium in the predominantly sandy soils, leading to a parallel slope retreat. Shallow depths of soil weathering suggest an active regime of soil erosion. Processes appear dependent on hillslope aspect. A southwestern profile yielded changes below the accuracy of measurement during a two-week period in which it rained. In contrast a northwestern profile experienced a lowering of the ground surface by 10 to 22 mm: all changes occurred only on bare and exposed ground whereas the natural litter-covered surface showed no signs of disturbance.[32]

A tendency toward localized overland flow in times of intense rainfall was postulated, given the bedrock and surficial soils, and observations of a rapid rise and fall in river levels (small flood events) during rainstorms. Although the data are very limited, tentative calculations of annual soil loss suggest the lowest rate is for secondary forests, a response that is attributed to the denser ground-level vegetation and therefore reduced sediment-transport capacity of overland flow. Primary forest and shifting cultivation were believed similar in impact. A soil loss 10,000 times greater on bare ground was attributed primarily to the action of splash detachment, which in turn is related to rainfall intensity.

Stadtmueller (1990) further confirms the hilly topography of East Kalimantan, with relatively steep slopes even in the lowlands, favors soil erosion as soon as the vegetation cover is removed. Fire acts as a multiplier, altering the hydrologic properties of the soils by burning litter, organic matter and vegetation. Erosion increases because soils are more exposed to the direct impact of raindrops and the infiltration capacity of the soil itself may be greatly reduced. A study in Kutai National Park yielded significantly higher erosion rates in burned areas, by a factor of more than 10 after the 1982/83 fires. Although vigorous regrowth was observed 18 months after the fire using techniques of remote sensing,[33] it is postulated the shallow root systems of the pioneer species are not particularly good at mitigating soil erosion.[34]

[32] Source: Besler, 1987.
[33] Source: Malingreau et al., 1985.
[34] Source: Leighton and Wirawan, 1986.

4.4.5 Implications of Increased Precipitation in 1997-98

A forecasted increase in precipitation will likely manifest itself both as longer periods of rain and greater intensities of rainfall. At the watershed scale, rainfall intensity is believed to govern the rate of surface erosion, while the duration of a rainstorm is more closely related to landslide activity. Therefore increased precipitation will place a greater demand on the capacity of the soil to absorb water and accommodate overland flow when the infiltration capacity of the soil is exceeded. Each of these actions is compromised in a fire-degraded landscape. Previous experience in East Kalimantan following the 1982/83 fires reveals steep slopes and formerly stable stream channels showed continued slippage even with complete vegetation coverage.

The environmental consequences relate to problems of increased soil erosion, landslides on steeper slopes, river siltation, siltation of reservoirs, degraded aquatic habitat and water quality. Additionally, any mismanagement of the forests that leads to more overland flow and soil erosion at the expense of groundwater infiltration, may result in reduced stream-flow during periods of dry weather.

4.5 SUMMARY REMARKS

- Conservation strategies if they are to be implemented and financed, should be developed in collaboration with the centralized directorates of the Ministry of Forests. However the prioritization and selection of specific actions must be done in partnership with the provincial and district offices to best respond to local needs.

- A soil conservation strategy must serve a clear and well-defined objective, with tangible cost-benefits. For example, it could provide a rationale for where, when and why the limited resources dedicated to reforestation are spent, to ensure an optimum return on the investment.

- A soil conservation strategy should be developed that is flexible and responsive. It should comprise a series of “basic components”, from which appropriate actions can be developed on a location-specific basis.

- A long-term view should be adopted in any soil conservation strategy, predicated on the principals of integrated resources management. This will ensure that reforestation and soil conservation are linked to associated non-timber values of the forest, for example water quality, wildlife and biodiveristy. These emerging issues were specifically raised at the meeting with Satkorlak PB and Vice Governor of East Kalimantan.[35]

[35] SOURCE: Nursahramdani, 1998.

- Significant capacity exists to identify problem areas using techniques of remote sensing. Further, staff at the Directorate of Environmental Geology are engaged in mapping potentially unstable terrain on Jawa and some selected areas of the outer islands (excluding Kalimantan). Inter-agency collaboration should be fostered with the Ministry of Forests to identify and map susceptible areas of the fire-degraded landscape.

- Community and concessionaire participation is vital to the success of any reforestation and soil conservation strategy. Their involvement must be driven by tangible cost-benefits, stewardship of the forest resources and alleviation of poverty.

- In addressing the situation in Kalimantan, there should be some direct transfer of knowledge to forest sector stakeholders from Irian Jaya to mitigate the repetition of similar problems.

Chapter 5

THE EMERGING ROLE OF CLIMATE SCIENCE COMMUNITY

5.1 THE CURRENT SITUATION

5.1.1 The Role of BMG

Prior to 1997 the BMG generally used to issue weather forecasts keeping in view meteorological parameters. From 1997 onwards, the BMG has taken the initiative to establish a broad based National Seasonal Forecasting Working Group drawing upon expertise from various sectors. The National Seasonal Forecasting Working Group has drawn upon La Niña Forecast information from IRI as well as obtained inputs from ASEAN Specialized Meteorological Center, BOM Australia and UK Metro Office to prepare the following seasonal forecast guidance produced and issued on 4 September 1998 for the wet season 1998-99:

- Seasonal Monsoon onset forecast - indicating the dates of onset of monsoon with ten days intervals for 102 meteorological regions across the entire country.

- Monthly forecast of rain fall for 102 meteorological regions for the country.

- Seasonal cumulative rainfall status for the entire season for 102 meteorological regions.

The following paragraphs describe the applications of these forecast products:

Seasonal Monsoon Onset Forecast

Indicates probable dates of onset of rains with respect to country's 102 meteorological zones. This information is very crucial for planning an appropriate crop schedule. For instance in the current year the information can enable agricultural planners to advise farmers to advance planting of paddy by up to 45 days. In such a case, in many areas this information can help increase the number of crops harvested in the wet season.

Monthly Forecast

The monthly forecast provides information on spatial and temporal distribution of rains in different parts of the country. This information forms a useful basis for evolving agricultural practices that enable farmers to choose and adopt appropriate crop planning schedules. For example, this information may be used in the following manner:

Table 5.1: Monthly rainfall forecasts and appropriate agricultural practices

Monthly Forecast	Appropriate Agricultural Practice
Areas receiving less than 50 mm rainfall	Wait for Paddy Planting till next month or take up secondary crop cultivation.
Areas receiving rainfall between 51 and 100 mm	Adopt dry seeded paddy planting method
Areas receiving rainfall 101-200 mm and 201-300 mm	Prepare paddy nursery & adopt transplanting of Paddy method.
Areas with more than 301 mm	Upland farmers to undertake paddy cultivation. Low land farmers to prepare nursery and plant when intensity of rains ceases.

Cumulative Seasonal Forecast:

The overall seasonal forecast about the behavior of the monsoon provides confidence for undertaking crop schedule and water management decisions. Hence, weather guidance approach adopted by BMG by using La Niña forecasting information is a significant improvement over its previous weather forecast products in terms of its utility for the decision makers.

Improvements in forecast products over previous years

The BMG has evolved these weather guidance products through a consultation process involving agroclimatology and water resource management experts. Such weather guidance with enough lead time can enable user departments to initiate appropriate resource management planning at an early stage. This year's weather guidance product is an improved more user-friendly information product than the previous year' weather forecast products which used to indicate weather behavior in terms of above normal, normal and below normal rainfall characteristics which were too general to use them for decision making.

Based on overall weather guidance information provided by BMG the provincial meteorological offices have issued rainfall probabilities for months up to January 1999.[36] These rainfall probabilities are based on historical data by adopting an empirical analytical approach. For instance, the forecast issued by the provincial meteorological office of Central Jawa on 12th August provides an indication of rainfall in December 1998 and January 1999:

[36] Based on the mission's field Trip to Central Java province.

Table 5.1: Probable Rainfall in Various Parts of Central Java Province

Station	December 1998	January1999
	Rain in mm	
Semarang	328	429
Demark	343	506
Jepara	406	687
Pati	307	581
Kudud	478	615
Rembang	224	275
Blora	282	294

Source: Provincial BMG, Semarang, 12th August.

Such detailed information is very useful for various user departments such as Agriculture, Water Resource Management, Power Management etc. to evolve an integrated resource management plan for maximizing the benefits and minimizing the negative impacts in different areas.

5.1.2 The Interface with Media

On 4 September 1998 the Director General of BMG held a press conference where a forecast for the forthcoming Wet Season was presented. The mission attended this press conference. The conference was attended by nearly 46 media persons from all over Indonesia. The BMG Director General released two documents pertaining to the forecast. One of the purposes of the conference was to dispel the fear of flooding among general masses and at the same time advocate adequate preparedness measures. The day after the press conference most newspapers focussed mainly on the flooding aspect of La Niña. The Jakarta Post of 5 September 1998 carried a news item:

> Agency forecasts heavy rains, warns of floods.
>
> Heavy rains are expected to fall on the country from this month until early next year, the Meteorology and Geophysics Agency (BMG) said here on Friday. He was referring to the weather phenomenon which experts say is the reverse of El Niño, the weather phenomenon that brought widespread drought to the country last year. Pak Sri Diharto said he hoped the relevant government agencies would begin to draft contingency plans for severe weather immediately. He said that public works offices should identify areas prone to flooding and help residents to prepare themselves and protect their crops and homes. He also said that agricultural offices should disseminate recommendations on crop planting patterns.

The message was perceived that La Niña is a flood-inducing agent and prompted the public departments to take action for undertaking preparatory activities to mitigate the impact of flood. The Jakarta Post of 10 September 1998 carried the following news item:

> Minister warns of La Niña -induced flood
>
> The government has warned that La Niña -induced floods will threaten many Indonesian provinces, even as it admitted that the country has poor flood control contingency plans. Minister of Public Works Rachmadi Bambang Sumadhijo said after a lecture in Semarang on Wednesday that established flood control projects covered less than 10 percent of the areas vulnerable to flooding. But we will keep on working to cope with the threat with whatever resources are available; Antara quoted him as say.
>
> In Yogyakarta on Tuesday, the Director General of water resources development in the Ministry of Public Works, Budiman Arief, told the 11th Congress of the Asia-Pacific Division of the International Association for Hydraulic Research that 13 of Indonesia's 27 provinces are particularly vulnerable to La Niña -induced flooding.
>
> La Niña may bring floods to 13 provinces. The probability of that happening is over 60 percent. We are beginning to see the symptoms. There are already significant flow increases in rivers in those provinces, he said.

Once again, it may be seen that the La Niña is being perceived mainly as a flood-inducing agent and the positive dimensions of the phenomenon do not get attention.

5.1.3 Response to climate forecasts at the local level

The awareness generated by La Niña information at the local level has prompted the authorities to undertake flood preparedness activities. However, no action/ program is discernible to take the advantage of the early onset of rains for managing water resources and re-orienting agricultural practices to increase production of crops.

5.2 THE CLIMATE INFORMATION NEEDS OF SOCIETY

While the current climate forecast information in respect of La Niña has created awareness, there is a need to channelize this awareness to promote specific actions to harness potential benefits of this climate phenomenon and at the same time minimize its negative impacts. The forecast information is currently being perceived mainly as indicative of impending floods and a distinct one-time event likely to take place in the near future. Hence the general reaction to the forecast is to wait (and prepare) for this distinct one-time event and respond to it after it occurs.

There is a growing need to communicate these forecasts in a language easily understandable by the policy makers and implementers. Such communication should also include examples of past La Niña occurrence and their impacts on agriculture, economy etc. Such comprehensive communication message will help policy makers at the national and provincial levels to appreciate better both potential benefits and negative impacts of La Niña, and incorporate this understanding in decision making at policy, program design and implementation levels.

5.2.1 Agriculture and Food Security Sector

Although the forecasts produced by BMG and its provincial counterparts have been disseminated widely, this information is not being adequately translated or interpreted to a usable format for end users such as water resource management and crop management authorities. There is an urgent need to evolve a system to translate the BMG forecasts into a usable communication package. This will involve a comprehensive cross-sectoral approach of converting weather forecast information into probable rainfall run off, water accumulation in reservoirs and various agroclimatic variables in specific location at the sub-district and district levels.

5.2.2 Natural resources and the Environment Sector

Within the sector of natural resources and the environment, forecasts of weather conditions are very important to a responsive management of forest resources and logging operations. Specifically, the need of the Ministry of Forests is for good data on both temperature and precipitation. The data should be provided such that they address both spatial and temporal variations across the forested land base of the country (for which the key areas are Kalimantan, Irian Jaya, Sumatra and Sulawesi).

Further, the context within which the data are provided should be such that they can be used for decision support in land use planning. For example, particular emphasis should be placed on the identification of climate behavior that does not fit the usual or common pattern. The value of forecasting such climate anomalies is that many land use practices are carried out in anticipation of a normal weather cycle. Changes to that cycle, or anomalies, can have adverse consequences. Anticipation of the consequences can serve to provide an “advance lead time” to those responsible for, and dependent on, the forest resources. As an illustration, remote sensing through the offices of the IFFM provided an early warning of the drought conditions and resulting fire risk in East Kalimantan. Action by the local government in early August 1997, including the revoking of all timber use licenses. is credited with a low to moderate fire activity in 1997 compared with other provinces in Kalimantan and Sumatra.[37] In summary, climate forecasts for the forest sector can be used in early warning systems for fire and the management of land use activities by forest concessionaires.

[37] Source: Schindler, 1998.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

6.1.1 Agriculture and Food Security Sector

- The La Niña forecast information has created widespread awareness across the spectrum of policy makers and implementation authorities about the possibility of floods in various parts of the country. Actions are underway to mitigate the impact of floods.

- The potential benefits of La Niña for increasing crop production and the opportunity to ease the current food insecurity situation in Indonesia that has not been incorporated into policy planning and implementation process in the country.

- There is a possibility of flood damages to around 40,000 hectares leading to a loss of 160,000 tons of paddy in the worst case scenario. If the rainfall distribution is uniform and prolonged, there is possibility of flood damage to around 15,000 to 20,000 hectares and production loss is likely from 60,000 tons to 80,000 tons of paddy. The loss to secondary crop is insignificant.

- Paddy production could be increased by 5 to 6 million tons provided that a comprehensive program is introduced capitalizing on the La Niña factor. The comprehensive program may have the following components:

    - enhancing paddy yield from 43.3 quintal per hectare to 45.0 quintal per hectare;

    - restructuring of cropping pattern taking advantage of early onset of Monsoon;

    - bringing idle cultivable lands under paddy production. *Refer section 3.4.1 for details.*

- The BULOG has plans to import 3.42 million tons of rice in the next fiscal year starting from April 1999. It appears that this plan assumes that there will be no possibility of additional production of around 5.0 million tons of paddy taking advantage of La Niña climatic factor. There is a need to incorporate La Niña factor into policy planning of BULOG in coordination with the Agriculture Ministry. If additional production of paddy is achieved, there is a possibility of considerably reducing import requirements.

6.1.2 Natural Resources and the Environment Sector

In the context of the natural resources and environment sector, an assessment of the state of the forest reveals a serious degradation of the land base. It is in a fragile state, and vulnerable to excessive soil erosion and landslide activity that will likely impact water resources and detract further from the depleted condition of the forest health and future value of what should be a renewable resource. To compound this state of the forest resource, the economic crisis has left the country of Indonesia with very limited financial resources to address the situation. These conclusions can be summarized as follows:

- In the context of forest resources management in Indonesia, erosion and sedimentation are serious issues affecting the fire-degraded landscape.

- The region is characterized by high rainfall intensities that will only be worsened by a La Niña event, leaving unprotected, sloping forest soils subject to extreme rates of accelerated erosion.

- The nature of extreme rainfall events, and limited data from field research, implies that predicting large-scale processes at the watershed scale would be inappropriate at this time.

- Any programs of conservation must be developed to be compatible with the prevailing conditions at the watershed scale and related problems at the subdrainage scale. The effect of logging practices, current land use and extent of fire damage all control rates of erosion and sedimentation on the landscape: their cumulative effects are not entirely clear. Additionally, individual watersheds respond in a unique manner according to their geology, surficial geomorphology, soils and vegetation cover.

6.2 RECOMMENDATIONS

6.2.1 Immediate

Agriculture and Food Security

Recommendation I: La Niña forecast information should be incorporated into the food crop production program for the wet season 1998-99. The Food Crop Production Directorate of the Ministry of Agriculture, Indonesia would be an appropriate choice to take the lead in this direction. This will translate into a special La Niña year paddy production program with following specific components:

· A comprehensive communication strategy to inform the policy makers and program implementers at different levels in the Department of Agriculture and convince them of the potential benefits of using La Niña forecasting information to maximize crop production and minimize flood related losses. This strategy will promote a balanced understanding of this climatic phenomenon and dispel the current public perception of La Niña as only a flood-inducing agent.

· A communication brochure in local dialects for extensive dissemination among the agrarian communities indicating the methods of La Niña season crop management. Similar information should be disseminated through media such as television and radio.

· Short, focused training to agriculture extension personnel to disseminate information on methods of La Niña season crop management such as advance planting of paddy crops by adopting dry seed method.

· Incentive packages to encourage and support the farmers to obtain and appropriately use agricultural inputs.

· Effective coordination mechanism with irrigation water reservoir management authorities to provide water to the farmers at the appropriate time to advance planting of first paddy crop. This approach will ensure enough space in the reservoir to hold additional water, which is expected due to heavy precipitation in November, December and January months. This will also enhance the efficiency of flood management.

· Advance warning to farmers engaged in paddy cultivation in flood-prone zones (such as around River Penny lake in Central Jawa province). For (marginal) farmers holding lands only in extremely flood-prone areas this warning should be coupled with support through food-for-work programs. These food-for-work programs can undertake drainage clearance works, repair of flood protection structures etc. This will ensure income to such marginal farmers as well as minimize the impact of possible flooding.

Recommendation II:Strengthening the dialogue mechanism between the Food Crop Production Directorate and the BULOG and other relevant departments and ministries would be beneficial. In view of the potential increase in rice production, it is necessary that the Food Crop Production Directorate and the BULOG communicate more effectively and regularly. Such a dialogue on continuing basis will make it possible to undertake following actions in a concerted manner:

- Formulation of a rice procurement policy by enhancing floor price suitably to procure at least 3 million tons of rice during the forthcoming Wet Season; and

- Assessment, validation and if necessary modification of Rice Import Plan for fiscal year 1999-2000. Currently, the BULOG plans to import 3.2 million tons rice for the fiscal year 1999-2000 (Apr. 99 to Mar. 2000).

Natural Resources and the Environment

Recommendation III: A validation of the spatial extent of the fires using remote sensing techniques is recommended, to include assessments of the percentage of land use type that has been burned (production forest, protection forest, non-convertible forest etc.).

Some uncertainty exists as to the spatial extent of the fires. Remote sensing techniques offer a reliable approach to measure the size of the burn areas, and could be used to assess the land use category of those areas (production forest, protection forest, non-convertible forest, etc.). Confirmation of the nature and size of the fire-degraded landscape will allow for the development of suitable rehabilitation plans. The Ministry of Forests is well-suited to take the lead on this task. The objective should be the development of a new land use inventory map for decision support in preparation of targeted rehabilitation plans.

Recommendation IV: Facilitated workshops should be considered for integrated resources management at the provincial level in those provinces where the natural environment has been severely degraded by last year's forest fires. A facilitated workshop on integrated resources management should be considered. Issues of timber and non-timber values, together with those of biodiversity, could then be explored with the forest sector stakeholders. A strategic vision is required, but one that is developed at the national level and implemented at the provincial and district level with recognition of the problems at the watershed scale (see 4.5 Natural Resources and the Environment: Summary Remarks). In the absence of a such strategic vision, and without any implementation of best practices in the management of the forest resource, Indonesia risks losing international markets for its wood products given current initiatives in the ecolabelling of goods.

Recommendation V: There may be benefits to be gained from development of a strategic plan for salvage logging of some burned areas. Recognizing that merchantable timber may be lost if burned areas that are suitable for salvage logging are left unmanaged, there are likely benefits to be gained from developing a strategic plan. This would then provide a framework for decisions regarding the extent, timing and environmental impact of any salvage logging that might be approved. The Ministry of Forests could take the lead in this task, perhaps working in partnership with the Directorate of Environmental Geology. The work could also involve a review of the role of conversion forests.

6.2.2 Medium term

Agriculture and Food Security

Recommendation VI: Developing institutional mechanisms to promote restructured cropping pattern during extreme climate events. The Crop Production Directorate of the Ministry of Agriculture, BMG and Central Agricultural Research Institute based in Bogor should initiate concerted action to develop mechanisms to promote restructured cropping pattern during extreme climate events. One specific action can be:

- Preparation of contingency crop planning manuals incorporating different agro-climatic variations at sub-district level along with code of practices for agricultural extension workers and farmers.

This strategy will help in restructuring the cropping pattern in each Sub-District of the country during the extreme climate events to maximize potential benefits of La Niña and El Niño events and minimize the adverse impacts. This will eliminate violent fluctuation in food crop production and preserve food security in all part of the country.

Natural Resources and the Environment

Recommendation VII: Prioritization of forest rehabilitation and regeneration plans to protect most vulnerable watersheds. The outcome of the facilitated workshop should be a targeted program of action to identify, in the medium term, the most vulnerable watersheds. This will provide a tool for decision support in reforestation plans. The tool will enable finite resources to be directed at the most critical sites, thereby optimizing the investment in rehabilitation of the degraded environment and mitigation of rainfall-induced erosion, landslides, sedimentation and floods.

Delayed reforestation will lead to wholesale degradation of some particularly vulnerable and important watersheds. Furthermore, a program of action should ensure that efforts placed in reforestation are not lost to future fires.

Recommendation VIII: A forest practices guidebook should be written for mapping and assessing environmentally sensitive terrain. Regionally based training should be included to disseminate the findings. The objective is to identify areas of the land base that should never be logged, and if burned should always be rehabilitated immediately. These environmentally sensitive sites may, for example, be susceptible to erosion and landslides, may be the natural buffer in community watershed, or may provide valuable habitats. This recommendation follows sequentially from the workshop proposed in the immediate recommendations, and is related to development of a strategy for salvage logging in burned areas. A working partnership between the Ministry of Forests, the Ministry of Environment and the Directorate of Environmental Geology can play an effective leadership role in this direction.

6.2.3 Long term

Agriculture and Food Security

Recommendation IX: Incorporation of extreme climate event into long term Agriculture Development Planning. In the long term, the Crop Production Directorate and the National Development Planning Agency should work together and factor extreme climate events into their long-term planning based on their experiences of contingency crop planning as mentioned in the previous recommendation.

Currently, Jawa region contributes 60% of country's food production from 7% of land resource. As such the natural resources of the Jawa region are over strained. The periodic extreme climate events put additional burden on this region to produce additional food grain to preserve food security of the country. Immense potential exists in other regions to produce required food crops provided the cropping pattern is restructured incorporating the extreme climate events into the farming system in order to make them sustainable.

Recommendation X: Development and integration of in-country resources. Efforts must be invested in developing and integrating more effectively the use of in-country resources. The facilitated workshop recommended for integrated watershed management would assist these efforts. . For example, the staff of the Directorate of Environmental Geology could work to great effect in an interdisciplinary setting with the Ministry of Forests, Directorate General for Reforestation and Rehabilitation, and with the Ministry of Public Works at the provincial level, to identify vulnerable watersheds.

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APPENDIX I: IRI Climate Forecast Guidance for Indonesia for Sep. 1998 - Jan. 1999

prepared by International Research Institute for climate prediction
Experimental Climate Forecast Division

Given the recent development of La Niña conditions in the central tropical Pacific Ocean, there is some concern regarding the upcoming rainy season(s) in the Indonesian region.

Below we summarize the seasonal characteristics of the regional rainfall. We describe the previously observed climate impacts for this region that are associated with La Niña. We then discuss the observed and forecast evolution of the current La Niña event. Finally, we present the projected climate outlook suggested for this La Niña.

Annual Cycle:

Nearly the entire geographic region containing Indonesia (approx. 10S-20N; 90E 140E) experiences an increase in precipitation from August through December. The months during which the seasonal rainfall peaks varies through the region. The peak rainfall season over southern Vietnam and Thailand generally occurs during the boreal summer (northern hemisphere summer), extending into fall. The peak rainfall over northern Sumatra occurs slightly later, typically from October December, and that over southern Sumatra even later, beginning in November and extending through April. Similarly, Java extending eastward to Timor, experiences peak rainfall near the end of the year, beginning to increase during November with high values in January and February and in many places continuing through March or April. To the north, over Kalimantan the rainfall also peaks in the December February season, although there are very few meteorological stations there. East of Kalimantan, near the equator, the islands distributed in this region typically see peak rainfall in the boreal summer and little rainfall during boreal winter. Immediately to the east, western New Guinea has a moderate peak in rainfall during boreal winter, although this region does not have a well-defined seasonal cycle for rainfall.

Typical La Niña Impacts:

Based on observations of the climate over the Indonesian region during previous La Niña events (defined by season), we describe typical seasonal climate impacts during a La Niña event.

Temperature: The variance in seasonal temperature is very weak over this tropical region, but there does seem to be a noticeable response to La Niña, though. During the boreal fall (September-October-November) temperatures tend to be below normal west of 120E (5-8 out of 10 La Niñas) and tend to be warmer than normal east of 120E (5-6 out of 10 La Niñas). In the following months (December March), the entire area usually experiences below normal seasonal temperatures during a La Niña.

Precipitation: The variance in seasonal rainfall depends on location and season. In general though, seasonal rainfall amounts that exceed 110% to 120% of the seasonal average constitute "above-normal" rainfall (wettest one-third of years). Over nearly the entire region during the boreal fall (September-October-November) the past observations show increased likelihood for near-normal to above-normal rainfall, and a much reduced likelihood for below-normal rainfall (an exception is north west Sumatra). This remains true for the Indonesian region through October November-December and November-December-January. During December

January-February and January-February-March, northern Sumatra and western Kalimantan do not show any repeatable precipitation signal, and below-normal rainfall is just as likely as the other categories. The repeatability of the La Niña signal over other parts of Indonesia is also reduced during December-January-February and in January-February-March, much of Java and Kalimantan favor near-normal to below-normal rainfall during La Niña years.

1998-1999 La Niña Evolution:

The anomalies of sea surface temperature (SST) in the eastern Pacific have decreased dramatically since the first of the year and in May averaged SST anomalies along the West Coast of South American fell below levels generally associated with convective activity. Despite these relatively rapid decreases, SST anomalies remained near 2° C by the end of July. However, SSTs in this area have been following an accelerated rate of decrease and have, thus far, out paced the normal annual tendency towards a minimum in September.

The relatively coldest waters in this evolving La Niña remain centered on the equator near 140W. SST anomalies in this area have been fairly constant during July with magnitudes of up to - 3° C. La Niña 's continuing evolution is seen in the appearance of negative SST anomalies in the Niño 4 region (150W to 165E) for the first time since the 1996 La Niña. Also, easterly wind stress anomalies (increased SE trade winds) have appeared in the central Pacific in response to the cold SST anomalies.

The slower rate of temperature decrease in the central ocean is more in agreement with earlier coupled-model and statistical forecasts. If current trends continue moderate La Niña conditions can be expected by late Northern Hemisphere summer to early fall. Conditions will likely persist through the early months of 1999.

1998-1999 Climate Outlook:

Dynamical model predictions for Indonesia have been produced using the ECHAM, NCEP and CCM3 atmosphere models forced with forecast sea-surface temperature anomalies. All the models suggest enhanced probabilities of wetter than normal conditions over most of Indonesia south of the equator, except over New Guinea, for the next three months (September-October-November). Over northern Sumatra, northern Kalimantan, and New Guinea the model forecasts are in less agreement. Beyond November there are only weak indications from the models of enhanced probabilities of above-normal rainfall.

Rainfall probabilities for the season September-October-November 1998 for areas west of about 125E and south of the equator are 55% above-normal, 30% near normal, and 15% below-normal. Over New Guinea and in areas north of the equator the probabilities are 40% above-normal, 40% near-normal, and 20% below normal. For the period December-February there is much less confidence in the forecast because of the greater uncertainty in the evolution of sea-surface temperatures at the longer lead-time. For December-January-February, rainfall probabilities over the whole of Indonesia are 40% above-normal, 35% near-normal, and 25% below-normal.

APPENDIX II: General Forecast by BMG of 1998-99 Wet Season in Indonesia

Jakarta, September 1998

The following is the English Translation of the text of General Forecast Guidance issued by Bureau of Meteorology and Geophysics of Indonesia for Wet Season 1998-99 on 4 September 1998. The Forecast was also accompanied by a number of maps. The English translation is only indicative of the structure and content of the document. Readers are also advised not to use this translation for any other purpose and kindly allow for inaccuracies in translation. This document was accompanied by another document, which presented a more detailed forecast. Both the documents can be requested from: Department Perhubungan Badan Meteorology Dan Geofisika, Jl. Angkasa I No. 2 Kemayorn P.O. Box 540, Jakarta, Indonesia.

I. General

In general, there are two seasons in Indonesia, i.e. rainy season with the activation of monsoon from Asia and dry season with monsoon from Australia. However, the beginning and duration of the season in each region is different. Apart from the onset of monsoon, season in Indonesia is also influenced by global phenomena such as El Niño and La Niña. According to the past observations El Niño causes its impact in terms of low rainfall while La Niña causes high rainfall to most areas in Indonesia.

II. Understanding of La Niña

La Niña, a Spanish word, means a little girl. In terms of meteorology and oceanography, La Niña is the name given to the cooling of surface water temperature in the central and eastern equatorial Pacific Ocean. The reverse condition is El Niño phenomenon, which is the warming of surface water temperature.

This phenomenon usually causes disruption in pressure difference between Tahiti and Darwin, which is known as South Oscillation Index (SOI). The value of SOI and water surface temperature anomaly in western Pacific is used as an indicator to recognize the activation of El Niño and La Niña. SOI, which its index is taken from normalization of air pressure difference between Tahiti and Darwin, with high positive value indicates the strengthening of pasat wind. This condition usually coincides with the active La Niña period. On the contrary, if SOI is low (negative), it indicates the weakening of pasat wind and this condition usually coincides with the activation of El Niño (ENSO / El Niño Southern Oscillation).

La Niña phenomenon can be recognized by the high rainfall. Basically, during a La Niña year the rainy season is characterized by normal to above normal.

III. Expansion of La Niña 1998/1999

Since 1970, La Niña phenomena have happened 6 times: in years 1970, 1971, 1973, 1975,1988 and 1995. During this period there were two El Niño events which were directly followed by La Niña phenomena: 1971 / 1972 and 1994 / 1995 respectively.

In general, natural phenomenon El Niño in 1997 / 1998 has disintegrated in May 1998 with SOI reaching 10. And the last analysis result in July 1998 shows that SOI has reached 15 while sea surface temperature in central equatorial Pacific Ocean deviated -2 degree C to -3 degree C, which is lower than average, and the waters in Indonesia seemed to have deviated 0-3 C, which is hotter than average.

Based on those conditions, it shows that La Niña is still on its preliminary expansion. However, with the increasing of hot water area in Indonesia it will cause much steam to the air which will subsequently increase raining opportunity on transition period from dry to rainy season.

IV. **Forecasting of 1998/1999 Rainy Season**

A. ***Predictions of International Meteorology Institutions***

For developing 1998 / 1999 rainy season forecast in Indonesia, the Working Team has given attention to the global forecast, which is produced by several meteorology institutions such as:

ASMC (Asean Specialised Meteorological Centre)

ASMC produced two following scenarios :

a) Scenario I : Neutral condition, with 35% probability. The conditions of 1998 / 1999 rainy season in Indonesia are generally above normal, except in Maluku, Nusatenggara, East Kalimantan, Central and Southest Sulawesi.

b) Scenario II : La Niña condition, with 65% probability. The condition of 1998 / 1999 rainy season in this scenario is above normal.

NOAA/IRI

Based on the increase of sea surface temperature in equatorial Pacific Ocean and India Ocean until July 1998 it shows that La Niña condition will continuously strengthen until end of the year. IRI has predicted that during the period of September to December 1998 there will be 60% above normal precipitation probability in all Indonesian regions, except North and Central Sumatra, 25% normal and 15% below normal respectively.

BOM Australia

Based on BOM analysis it shows that anomaly of sea surface temperature in July 1998 is around -2C around equatorial Pacific Ocean. This means those areas are frozen.

South Oscillation Index Value for July 1998 has reached 15. This shows the sharp increase during last three months. BOM analysis result shows that this actively indicates the preliminary condition of La Niña.

UK METEO OFFICE

Based on model result from UK it shows that the rainfall in Indonesia inclines to be above normal except North Sumatra.

B. ***Prediction of National Working Team***

With the above considerations, National Season Forecast Working Team, comprising BMG, BBPT, BIOTROP, BAKOSURTANAL, DISHIDROS, IPB, ITB, LAPAN, LIPI, PERHIMPI and Center of Soil and Agroclimate Research (PUSLITTANAK), has prepared a forecasting of 1998/1999 rainy season by considering the probability of the occurrence of natural phenomena La Niña.

General Forecast of 1998/1999 rainy season is shown in the attached maps. Based on the maps, it can be stated that in 1998/1999 rainy season in overall Indonesia will experience high rainfall with the percentage of above 115%, except in South East Maluku and South Minahasa which will encounter medium rainfall with percentage between 85%-115%.

Notes of Rainfall Conditions

Low	:	if rainfall is less than 85% than the average
Medium	:	if rainfall is around 85% to 115% than the average.
High	:	if rainfall is more 115% than the average.

APPENDIX III: Availability of Seeds for Increased Paddy Production in Indonesia

The mission held detailed consultations with both the national and provincial level authorities of Ministry of Agriculture about the availability of seeds for enhancing production in Indonesia for the wet season 1998-99. The mission was provided with historical background on seed production system in Indonesia and the current situation with regards to their availability. The mission also interviewed the farmers in Central Jawa province regarding these issues. The following paragraphs summarize these discussions:

Historical Background: In the early 1950s, the Government of Indonesia had established several seed farms throughout the country, which were later expanded with the release of new varieties by Agriculture Research Institute. In 1970s, due to limited number of skilled personnel and budget, and based on other market considerations, the Government launched a new policy in the seed program. The government gradually phased out from the seed production business and encouraged the private sector to assume this role. However, the government continued to directly support research on seed production and assume responsibility for providing technical guidance in seed production, as well as seed certification and quality control.

Based on this policy, the Government of Indonesia developed a modern seed industry primarily by providing incentive to the private sector to cater to the needs of the farmers. The seed market in Indonesia operates in the following three ways:

- farmers reserve their own seeds for crop production
- farmers interchange seeds among themselves
- farmers purchase seeds from private sources

Current Situation: The discussions with the farmers and authorities revealed that enough seeds are available for enhancing paddy production within the country from at least one of the above mentioned three channels. However, the cost of seeds for sowing in one hectare, in the context of economic crisis, has increased from Rp 15,564 (1996 level) to Rp 70,000 (in 1998). The almost five-fold increase in the cost of seed is proving to be one of the major constraints for farmers to obtain high quality seeds from private sources. However, the price of paddy output has also proportionately gone up considerably. Hence, the farmers are willing to invest in seeds. If the Government provides credit support to farmers to purchase seeds, it would be easier for the farmers to purchase seeds from private sources. Hence, this report identifies provision of incentive by the government to farmers to invest in agriculture inputs including seeds as one of the pre-conditions for enhancing the paddy production.

In the absence of any incentive from the government, farmers may tend to use their own seeds or borrow seeds from another farmer who has surplus seeds. Seeds from these informal sources have less yield potential when compared to certified seeds marketed through private trading channels. Hence in the estimation of potential increase in paddy production due to La Niña, we have taken yield per hectare at the level of 2 to 3 ton per hectare against the potential of producing 4 to 5 tons per hectare.

To sum up, while physical availability of seeds is not a constraint, its accessibility to farmers could be the major constraint in enhancing paddy production. Hence this report recommends that the government may evolve appropriate mechanism to ensure easy accessibility of inputs (including seeds) to farmers.

APPENDIX IV: List of Institutions and Individuals Consulted for the Present Study

JAKARTA, BANDUNG AND BOGOR

1. Drs. Soetarso, MSW, National Project Manager, Project INS/94/006, BAKORNAS PB Secretariat, Jl. Medan Merdeka Barat No.3, Jakarta 10110.

An overview was given of BAKORNAS PB operations, current projects, and the relationship between national, provincial and district responsibilities. As coordinator of the ADPC pre-assessment mission, a proposed itinerary was presented by BAKORNAS PB and, following discussion of team interests and expertise, requests for new or unscheduled contacts accommodated.

2. Sri Diharto, Director General, Dept. of Communications, Meteorological and Geophysical Agency (BMG), Jl. Angkasa 1 No.2 Kemayoran, Jakarta Pusat 10720.

Overview of weather forecasting arrangements in Indonesia with particular reference to La Niña and its impacts on the climate of Indonesia wet season 1998-99. A description was provided of the regional use of meteorological data (five regions) to provide weather forecasts for Indonesia. The data are used for research, for publication/forecasting and for commercial purposes: the latter use requires the data be purchased. The data record dates back to 1866, and clearly represents a very valuable, and underused resource.

3. Salim Wantjik, Director General, Social Assistance Development, Department of Social Affairs, Jakarta.

A summary was given of the measures taken for disaster mitigation and service delivery, namely: ensuring the infrastructure is functional; communication of situation reports to other agencies; stockpiling of foodstuffs at the provincial and district levels; food-for-work initiatives; rice subsidies; emphasis on inter-sectoral delivery of services; promoting rural capacity through training programs. Discussion then addressed the value of maps for contingency planning that would identify the likely worst-hit areas during a La Niña event, based on precipitation, landslides, floods, crop damage and population density.

4. Dr. Paulus Agus Winarso, Meteorologist/Environmental Engg./Oceanographysist, Meteorological and Geophysical Agency (Kantor BMG), Jl. Arif Rachman Hakim, No.3 Jakarta Pusat 10340.

Monsoon pattern in Indonesia. Rainfall distribution since 1961 to 1998 in Indonesia in various provinces. History of La Niña and El Niño events in Indonesia.

5. Mr. Mukadi, Head of Agricultural Bureau, BPS Biro Pusat Statistik, Indonesia, Jl. Dr. Sutomo No.8, Jakarta.
and
Mr. C. Maksum, Paddy Stat. Division, Agricultural Bureau, BPS Biro Pusat Statistik, Indonesia, Jl. Dr. Sutomo No.8, Jakarta

Trends of agricultural production in Indonesia. The definitions used for classifying agricultural data, method of collection, processing, maintenance and distribution of crop production data.

6. Mr. Sutarto Alimuso, Direktur Bina Perlindungan Tanaman, Department of Agriculture (Departemen Pertanian), DG Food Production and Horticulture (Direktorat Jenderal Tanaman Tangan Dan Hortikultura), Jl. AUP, Pasar Minggu, Depan Mesjit PALAPA, Jakarta Selatan.
and
Mr. Yusmin MSc, Agrometerologist, Kantor, Directorate of Food Crops Protection, Jl AUP PO Box.36, Pasar Minggu, Jakarta 12520
and
Ir. Jasis, Kepala Subdirektorat Analysis Organism, Pengganggu Tumbuhan, Direktorat Jenderal Tanaman Pangan dan Hortikultura, Direktorat Bina Perlindungan Tanaman, Jl. AUP Pasar Minggu Jakarta Selatan 12072

The cropping pattern in Indonesia. Rice production plan for wet season 1998-99. Agronomic practices and the past history of crop production in various provinces. Impact of weather and non-weather factors on crop production in Indonesia. Impact of past La Niña events and flood events on paddy and secondary crop production.

7. Mr. lr. Slamet Purnomo, Banas ASMEN I, State Ministry of Food Security and Horticulture, (Kantor Menteri Negara Urusan Pangan dan Hortikultura), Jl. Kuningan Timur M.2/5 Jakarta Selatan

Food security situation in Indonesia. Overview of policies on production, procurement and distribution of rice through public distribution network. Details of food aid from abroad.

8. Dr. P. SUKARNO, Managing Director, Bulog, Jakarta

Overview of the role of Bulog in ensuring food security. Current status of Bulog's operation.

9. Dr. Istiqlal Amin Ph.D, Soil Scientist & Knowledge Engineer, Centre For Soil and Agroclimate Research, Jalan Ir. H. Jyanda 98, Bogor 16123 Indonesia

The role of Centre for Soil and Agriculture Research and agriculture relating to the agrimeteorology in Indonesia. The role of the agency in preparing weather guidance in collaboration with BMG.

10. Mr. William Gelman, Director, SE Asia Regional Housing & Urban Development Office, Urban Environmental Management Team Leader, USAID Indonesia, Jl. Medan Merdeka Selatan No.3-5, Jakarta 10110, Indonesia.

De-briefing on La Niña pre-assessment work.

11. UNDP, Indonesia

On 31.8.98 – Ms. Anne-Birgitte Albrectsen, Deputy Resident Representative, UNDP, Jakarta

Three observations were shared on the current state of the country. First, the World Food Program is re-assessing in-country activities. Second, it appears that communities are coping by selling assets, which is leading to a precariously low reserves. Third, there is a need for targeting food assessments and vulnerability mapping. In summary, the depletion of assets, readiness and capacity is rendering the people of Indonesia very vulnerable.

On10.9.98 – Mr. Ravi Rajan, Ms. Anne-Birgitte Albrectsen, members of UN Inter-agency task force

Presentation of preliminary findings of the Mission to UN Inter-agency Meeting.

12. Aca Sugandhy, Assistant Minister for Environment, Division of Policy Formulation for Environmental Management, Ministry of Environment, Jakarta

Concern was raised that the BMG climate predictions are unreliable and not-well suited to the needs of the Ministry of Environment. There is a need for some kind of Early Warning System, likely based on remote sensing and geographical information systems. Such a system was first considered in the early 1980's, and received some World Bank and Australian government funding. The need for a national water resources management system was also identified.

13. K.D. Soedarto, Secretary to the Director General Reforestation and Land Rehabilitation, Ministry of Forests, Jakarta

Information was provided on burned forest lands, by land use category. Discussion then addressed selection logging, and salvage logging burned areas, together with the role of silvicultural treatment after harvesting.

14. H. Asep Effendi, Head, Directorate of Environmental Geology, Engineering Geology Division, Bandung

Landslide susceptibility maps are being developed at a scale of 1:100,000 for most of Java, and for a few other specific locations in Indonesia. Debris slides and flows account for approximately 70% of all landslide activity. The maps are based on landslide activity, geology, land use, slope and rainfall data obtained from various sources. No work is currently being done on Kalimantan.

CENTRAL JAVA

Field Visits in Semarang District. Meetings with Central Java Province authorities in respect of agriculture, public works department. Discussion with farmers and agriculture extension personnel.

15. Col. Sutono, Chief of Civil Defence, Central Java Province, Semarang

A field trip was undertaken with Col. Sutono and members of his staff to inspect flood-prone lowlands and erosion-prone uplands. The erosion-prone uplands were identified on a map of landslide susceptibility for the area as most unstable.

EAST KALIMANTAN

16. H. Chaidir Hafiedz, Vice-Governor, East Kalimantan, Samarinda, together with the SATKORLAK PB Board Members

A report was given on the extent and impact of recent flooding in the city. This was followed by a report by H. Awang Faroek Ishak, Chief of the Agency for Control of Environmental Impact, who described the state of the forests and the susceptibility to fires. He reiterated the need for an early warning system. He also spoke to the need for rehabilitation of industrial forest lands and Kutai National Park. Erik Nursahramdani, Head of Livestock Services, raised the issue of non-timber values such as biodiversity in any rehabilitation plans for degraded forest lands.

17. H.S. Jachrul Sjahibar, Regional Forestry Officer, Governor's Office, East Kalimantan

An overview was given of forest harvesting practices and silvicultural treatments, with emphasis on selection logging (HPH) and clear-cut logging (HTI).

18. Anja A. Hoffmann, Remote Sensing Specialist, Integrated Forest Fire Management (IFFM)

Following a presentation on the forest fires and remote sensing techniques, discussion addressed the extent of the burned area, and validating government data for the actual total hectares of degraded forest land.