PT BIO INTI AGRINDO
Office : Jl. Raya Mandala Gang Soska no. 28 Merauke
Papua Province

MAIN REPORT

ANALYSIS ON THE IMPACT TO LIVING ENVIRONMENT
(ANDAL)
OF
THE CONSTRUCTION OF PLANTATION
AND OIL PALM PROCESSING PLANT OF
PT BIO INTI AGRINDO
In Merauke Regency
Papua Province

Site permit:
SK OF THE REGENT OF MERAUKE
No : 9 of 2007
Dated January 16, 2007

Area : 39,900 Hectares
Plant's capacity: 120 tons of TBS/hour

Merauke, April 2009

THE REGENT OF MERAUKE REGENCY

DECISION LETTER OF THE REGENT OF MERAUKE REGENCY
NUMBER 88 OF 2009

CONCERNING
THE LIVING ENVIRONMENTAL FEASIBILITY OF THE CONSTRUCTION OF PLANTATION AND OIL PALM PROCESSING PLANT BY PT BIO INTI AGRINDO IN ULILIN DISTRICT
MERAUKE REGENCY, PAPUA PROVINCE

THE REGENT OF MERAUKE REGENCY

Considering : a. that the Construction activity plan of oil palm business and supporting facility by PT Bio inti Agrindo in Ulilin district of Merauke regency, Papua province, constitutes an activity required to be equipped with Analytical Study on Living environmental impact (AMDAL)

b. that Living environmental Impact analysis (ANDAL), Living environmental Management Plan (RKL) and Monitoring Plan on Oil palm industry along with its supporting facilities by PT Bio inti Agrindo in Ulilin district of Merauke regency, Papua province is one section of Analytical Study on Living environmental impact (AMDAL) obtaining the Decision on Living environmental feasibility based on the assessment results of regional AMDAL Assessing Commission of Merauke Regency

c. that for such purposes in letter a and letter b above, it needs to stipulate a Decision of the Regent of Merauke regency

In view of :

1. Law number 12 of 1969 concerning the Formation of Irian Barat Autonomic Province and Autonomic Regencies in Irian Barat province (State gazette of 1969 number 47, Supplement to State gazette number 2907)
2. Law number 5 of 1984 concerning Industry (State gazette of 1984 number 22, Supplement to State gazette number 3274)
3. Law number 5 of 1990 concerning Conservation of Bio natural resources and their ecosystem (State gazette of 1990 number 49, Supplement to State gazette number 3419)
4. Law number 23 of 1997 concerning Living environmental management (State gazette of 1997 number 68, Supplement to State gazette number 3699)
5. Law number 21 of 2001 concerning Special Autonomy for Papua province (State gazette of 2001 number 135, Supplement to State gazette number 4151)
6. Law number 18 of 2004 concerning Plantation (State gazette of 2004 number 85, Supplement to State gazette number 4411)
7. Law number 32 of 2004 concerning Regional government (State gazette of 2004 number 125, Supplement to State gazette number 4437) as amended lastly by Law number 12 of 2008 (State gazette of 2008 number 59, Supplement to State gazette number 4844)
8. Law number 26 of 2007 concerning Spatial Arrangement (State gazette of 2007 number 68, Supplement to State gazette number 4725)
9. Governmental Regulation number 27 of 1999 concerning Analysis on Living environmental Impact (State gazette of 1999 number 59, Supplement to State gazette number 3838)

10. Governmental Regulation number 38 of 2007 concerning the Division of Governmental affairs between the Government, Regional government of province, and Regional government of Regency/city (State gazette of 2007 number 82, Supplement to State gazette number 4737)
11. Regulation of the State Minister of Living Environment number 11 of 2006 concerning Types of Business and/or activity plan required to be equipped with Analysis on Living environmental Impact

DECIDES:

To Stipulate:

FIRSTLY : The Living environmental feasibility of the Construction of Plantation and Oil palm processing plant by PT Bio Inti Agrindo in Ulilin district of Merauke regency, Papua province.

SECONDLY : The business activity of Oil Palm Plantation by PT Bio Inti Agrindo in Ulilin district of Merauke regency, Papua province covers:

a. Carry out the Activity of Oil Palm Plantation business permit on an area of 39.800 ha
b. The construction activity of Oil Palm industry and its supporting facilities covers:
    1. Pre-construction phase (Preparation phase)
       Covers certification and consulting study activity (Licensing process) in which at this phase there does not occur yet an interaction between the activity plan of oil palm plantation and the physical, chemical and biological components

2. Construction phase (Investment phase from Year 0 to Year 4)
    a) Land preparation
    b) Planting
    c) The nursery of TBM 1 to TBM 3
    d) The construction of road, bridges and water channel
    e) The recruitment of manpower
    f) The procurement of facilities and infrastructure such as : housing buildings and company buildings, the procurement of vehicles and heavy equipment, office inventory and housing, water facility and infrastructure, power plant and workshop equipment
    g) The construction of oil palm processing plant and IPAL
3. Post-construction / Operational Phase (Exploitation phase starting from year 4 to year 25)
    a) The nursery of producing plants
    b) The maintenance of facilities and infrastructure
    c) Production (TBS harvesting)
    d) Marketing of product
    e) Transportation of product to oil palm processing plant
    f) Recruitment of manpower and people nurturing

THIRDLY : PT Bio Inti Agrindo in Ulilin district, in running its activity is obliged to meet and comply with those requirements as follows:

1. Complying with any statutory regulation, requirements and policies of the Central Government, Papua provincial government and Merauke regency government as well as related sectors that pertain to living environment
2. Coordinating with related instances within Merauke regency government at each phase conducted in performing the living environmental management
3. Implementing the community development program according to the potential, aspiration and requirement of community as well as the mutual agreement with local community the implementation of which to be coordinated with Merauke regency government
4. Doing the socialization to the surrounding community of activity site especially at each phase of activity through the forums of local community
5. Prioritizing the employment of local manpower according to the criteria required at all levels of jobs
6. Having, implementing and evaluating periodically an emergency response system to ward off any leakage, pollution and or damage to living environment
7. Carrying out all of the requirements both set forth in this decision and in the documents of Living environmental management plan (RKL) and Living environment Monitoring plan (RPL)
8. Reporting the results of living environmental management and living environment monitoring implementation activities to the Ministry of Living environment, the center of regional Living environmental management of Sulawesi, the Moluccas and Papua, BAPEDALDA of Papua province

and the Mining and Energy Environmental Impact Controlling Service of Merauke regency once in each 6 (six) months effective since the stipulation date of this decision

FOURTHLY : Licensing instances are obliged to include all requirements and obligations both those written in this decision and in Living environmental management plan (RKL) and Living environment Monitoring plan (RPL) as requirements in the permit to conduct the Construction of Oil Palm Plantation and its Supporting facilities by PT Bio Inti Agrindo in Ulilin district of Merauke regency, Papua province

FIFTHLY : Should in the future there occur any environmental impact beyond such plan included in the Living environmental Impact analysis (ANDAL), Living environmental Management Plan (RKL) and Living environment Monitoring plan (RPL), it shall be fully borne by the initiator who shall be obliged to report it immediately to such instances as referred to in Dictum THIRDLY number 8 (eight) and the related instances to take required settlement measures

SIXTHLY : If it is done any expansion, relocation and/or change to such activity plan as included in the Living environmental Impact analysis (ANDAL), Living environmental Management Plan (RKL), then the initiator is obliged to prepare a new Analytical Study on Living environmental impact (AMDAL)

SEVENTHLY : Any negligence and/or deviation committed beyond this decision shall be subject to a sanction pursuant to the applicable regulation

EIGHTHLY : This decision shall become in effect on its stipulation date.

Stipulated in Jakarta
On April 22, 2009
REGENT OF MERAUKE REGENCY

STAMPED / SIGNED

Drs. JOHANES GLUBA GEBZE

For a true copy to the original
For REGIONAL SECRETARY OF MERAUKE REGENCY
HEAD OF LEGAL SECTION

Signed and stamped

S.M. SILUBUN, SH
NURTURER

NIP.

Copies of this decision are sent to:

1. Minister of Home affairs of the Republic of Indonesia in Jakarta
2. Minister of Forestry of the Republic of Indonesia in Jakarta
3. State Minister of Living environment of the Republic of Indonesia in Jakarta
4. Head of Capital Investment Coordinating body in Jakarta
5. Governor of Papua Province in Jayapura
6. Head of BAWASDA of Papua Province in Jayapura
7. Head of the center of regional Living environmental management of Sulawesi, the Moluccas and Papua in Makassar
8. Head of BAPEDALDA of Papua Province in Jayapura

9. Chairperson of DPRD of Merauke regency
10. The assistants to regional secretary of Merauke regency
11. Head of BAWASDA of Merauke regency
12. Head of BAPPEDA of Merauke regency
13. Head of the Mining and Energy Environmental Impact Controlling Service of Merauke regency
14. Head of BPID of Merauke regency
15. Head of Forestry and Plantation service of Merauke regency
16. Board of directors of PT Bio Inti Agrindo
17. Head of Ulilin district of Merauke regency

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Merauke, April 2009

MAP OF VIEW

FOREWORD

FOREWORD

This Document of Main Report on the Analysis on Living environmental impact (ANDAL) on the Construction of Oil palm Plantation and Processing plant of PT Bio Inti Agrindo was developed by a collaboration between PT Bio Inti Agrindo as initiator and the developing consultant CV Bahana Papua Mandiri. PT Bio Inti Agrindo has its registered office at Jl. Raya Mandala Gang Soska no. 28 Merauke, Papua Province with Managing director Kim Nam Ku. CV Bahana Papua Mandiri with Managing director Irianto Awaludin, has its registered office at Jl. Raya Abepura 42 C Jayapura administrative city, Papua province. Phone / Fax (0967) 588869.

The study area of PT Bio Inti Agrindo of 39,900 hectares is located in the forest group of Sungai Bian, Merauke regency, Papua province. The area is a Site Permit for Oil Palm Plantation purpose approved by the Regent of Merauke with Letter number 9 of 2007 dated January 16, 2007.

Based on the Minister of Living environment's decree No. 17 of 2001 concerning Types of Businesses or Activities required to be equipped with Analysis on Living environmental impact, the Construction of Oil palm Plantation and Processing plant activity of PT Bio Inti Agrindo includes in those activities required to conduct the Analytical Study on Living environmental impact (AMDAL). The preparation of this AMDAL for PT Bio Inti Agrindo referred to the Governmental Regulation number 27 of 1999 concerning Analysis on Living environmental Impact and the Minister of living environment's decree no. 8 of 2006 concerning Guidance on AMDAL preparation. The preparation of AMDAL followed the Technical guidance on AMDAL preparation issued by the Minister of Agriculture no. 25/Kpts/OT210/95 concerning Technical guidance on the preparation of Analysis on Environmental Impact (ANDAL) for Business or activity plan in Agricultural Scope.

As an outline, the contents of this ANDAL Main report consist of: (1) Introduction, (2) Description of Activity Plan, (3) Living environmental Color, (4) Scope of study, (5) Method of Study, (6) Estimation on Significant and Important Impacts and (7) Evaluation on Significant and Important Impacts.

It is our hope that this Main Report is capable of giving a comprehensive picture on the process and result of the Construction of Oil palm Plantation and Processing plant of PT Bio Inti Agrindo. Subsequently, this result of study will be used as the basis in preparing Living environmental Management Plan (RKL) and Living environment Monitoring plan (RPL).

Merauke, April 2009
PT BIO INTI AGRINDO

Kim Nam Ku
Managing director

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PREPARING TEAM

THE PREPARING TEAM OF ANDAL ON THE CONSTRUCTION OF
OIL PALM PLANTATION AND PROCESSING PLANT OF PT BIO INTI AGRINDO

Merauke Regency , Papua Province

	I. PREPARING CONSULTANT	
Company name	CV. Bahana Papua Mandiri Jl. Raya Abepura 42 C Jayapura administrative city, Papua province. Phone / Fax (0967) 588869	
Director	Irianto Awaludin	
	II. PREPARING TEAM	
POSITION IN TEAM	FULL NAME	EXPERTISE
TEAM LEADER	Sugimin Sugianto	* S1 Agriculture * AMDAL Certificates A and B
PHYSICAL-CHEMICAL SUB-TEAM		
* Chairman	Aom Subardiman	* S1 Agriculture
* Member	Pol Kamadi	* S1 Forestry
BIOLOGICAL SUB-TEAM		
* Chairman	Supadi	* S1 Agriculture AMDAL Certificate A
* Member	Dimas Bambang Setiawan	* S1 Agriculture
SOSEKBUD SUB-TEAM		
* Chairman	Aris Sudarsono	* S1 Anthropology
* Member	Hendy Yulianto	* S1 Agriculture

INTRODUCTION

A. BACKGROUND

The development of agricultural sector, particularly plantation sub-sector being an integral part of the National Development has many opportunities in the context of supporting the upgrading of non-oil and gas export being encouraged by the government. In respect of this, plantation sub-sector will keep being moved to play an active role and can increase its contribution in resolving various national problems, both economic problem (increasing the national income and per capita income) and social manpower problem.

Among some leading export commodities in plantation sector are palm oil. This is reasonable because the use of palm oil nowadays is wide enough (as materials for cooking oil, butter, pharmaceutical, and cosmetics) the marketing of which both domestically and overseas is always open.

In the context of supporting the implementation of the government's effort in supporting the attempt to increase state's foreign currency through the trade in plantation sub-sector, PT Bio Inti Agrindo conducts the construction of oil palm plantation in Ulilin district, Merauke regency, Papua province.

For the construction of oil palm plantation, PT Bio Inti Agrindo gets an area reserve (site permit) of 39.900 ha. The construction plan of PT Bio Inti Agrindo's oil palm plantation covers among others area blocking, land opening, as well as physical construction of facilities and infrastructure to support seeds supply.

To accommodate Fresh fruit bunches (TBS) production from oil palm plantation it will be built an oil palm processing plant with installed capacity of 120 tons /TBS/hour equipped with IPAL (Waste water treatment plant) located near to Bian river.

PT Bio Inti Agrindo has acquired a site permit for oil palm plantation purpose through the Decision Letter of the Regent of Merauke Number 9 of 2007 dated January 16, 2007 concerning site permit for the purpose of PT Bio Inti Agrindo's oil palm plantation in Ulilin district, Merauke regency.

1. THE OBJECTIVE AND BENEFITS OF OIL PALM PLANTATION CONSTRUCTION

In general, the objective and benefits of Oil Palm plantation construction are as follows:

a. ***The objective of Oil Palm plantation construction***

- To do soil and water conservation activity particularly on critical land
- To upgrade land productivity through a sustainable utilization of land resources
- To improve the welfare of community around the plantation

b. ***The benefits of Oil Palm plantation construction***

* Benefits for Initiator
  - To keep the continuity of the entire company's economic wheel
  - To fill-in the chance and expand the opportunity of exporting oil palm plantation produce
  - To participate in the development of agricultural sector in general and plantation sub-sector in particular
* Benefits for Community
  - To expand employment opportunity and business chance
  - To utilize nature resources by keep maintaining the sustainability of said natural resources
  - To improve the accessibility of area originally remote through the development of road network, which stimulates the upgrading intensity of local economy
* Benefits for Government
  - As government's partner in the regional and national development efforts
  - Giving a contribution in reducing unemployment level i.e. by providing employment opportunities, both technical and managerial levels

- Giving a contribution in increasing Region's Original Income (PAD) through tax revenue and retributions
- Giving a contribution in increasing Gross Regional Domestic Product (PDRB) through investible surplus acquired

The construction activity of oil palm plantation is expected to have an impact on the environment, both positive and negative impacts. Therefore, to minimize any important negative impact it needs to do an in-depth environmental review so it can be prepared an environmental management and monitoring plan in the context of controlling any possible emergence of negative impact and developing the positive impact. In respect of this, PT Bio Inti Agrindo deems it necessary to immediately conduct the preparation of Analytical Study on Living environmental impact (AMDAL) which is preceded by the activity of developing a Reference Framework (KA) of Analysis on Environmental Impact (ANDAL), ANDAL Main report, Environmental Management Plan, and Environment Monitoring plan (RPL) according to the rules currently applicable. As for the technical aspect of Reference Framework (KA) for ANDAL preparation shall refer to Minister of Agriculture's Decree no. 25/Kpts/OT210/95 concerning Technical guidance on the preparation of Analysis on Environmental Impact (ANDAL) for Business or activity plan in Agricultural Scope and the Minister of living environment's decree no. 8 of 2006 concerning Guidance on AMDAL preparation.

2 THE RELATED STATUTORY REGULATIONS

1. Law

(1) Law of the Republic of Indonesia (RI) number 5 of 1990 concerning Conservation of Bio Natural Resources and its ecosystem
(2) Law of RI number 5 of 1991 concerning Cultural preservative items
(3) Law of RI number 24 of 1992 concerning Spatial Arrangement
(4) Law of RI number 5 of 1994 concerning the Ratification of UN Convention on Bio-diversity
(5) Law of RI number 2 of 1997 concerning Manpower Social Security

(6) Law of RI number 23 of 1997 concerning Living environmental Management
(7) Law of RI number 22 of 1999 concerning Regional Government
(8) Law of RI number 25 of 1999 concerning the Financial Balance between the Central and regional Governments
(9) Law of RI number 41 of 1999 concerning Forestry

2. Governmental Regulation

(1) Regulation of the republic of Indonesia Government no. 23 of 1970 concerning Irrigation
(2) Governmental Regulation No. 28 of 1985 concerning Forest Protection
(3) Governmental Regulation No. 20 of 1990 concerning Water Pollution Control
(4) Governmental Regulation No. 32 of 1990 concerning Protected Area management
(5) Governmental Regulation No. 35 of 1990 concerning River
(6) Governmental Regulation No. 44 of 1995 concerning Seedling
(7) Governmental Regulation No. 6 of 1995 concerning Plant Protection
(8) Governmental Regulation No. 47 of 1997 concerning the National Scope Arrangement
(9) Governmental Regulation No. 27 of 1999 concerning Analysis on Environmental Impact
(10) Governmental Regulation No. 41 of 1999 concerning Air Pollution Control
(11) Governmental Regulation No. 85 of 1999, Amendment to Governmental Regulation No.18 of 1999 concerning Dangerous and Toxic Waste management
(12) Governmental Regulation No. 7 of 1999 concerning the preservation of Flora and Fauna species

(13) Governmental Regulation No. 25 of 2000 concerning Government's Authority and Province's authority as an Autonomic Region

(14) Governmental Regulation No. 150 of 2000 concerning Control on Soil Damage for Biomass Production

(15) Governmental Regulation No. 4 of 2001 concerning Control on the damage and or Pollution to Living environment that relates to forest and or land fire

(16) Governmental Regulation No. 82 of 2001 concerning Water Quality control and Water Pollution control

3. Presidential Decree and Instruction

(1) Decree of the President of RI No. 22 of 1990 concerning Environmental Impact Control

(2) Decree of the President of RI No. 32 of 1990 concerning Protected Area Management

(3) Instruction of the President of RI No. 22 of 1998 concerning Elimination on the Obligation of having technical recommendation in an application for Capital investment approval

(4) Decree of the President of RI No. 10 of 2000 concerning Environmental Impact Control Agency (BAPEDAL)

4. Ministerial Decree and Instruction

(1) The Minister of Agriculture's Decree No. 54/Kpts/Um/2/1972 concerning Trees in Protected Forest area

(2) The Minister of Manpower's Decree No. SE.01/MEN/1978 concerning Ambient Air quality standard within Working environment

(3) The Minister of Agriculture's Decree No.66 Kpts/Um/5/1978 concerning Criteria of Protected Fauna according to Ordnance on Wild animal protection of 1931

(4) The Minister of Agriculture's Decree No.837 Kpts/Um/11/1980 concerning Criteria and Procedure of Protected Forest determination

(5) The Minister of Agriculture's Decree No.683 Kpts/Um/8/1981 concerning Criteria and Procedure of Production Forest determination

(6) The Minister of Health's Decree No. 528/MENKES/PER/XII/1982 concerning Soil water quality that pertains to Health

(7) The Minister of Industry's Decree No. 148 of 1985 concerning the Handling of Toxic and Dangerous Raw Materials from Industrial company

(8) Decree of the State Minister of Demography and Living environment Number Kep 03/MENKLH/6/1987 concerning Procedure on the Handling of Living environment Pollution and destruction cases

(9) Decree of the State Minister of Demography and Living environment Number Kep 49/MENKLH/6/1987 concerning the Determination of Important Impact

(10) Decree of the State Minister of Demography and Living environment Number Kep 02/MENKLH/6/1988 concerning Guidance on the determination of Environmental quality standard for Ambient Air within Residential environment and Working environment

(11) The Minister of Industry's Decree No. 134 of 1988 concerning Prevention and Handling of Pollution due to Industrial business activity upon living environment

(12) Decree of the Minister of Home Affairs No. 48 of 1989 concerning Identities of Regional Flora and Fauna

(13) The Minister of Forestry' s Decree No. 485/Kpts-II/1989 concerning Silvicultural System on the Management of Production Natural forest in Indonesia

(14) Decree of the Minister of Home Affairs No. 86 of 1990 concerning the Procedure of Used Lubricant destruction and its supervision

(15) Decree of the Minister of Health of RI no. 416/MENKES/PER/IX/1990 concerning conditions and supervision on water quality

(16) Minister of Forestry's Decree no. 301/Kpts-II/1991 concerning Inventory on Animals protected by Law and or their Parts cared for by Someone

(17) Decree of the Minister of Health of RI no. 453 of 1993 concerning Dangerous Toxic Materials

(18) Decree of State Minister of Agrarian / head of BPN number 2 of 1993 concerning Requirements on the Granting of Site Permit

(19) Decision of the Head of BAPEDAL no. Kep-056 of 1994 concerning Guidance on the size of Important Impact

(20) Decision of the Head of BAPEDAL no. Kep-02/BAPEDAL/09/1995 concerning Document of B3 Waste

(21) Minister of Living Environment's decree Number Kep.13/MENLH/11/1995 concerning Quality Standard of Immobile source's emission

(22) The Minister of Agriculture's Decree No.25/Kpts/OT.210/I/95 concerning Technical guidance on the preparation of AMDAL for business or activity plan in Agricultural Scope

(23) Minister of Living Environment's decree Number Kep. 35/MENKLH/7/1995 concerning Clean River Program

(24) Minister of Living Environment's decree Number Kep. 51/MENKLH/10/1995 concerning Quality standard of liquid waste for Industrial activity

(25) Decree of the State Minister of Demography and Living environment Number Kep XII/MENKLH/6/1995 concerning Guidance on Environmental quality standard

(26) The Minister of Forestry' s Decree No. 464/Kpts-II/1995 concerning Protected Forest Management

(27) Minister of Living Environment's decree Number Kep. 48/MENLH/11/1996 concerning Quality standard of Noise Level

(28) Minister of Living Environment's decree Number Kep. 50/MENLH/11/1996 concerning Quality standard of Smell degree

(29) SKB of the Minister of Health and the Minister of Agriculture no. 881 and 771 dated August 22, 1996 concerning the Determination on Pesticide residual limits in Agricultural produce

(30) Decision of the Head of Bapedal no. Kep-105 of 1996 concerning Guidance on the Monitoring of the implementation of Environmental management plan and Environment monitoring Plan

(31) Decision of the Head of BAPEDAL no. Kep-299/11 of 1996 concerning Technical guidance on Social Aspect Review in AMDAL preparation

(32) Decree of MenLH/head of Bapedal no. 17 of 1997 concerning Social Aspect Review

(33) Minister of Living Environment's decree Number Kep. 45/MENLH/11/1997 concerning Air Pollution Standard Index

(34) Decision of the Head of Bapedal no. Kep-124 of 1997 concerning Community's Health Aspect

(35) Decision of the Head of BAPEDAL no. Kep-299/11 of 1996 concerning Procedure on the supervision of Dangerous and toxic material waste management in regions

(36) Decree of the Minister of Forestry and Plantation no. 376/Kpts-II/1998 concerning Criteria on the Provision of Forest area for Oil palm cultivation plantation

(37) Decree of the Minister of Forestry and Plantation no. 479/Kpts-II/1998 concerning Conservation Institution of Wild Flora and fauna

(38) Decree of the Minister of Forestry and Plantation no. 602/Kpts-II/1998 jo. No. 622/Kpts-II/1999 concerning Analysis on Environmental impact, Environmental management Effort and Environment Monitoring effort for Forestry and Plantation Construction

(39) Decree of the Minister of Forestry and Plantation no. 692/Kpts-II/1998 concerning Amendment to Minister of Forestry's decree no. 58/Kpts-II/1996 concerning Amendment to Minister of Agriculture's decree no.

54/Kpts/Um/2/1972 jo Minister of Forestry's Decree No. 261/Kpts-IV/1990 concerning Trees in the Protected Forest area

(40) Decree of the Minister of Forestry and Plantation no. 107/Kpts-II/1999 concerning Licensing of Plantation business

(41) Regulation of State Minister of Agrarian / head of National Land affairs Agency number 5 of 1999 dated June 24, 1999 concerning the Settlement on the issue of Custom Law traditional right

(42) Decree of the Minister of Forestry and Plantation no. 728/Kpts-II/1999 concerning Maximum Width of Forest control and Mutual agreement on Forest area for Plantation cultivation

(43) Decree of Men LH no. 2 of 2000 concerning Guidance on the Assessment of AMDAL document

(44) Decision of the Head of Bapedal no. 08 of 2000 concerning Community Involvement and Information Openness in the Process of Analysis on Living environmental Impact

(45) Decision of the Head of Bapedal no. 09 of 2000 concerning Guidance on the Preparation of Analysis on Living environmental Impact

(46) Decree of Men LH no. 40 of 2000 concerning Guidance on the working procedure of AMDAL assessment commission

(47) Decree of Men LH no. 41 of 2000 concerning Guidance on the Formation of Regency /City AMDAL assessment commission

(48) Decree of Men LH no. 42 of 2000 concerning the Membership Composition of Central Assessment commission and AMDAL technical Team

(49) Decree of the Minister of Living environment no. 17 of 2001 concerning Types of business or activity required to be equipped with Analysis on Living environmental impact

(50) Decree of Men LH no. 28 of 2003 concerning Technical guidance on the Review of waste water utilization from Palm Oil industry in soil at Oil palm plantations

(51) Decree of Men LH no. 29 of 2003 concerning Guidance on Licensing conditions and procedure of Oil palm industry's waste water utilization in soil at Oil palm plantations

(52) Decree of Men LH no. 37 of 2003 concerning Method of Analysis on Surface water quality and Sampling of Surface water

(53) Decree of Men LH no. 115/MENLH/2003 concerning Guidance on the determination of water quality

(54) Decree of Men LH no. 148 of 2004 concerning Guidance on the formation of Regional living environmental institutions

(55) Decree of Men LH no. 197 of 2004 concerning the Minimum service standard of living environmental sector in Regency region and city region

(56) Decree of Men LH no. 45 of 2005 concerning Guidance on the preparation of Implementation report on Living environmental management plan(RKL) and Living environment monitoring plan (RPL)

(57) Decree of Men LH no. 03 of 2006 concerning Go to Green Indonesia Program

(58) Decree of Men LH no. 06 of 2006 concerning the standardization of personnel's and environmental institutions' competence

(59) Decree of Men LH no. 07 of 2006 concerning the Measurement procedure on standard criteria of soil damage for Biomass production

(60) Decree of Men LH no. 08 of 2006 concerning guidance on the preparation of Analytical Study on Living environmental impact (AMDAL)

(61) Decree of Men LH no. 11 of 2006 concerning types of mandatory-AMDAL business

(62) Decree of Men LH no. 01 of 2007 concerning guidance on technical review for the determination of water Class

(63) Decree of Men LH no. 03 of 2007 concerning the gathering and storage facility of B3 waste

5. Decisions and Circulars of Director generals

(1) Decision of the Director General of Forest Undertaking no. 564/Kpts/IV-BPHH/1989 concerning Guidance on Indonesian Planting selected trees felling down (TPTI)

(2) Decision of the Director General of INTAG no. 715/A/VII-2/1995 concerning the Management of Protected area and Cultivation area

(3) Decision of the Director General of Plantation no. 38/KB.110/SK//DJ-BUN/05.95 concerning Technical guidance on Land opening without burning for Plantation development

6. Regional decision / Governor's and Regent's Decision

(1) Decision of Regent of Merauke no. 9 of 2007 concerning Site Permit for the purpose of PT Bio Inti Agrindo's Oil palm Plantation in Ulilin district, Merauke regency

(2) Decision of Regent of Merauke no. 52/1110 dated April 14, 2007 concerning the Granting of Plantation business permit (IUP) to PT Bio Inti Agrindo

(3) Decision of Regent of Merauke no. 522.1/1306 dated May 8, 2007 concerning Recommendation on the Release of Forest area for Plantation cultivation

(4) Decision of Governor of Papua no. 525.2/2904/SET dated September 25, 2007 concerning Recommendation on the reservation of oil palm plantation area of 39.900 Ha

(5) Decision of Governor of Papua no. 525.1/2901/SET dated September 25, 2007 concerning Recommendation on the release of Conversion Forest area for the construction of Oil Palm Plantation in the name of PT Bio Inti Agrindo

3. THE CONNECTION BETWEEN OIL PALM PLANTATION ACTIVITY AND ITS PROCESSING PLANT

As for the relation between oil palm plantation activity of PT Bio Inti Agrindo and oil palm processing plant are among others:

a) The oil palm plantation activity is estimated to cause important impacts both positive impact and negative impact on physical-chemical, biological, social economic cultural environment, and community's health. The activity is among others land preparation, oil palm planting, etc

b) Oil palm plantation cultivation, i.e. by the opening of secondary forest area into an oil palm plantation area will also cause onshore biota in the form of protected wild animals will be threatened to become extinct, so it needs a serious handling

c) Liquid waste from oil palm treatment process may also degrade water quality, which at last may cause an interference to the life of aquatic biota, so the equilibrium of waters environment will be disturbed

d) Further impact in the form of water quality degradation due to the pollution by liquid waste from oil palm treatment process will cause community's restlessness which in the end shall create a social conflict

e) Any detrimental and quite complex issue must be analyzed deeply in order to reduce said issue up to minimum limit, as for any beneficial impact needs to be kept and developed on continuous basis

B. THE OBJECTIVE AND BENEFITS OF ANDAL STUDY

1. THE OBJECTIVE OF ANDAL STUDY

The objective of ANDAL study on the construction activity of PT Bio Inti Agrindo's oil palm plantation in Merauke regency, Papua province, are among others:

a. To present the construction activity of PT Bio Inti Agrindo's oil palm plantation since its commencement in the first year of activity

b. To identify the construction activity of oil palm plantation which is potential to cause an impact on the environment

c. To identify various environmental components, particularly those going to suffer basic changes due to said construction activity of PT Bio Inti Agrindo's oil palm plantation

d. To estimate any environmental important impact going to emerge due to said construction activity of PT Bio Inti Agrindo's oil palm plantation

e. To evaluate the environmental important impact holistically as the consequence of construction activity of PT Bio Inti Agrindo's oil palm plantation

f. To provide alternative follow-up suggestions on the environmental management and monitoring

2. BENEFITS OF ANDAL STUDY

a. ***Benefits for the Government***

- As a material for decision making on the environmental feasibility of PT Bio Inti Agrindo's oil palm plantation construction activity plan
- As a benchmark in the monitoring and evaluation on the implementation of environmental friendly agricultural development
- As a material for territory building and development planning
- To prevent any damage to other sources beyond the plantation area

b. Benefits for Initiator

- As an input to prepare the technical design of construction activity plan for PT Bio Inti Agrindo's oil palm plantation

- To show that initiator conducts the management of oil palm plantation which is environmental friendly and social friendly as mandated in the development strategy launched by the government reflected through legislation
- To obtain information on the existing environment around the study area, particularly social economic and culture, so the land management activity will keep paying attention to the environment
- To find a solution for any issue to encounter in the future in respect of environmental aspect
- To detect and control land management activity from any negative effect that is likely to emerge such as land dispute, flood, landslide etc

c. Benefits for Community

- Community may be aware of any change to the environment that will occur due to the construction activity plan of oil palm plantation, and may make use of any beneficial opportunity as well as avoiding any loss that might arise from the activity
- They may participate in each phase of oil palm plantation construction according to their capacity and expertise, so local manpower can be absorbed optimally
- To add community's knowledge on the importance of living environment, so community can cooperate with plantation management in handling any social problem that arises

Other benefits of ANDAL are particularly in the progress of analysis and research on the possibilities of effective science and technology application for the handling of environmental impact.

II DESCRIPTION OF ACTIVITY PLAN

A. IDENTITIES OF INITIATOR AND ANDAL PREPARING CONSULTANT

1. Identity of Initiator

Identity of the initiator of ANDAL preparation for PT Bio Inti Agrindo's Oil Palm Plantation and Processing Plant is as follows:

Name of company	: PT Bio Inti Agrindo
Office	: Jl. Raya Mandala Gang Soska no. 28 Merauke Papua Province
Managing director	: Kim Nam Ku

1. Identity of ANDAL preparing Consultant

Identity of the preparing consultant for ANDAL of Bio Inti Agrindo's Oil Palm Plantation and Processing Plant is as follows:

Name of company	: CV Bahana Papua Mandiri
Office	: Jl. Raya Abepura 42 C Jayapura administrative city, Papua province. Phone / Fax (0967) 588869.
Managing director	: Irianto Awaludin

B. DESCRIPTION OF ACTIVITY PLAN

1. Location of activity plan

   * Name of activity

     Name of activity being the object of study is the Construction Plan of an Oil Palm Plantation and Processing Plant belonging to PT Bio Inti Agrindo. While the business method is Pure Private Method.

* Location of activity

  PT Bio Inti Agrindo plantation is located on a land space situated in Ulilin district, Merauke regency, Papua province. The geographical site of this plantation is 140° 25’ – 141° 00’ BT and 06° 55’ - 07° 50’ LS, while the boundaries are as follows:

  To the North : Bordered with PT Papua Agro Lestari
  To the South : Bordered with PT Ulilin Agro Lestari
  To the East : Bordered with Fly river branch
  To the West : Bordered with PT Pusaka Agro Makmur

* Accessibility

  The location of this PT Bio Inti Agrindo can be taken by land vehicle from Merauke by passing land road route : Merauke – Sota – Bupul – Kumaaf – PT Bio Inti Agrindo

2. Phases of activity plan

The activities going to take place at the oil palm plantation of PT BIO INTI AGRINDO shall not all of them be reviewed deeply and be analyzed their impacts. Those aspects need to be reviewed their impacts are such activities having the criteria as follows:

- Activities having a potential to cause important impacts. The activities can be determined from the identification of important impacts or key issues giving a contribution or attributable to any change in environment
- Activities having a high hazardous risk. These activities when the study was conducted did not or had a potential to cause any impact on the environment but having a high risk to become an important impact
- Activities not included into both categories above, but in general in an analogous review with similar case may cause a potential to

environmental change yet there is no sufficient information available yet

Based on the criteria above, it can be determined those aspects reviewed, i.e. pre-construction / preparation phase, construction phase and post-construction / operation phase as follows:

a. pre-construction / preparation phase

This pre-construction / preparation phase covers Certification and Consultant study activity (licensing process). The activity at pre-construction phase reviewed is: Certification and Consultant study activity (licensing process). At this phase it does not occur any interaction between the activity plan of PT BIO INTI AGRINDO's oil palm plantation activity and physical, chemical and biological components.

The interaction that might occur is only on social economic and cultural component as the consequence of Certification and Consultant study activity (licensing process). This interaction will result in the occurrence of an impact covering: conflict of land ownership and use, income level and living standard, community's perception, as well as the occurrence of people mobilization and spread.

b. Construction phase activity

This construction phase is named **Investment phase** which starts from year 0 up to year 4. the activities conducted at this phase are as follows:

1. Land preparation
2. Planting
3. TBM 1 to TBM 3 nursery
4. Road, Bridges and Water channel construction
5. Manpower recruitment
6. Facilities and infrastructure procurement such as: Housing buildings and Company buildings, Procurement of Vehicles and Heavy equipment, office

and residential inventory, water facilities and infrastructure, power plant, and Workshop equipment

7. The construction of Oil Palm Processing plant and IPAL (Waste water treatment Plant)

At this phase it is expected to occur an interaction between the activity plan of PT BIO INTI AGRINDO's oil palm plantation and physical-chemical, biological, social economic culture environmental components, as well as community's health and environment.

The physical – chemical environmental components to be affected by the emergence of impact covering: air quality degradation and noise, the increase of erosion and sedimentation rate, degradation of river water's quality, and change to micro climate. The impact to occur on biological environmental component cover: the disturbance to flora and fauna habitat, degradation of bio diversity, and the decrease of aquatic biota population.

The impact to occur on social economic and cultural component is the increase of accessibility, employment and business opportunities, income level and living standard, local economic activity, people mobility and spread, as well as community's perception.

The impact to occur on community's health and environment constitutes a derivative impact from said impact on air quality degradation and river water's quality degradation, i.e. the degradation of community's health condition and the increase of medical staff and medical facility.

The manpower recruitment and community nurturing activities will cause an impact on social economic and cultural component , i.e. community's level of income and living standard impact, as well as local economic activity.

c. Post-construction / operation phase

This operation activity is named Production (exploitation) phase starting from year 4 up to year 25 (Plant's economic age) i.e. the phase in which plantation already operates in full. The activities conducted at this phase are producing plant nursery activity, facilities

and infrastructure maintenance, production (TBS harvesting), TBS and waste treatment, produce marketing, transporting produce to oil palm processing plant, as well as manpower recruitment and community nurturing.

Producing plant nursery will be influential to the occurrence of an impact on physical-chemical environmental component, i.e. the reduction of erosion and sedimentation rate. the harvesting and transporting of TBS is the cutting of oil palm fruit bunches, gathering of harvested produce and transportation of harvested produce to the plant. This activity will cause an effect to the degradation of air quality so it might disturb the community's health and environment.

The manufacturing activity series of oil palm processing consist of bunches weighing activity, water procurement and processing, energy source operation, and the processing of Fresh fruit bunches. The above series of activity are continued with waste handling activity in the form of waste water treatment plant (IPAL) operation, plant facility maintenance and product storage. The plant operation activity will cause an impact on physical – chemical environmental component, i.e. in the form of air quality degradation, the increase of B3 waste and the degradation of river water's quality as liquid waste receiving body. The impact on biological component constitutes a derivative impact caused by the degradation of river water's quality, i.e. the disturbance to aquatic biota as well as degradation to the diversity of nekton, plankton and benthos species.

The impact to occur on social economic and cultural component is community's perception, income level and living standard, as well as people mobilization and spread.

The impact to occur on community's health and environment due to harvesting and produce transportation constitutes a derivative impact from said impact on air quality degradation and river water's quality degradation, i.e. the degradation of community's health condition and the increase of medical staff and medical facility.

The manpower recruitment and community nurturing activities at operation phase will cause an impact on social economic and cultural component, i.e. community's level of income and living standard impact, as well as local economic activity.

d. Post-operation phase (year > 25)

Post-operation phase constitutes the final phase of oil palm plantation construction in which at this phase oil palm crops are no longer productive (not economic). Therefore at this phase oil palm crops can be cut off or totally cleared away and if the license is not extended then the area must be returned to the condition before it was constructed an oil palm plantation, i.e. a forest. Therefore, activities at this phase are land rehabilitation and reclamation activities.

3. Description of Activity Plan

a. **pre-construction phase**

Land survey and area blocking activity (certification and consultant's study)

Land survey is intended to see the actual condition of land, while Area blocking is to measure blocks of area in the smallest unit ± 25 Ha. Land survey and Area blocking need to be done as the basis for preparing the work plan that covers working system, equipment requirement and fund requirement.

The implementation of land survey and Area blocking is conducted simultaneously on time efficiency and implementation cost basis. In addition, some information required in Land survey can be supplied by Measurement staff (Area blocking work) such as place altitude and land declivity. The trajectory of land survey (US/SU/TB/BT) follows the measurement staff's trajectory (Area blocking work). Land survey and area blocking work is divided into 3 (three) phases, especially for phase II (second) and phase III (third) are conducted simultaneously.

1) Phase I

This survey is conducted to determine the area borders marked by the posting of survey stake at 50m interval along the area borders according to site permit map (BPN).

2) Phase II

This survey is conducted to check the condition inside the area marked by the posting of survey stake at 250m interval (US) x 1.000 m (TB) inside the area. The posting of survey stake at said interval constitutes part of Area blocking work.

3) Phase III

This survey is conducted to check the condition of area in detail marked by the posting of survey stake at 50m interval (US) x 100 m (TB) inside the area. The posting of survey stake at said interval constitutes part of Area blocking work.

The equipment needed in implementing the above work are:

a. To clear a way: chopper
b. To measure : Theodolite, compass, inclinometer (measuring declivity) , GPS, measuring tape, abney level (measuring place altitude), waterpass, data logger, planimeter, BPN basic map (site permit), contour map (Bakosurtanal / Consultant), clipboard, and paper
c. For stake posting : wood of 10 x 10 x 200 cm size, hammer, white paint, red paint, and blue paint
d. For map drawing : drawing table, drawing pen, graphic paper, tracing paper, and isometric paper (millimeter block)

The implementation of Land survey and Area blocking work starts from the determination on tying point (the coordinates are to find). Along the area borders, according to BPN's map and stake (if the measurement has been done) it is made a pioneering lane of 1.5 M wide and at each 50 M distance it is posted a stake painted in red (Phase I). The marking of borders is done by surveyor, project manager and community leading figures.

From the tying point it is made a pioneering lane of 1.5 m wide of North-South direction at each 250 M interval (Phase II), then it is also made a pioneering lane of 1.5 m wide of East – West direction at each 1000 M interval (Phase II). This pioneering lane is made

in straight lines, so in the implementation hills must be climbed, slopes must be descended and river must be crossed.

At each crossing of North-south and East-west lines it is posted a survey stake painted in white marked by point coding system, i.e. letter and number system (e.g. A 27), while along the pioneering lane to use as the road lane it is posted stake s painted in red at each 50 M interval (Phase III).

Data from each survey point (white stake) is to be recorded completely and accurately in the survey log book, i.e.:

a. Point code (e.g. A 27)
b. Topography
c. Species of vegetation
d. Type of soil
e. River
f. Place altitude
g. Coordinates of reference point

Reservation area:
39.900 Ha
Letter of the regent of Merauke no. 9 of 2007

Area (Regency spatial arrangement):
1. cultivation
2. non cultivation (protection)
3. special

Analysis on area use and re-arrangement

Forest and waters area:
Attachment to SK menhutbun no. 422/KPTS-II/99
Dated June 15, 1999

Reservation area: 39.900 Ha

Protected area : 660 ha
- river bank : 649 ha
- water spring: 11 ha

RE-ARRANGEMENT

Social area: 11 ha
- axis road : 11 ha

Gross effective area = 39.229 ha

ANALYS ON EFFECTIVE AREA

Facilities – infrastructure area : 3.229 ha
- housing & offices : 60 ha
- seeding location : 420 ha
- road network : 1.757 ha
- river body: 912 ha
- plant and IPAL : 80 ha

Net effective area = 36.000 ha

Phase I : 6.000 ha planted (240 plot / 25 ha)
Phase II : 6.000 ha planted (240 plot / 25 ha)
Phase III : 6.000 ha planted (240 plot / 25 ha)
Phase IV: 6.000 ha planted (240 plot / 25 ha)
Phase V: 6.000 ha planted (240 plot / 25 ha)
Phase VI : 6.000 ha planted (240 plot / 25 ha)

Figure II-1. Area blocking at PT Bio Inti Agrindo's Oil palm Plantation

GAMBAR PETA FORMAT LANDSCAPE

(TIDAK BISA DITRANSLATE)

Figure II-2. Map of working area re-arrangement (Area blocking) at PT Bio Inti Agrindo's Oil palm Plantation

At special condition (swamp, hill or steep slope) it is made pioneering lane at 100 M interval, then at the crossing of this pioneering lane it is posted a stake painted in white and be recorded the data of each said stake . At those areas that need drainage, it must absolutely be measured and recorded the place altitude of each survey point. At each crossing of survey lane with nature lines (river, cliff, etc) it is posted a stake painted in blue as well as being measured and recorded its distance from the nearest survey point.
The results of the entire abovementioned work are pictured on a basic map each day including also nature lines (river, swamp, hill, steep slope, plain area, paddy field, prohibited area etc), for a comparison it is usable the contour map from Bakosurtanal / Consultant.

In the daily survey working report, it must be ascertained that the data reported conforms to the actual facts, i.e. by field attendance and control particularly in term of working block (location), number of workers, and results of survey work.

Limitations in the use of Land

According to the objective of Oil palm plantation construction, the use of land is allocated for oil palm crops, facilities and infrastructure (Housing, Offices, seedlings , Plant and waste pond, road network, drainage network / river body, and public facility), protected area and social area,

Things need to consider in the planning of land use are among others:

a. Land used to select as the intended purpose of Oil palm development based on the recommended land suitability class and topography
b. Land for settlement area has a convenient environmental condition and close to the source of water spring. In addition it also needs to take into account the optimal mileage from employees' housing to plantation estate, i.e. maximum 5 kilometers. The average water requirement for housing area is 60 – 150 L/person/day
c. The seeding area selected should be flat, close to emplacement and source of water spring, as well as free from live stocks interference. In no-rainfall condition, the average requirement of water at the seeding for one time of watering is 1-2 liter per seed.

Plantation re-arrangement and Landscaping Plan

Plantation re-arrangement is the spatial arrangement planning activity of the plantation to be constructed, i.e. covering the division of plants' blocks, sections , the determination of seeding location, office, housing, road network re-arrangement, drainage network re-arrangement, protected area re-arrangement, and social area re-arrangement. The objective of re-arrangement is so that the plantation to be constructed has a proper spatial arrangement so it can produce an effective and efficient operational activity. The basic guide in plantation landscaping is land situation map and the topographical condition from the result of area survey (consultant).

From the area reserved, the width of area to be constructed for Oil Palm Plantation is 36.000 ha planted, while the other remaining land will be used for facilities and infrastructure area, protected area, and social area.
The Landscaping plan is as described in the following table.

Table II-1. Landscaping plan, the Construction of PT BIO INTI AGRINDO's Oil Palm Plantation

DESCRIPTION	AREA (HECTARE)
1. Area reservation (according to site permit no. 9 of 2007)	39.900
LANDSCAPING	
1. Protected area: a. river bank and water spring 2. Oil Palm planting area - effective 3. Facilities and infrastructure area a. Housing and Offices b. seedlings location c. Road network d. River body e. Plant and IPAL 4. Social area - Axis Road	NOTE TO MBAK KARTIKA: Untuk angka-angka dan huruf-huruf yang tidak perlu diterjemahkan, tidak saya buat, mohon maklum tks
TOTAL	

From the above landscaping plan particularly at Oil palm planting area it will be divided into planting blocks. Each planting block is planned at the area of ± 25 Ha (250 m US x 1.000 M TB), the area of this block has been adjusted to the convenience in harvested produce distribution, transportation and Production. The implementation of building is

done in 2 (two) phases, first phase is conducted prior to land preparation work (temporary block) and second phase when it has been done the planting (permanent block). At certain condition due to topographical, river and other considerations, the area of block built is adjusted to the field condition. The area of 1 (one) sections is adjusted to the topographic condition and plantation management efficiency (maintenance and harvesting). In this plan the area of 1 (one) sections is determined at ± 750 Ha (30 blocks), each 8 (eight) sections it is made 1 (one) division, and subsequently for 1 (one) plantation it shall consist of 6 (six) divisions.

The locations of housing, offices, seeding, plant, and public facility should be located in the middle of plantation and close to the source of water spring available along the year. While housing and sections office should be located in the middle of sections and close to water source.

The interval and density of road to be built are adjusted to the condition of area and the width of block, while the road direction (US or TB) is adjusted to the type of road built. For Main road either it is on flat area or hilly area the direction of road built is North – South, the same applies for control road. While Production road on flat area the road built is in East-west direction, and on hilly area the Production road is built at crosswise position against the hill in spiral shape. For clearer information, this road re-arrangement will be described separately.

The equipment and materials needed in Plantation Re-arrangement and Landscaping plan are:

a. drawing pens of various sizes
b. drawing table
c. graphic paper and tracing paper
d. basic map of BPN (site permit), Contour map (Bakosurtanal / Consultant), Landsat image and Radar map
e. data and map of survey results (Consultant)

b. Construction phase (Year 0 to year 4)

1. <u>Land Preparation</u>

Land preparation is the activity of opening land originating from forest (primary or secondary) / bushes / reeds / peat moss/conversion / re-planting to be cleaned up from the existing vegetation as well as being processed and prepared for the planting and building of oil palm plantation infrastructure. The purpose of this land preparation is to prepare a clean planting area and is suitable for oil palm and its supporting facilities. Based on information, at PT BIO INTI AGRINDO, the land allocated for oil palm planting is mostly dominated by ex forest burning land taking the form of bushes, reeds, and secondary forest.

Since in the land preparation it is not justified any burning, then in proposed plan the land preparation is to be done by combined method between **manual system** and **mechanical system.** In addition by considering the width of area to open each year, the application of this combined system is highly supportive in the timely completion of land preparation work above. The end of land preparation work is area drying at those places in puddle and the planting of cover crop.

The sequence of land preparation work:

1) Survey and Bordering

Survey and bordering cover the block initiating work, the making of temporary block, the making of permanent block/re-measurement, and re-mapping. Particularly for block initiating work and the making of temporary block it is done simultaneously with survey work as has been described previously. As for the making of permanent block/ re-measurement and re-mapping is done after oil palm planting.

2) Land Clearing

The clearing of land from the existing vegetation at PT BIO INTI AGRINDO's land is distinguished for bushes land from secondary dry land forest.

a) The clearing of bushes land

The work of clearing ex bushes land can be done manually, mechanically, or the combined manual and mechanical.

> Manual system

This work starts from clearing / felling down and total imas , i.e. clearing and felling down all the existing vegetations by chopper / axe / chainsaw. Then it is continued with *merumpuk* work i.e. gathering and piling up the bushes from said imas according to the designed lanes. This work is done the same way both on flat land, wavy land and hilly land. The working procedure of this manual system is:

- Bushes and small trees (dia. < 10 cm) is cut / felled down closely to soil surface (maximum 5 cm from soil surface) using chopper/ axe
- Medium trees (dia. > 10 - 30 cm) is cut / felled down by chainsaw
- It is made *rumpukan of* piles by following the contour with the distance between *rumpukan* lane is 2 times the distance between plant rows (± 16.32 m) and the distance of *piles* in the lane is 25 m. the direction of *rumpukan* on flat land to wavy land is US, *rumpukan* direction on hill peak land is in crosswise position against the hill, while the *rumpukan* direction at hill slope follows the contour
- All of vegetations felled down are *rumpuk* at the piled lane with *rumpukan* width of maximum 2 m, and *rumpukan* height of maximum 1 m
- For hilly area, the *rumpukan* is done at the lane between terraces and conducted after the building of terraces

> Mechanical system

Mechanical land clearing, i.e. by using bulldozer is only effective for flat and wavy roads. The works of clearing / felling down and *merumpuk* all of existing vegetations use a bulldozer and is done simultaneously. The working procedure of this mechanical system is:

- It is made *rumpukan* of piles by following the contour with the distance between *rumpukan* lane is 4 times or 6 times the distance between plant rows (± 32.64 m or ± 48,96 m) , distance of piles in the lane is 25 m, and *rumpukan* direction is US

- All of the existing vegetations are pushed by bulldozer and straightly *rumpuk* by following the piled lane with *rumpukan* width of maximum 3 m, and *rumpukan* height of maximum 2 m

  The work quality expected from both systems is the planting land must be clean with a minimum barrier towards the planting, drainage and transportation

b) The cleaning of Secondary dry land forest

The cleaning of ex secondary forest land can be done manually, mechanically, and a combined manual and mechanical way. For ex secondary forest land existing at PT BIO INTI AGRINDO this will be done by combined system, i.e. manual and mechanical way. The working procedure implemented at ex secondary forest land is as follows:

> Manual system

* Bushes and small trees (dia. < 10 cm) is cut shortly close to soil surface (maximum 5 cm from soil surface) using chopper/ axe
* Large wood (dia. > 10 cm) is felled down by using chainsaw systematically with regular direction, starting from one side of block up to the other side of block. To reduce risk to forest with still dense woods, for one working block the felling down can be hanged first (trees are cut but not straightly falling down or called also as shadow fell down) until that block finished, only afterwards the last stem is actually felled down to make a serial felling down of trees for being over-stricken by the tree next to it
* The standard height of tree stump permitted is : tree's diameter is 10-25 cm, cut with maximum height from soil surface is 30 cm. Tree's diameter of 25-50 cm, is cut with maximum height from soil surface is 60 cm. Tree's diameter of above 50 cm, is cut with maximum height from soil surface is 100 cm.

* Trees already felled down are cut and chopped their branches and stems with maximum length of ± 2.5 cm for wood with dia < 60 cm and ± 5 cm for wood with dia > 60 cm
* It is made *rumpukan* of piles by following the contour with the distance between *rumpukan* lane is 2 times the distance between plant rows (± 16.32 m) and the distance of piles in the lane is 25 m. the direction of *rumpukan* on flat the direction of *rumpukan* on flat land to wavy land is US, *rumpukan* direction on hill peak land is in the crosswise position against the hill, while the *rumpukan* direction at hill slope follows the contour
* Trees and branches from said chops are *rumpuk* at the piled lane with *rumpukan* width of maximum 2 m, and *rumpukan* height of maximum 1 m
* For land to be terraced, PE*rumpukan* is done when the terrace making completed, i.e. by following the contour at areas between terraces

> Manual and Mechanical systems

* After felling down by chainsaw, branches and stems are cut
* It is made *rumpukan* of piles, i.e. on flat land up to wavy land the distance between *rumpukan* lane is 4 times or 6 times the distance between plant rows (± 32.64 m or ± 48,96 m) with US direction, at hill peak the distance between *rumpukan* lane is 4 times or 6 times the distance between plant rows (± 32.64 m or ± 48,96 m) is transverse to hill direction, at hill slope 2 times the distance between plant rows (± 16.32 m), at terraced area is along the terrace lips when the terraces are built. The distance between piles in the lane is 25 m
* Trees, stump and their branches are *rumpuk* by using a bulldozer according to *rumpukan* lane with maximum *rumpukan* width of 3 m and

maximum *rumpukan* height of 2 m. Before being cut and *rumpuk* , woods that are still usable have been removed first from the land.

The land preparation up to oil palm planting at construction phase (year 0) of 36.000 ha planted is given in the following table.

Table II-2. Land preparation & Planting Plan of Construction phase (year 0)
The construction of PT BIO INTI AGRINDO'S Oil Palm Plantation

Description	Project year 0 month											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Preparation: a. building base camp b. equipment mobilization 2. Survey and bordering/Mapping/ Area blocking 3. Road network construction 4. Land Preparation *): a. Doing the *imas* b. Felling down c. *Rumpukan* of piles d. chopping I e. *Merumpuk* f. Terrace building g. Reeds eradication h. Weed control i. Circle ditches 5. seedlings :												

a. Site selection b. Pre Nursery c. Main Nursery 6. Planting: a. Pile & hole b. Planting LCC c. Planting Oil Palm d. TBM nursery												

Remark : *) type of work is adjusted to land condition

NOTE TO MBAK KARTIKA : *** di dalam kolom 1 sd 12 tidak saya buat karena tidak perlu ditranslate (di dalam tabel, saya hanya membuat yang harus ditranslate)

3) The building of *rorak* and bulwark

Areas with slope are highly prone to erosion process so the erosion prevention and land preservation efforts must be conducted by among others building containing ditches (rorak) and water blocking bulwark . The benefits of rorak and bulwark are to reduce the rate of runoff from rainfall, capable of minimizing soil erosion and nutrient loss, capable of increasing the infiltration of water into soil, and capable of helping in maintaining soil humidity.

Containing ditches (rorak) is dead-end ditches (intermittent ditches) built on sloping area (1° - 6° or 1.7 – 10.5 %). Water blocking bulwark is compacted landfill made next to rorak, the soil of which comes from rorak dug. The building procedure of rorak and water blocking bulwark is:

a. According to the designated interval between roraks, it is done the piling of lanes to be roraked with the help of water pass and meter, in which the distance between piles in the lane is 4 m

b. It is dug the rorak first in accordance with the designated size, i.e. top width 0.50 m, bottom width 0.35 m, depth 0.60 m, and length 4.00 m. Rorak digging uses mattock , Scoop and crowbar at the pile lane where at pile spot rorak is cut or partitioned of 0.30 m wide

c. The dug soil is shaped by the size, i.e. the distance from rorak is 0.45 m, top width 0,40 cm, bottom width 0.60 m, and height 0.30 m. The compaction is done by beating with beam so it becomes a bulwark capable of blocking and resistant to runoff

d. The shape and size of rorak and bulwark to be determined by the help of mal of board

e. It needs to note that rorak and bulwark must be horizontal (water level), at disc location (2.5 m radius from pile) rorak and pile are not built

f. Interval between rorak for declivity 1° - 2° is 60 m, declivity 2° - 3° is 40 m, declivity 3° - 4° is 30 m, and declivity 4° - 5° is 20 m

g. The building of rorak and bulwark is done at the beginning of rainy season

4) Terrace building

The building of terraces constitutes one of land and water conservation efforts made at an area with wavy to hilly topography. According to the condition of area encountered at PT BIO INTI AGRINDO's site, at several locations (blocks) it will be built terraces for planting spot be it in the form of individual terrace or continued terraces (contour). The building of individual terrace or continued terraces (contour) will be adjusted to local situation and situation (block) according to the results of land survey.

a) Individual terrace (horse tread)

Individual terrace (horse tread) is a terrace built by crossing hill slope towards cliff / land-wall to form 10° - 15° angle (18% - 27%) at each planting spot so it is obtained a flat planting spot. Individual terrace (horse tread) is built manually at an area the

declivity of which is 8° - 15° angle (15% - 27%) and at the declivity of > 15° (> 27%) if it can't be built a continued terrace (contour).

The objective of building Individual terrace (horse tread) is :

a. To provide a suitable planting spot and a proper facility for nursery, fertilization, and harvesting activities at a wavy area
b. To reduce loss of nutrient through runoff and minimize the occurrence of soil erosion
c. To increase water infiltration into the soil
d. To prevent any loss of bunches

The building of Individual terrace (horse tread):

a. The width of firstly built Individual terrace (horse tread) is 3 x 3 m, then subsequently it is widened (starting from TM 1) so it shall become 4 x 4 m later
b. The building of Individual terrace (horse tread) is done at the same with the building of planting hole
c. The spots going to build an Individual terrace (horse tread) on must be pile well and pile is planted as deep as possible so during work it shall not change the planting spot
d. It is measured the width of Individual terrace (horse tread) at pile spot horizontally, then marked from end to end by mattock
e. Soil at the top section of cliff is dug from pile spot into hill's inside to form a 10° - 15° angle (18% - 27%) to as far as 60% (1,8 m) of Individual terrace (horse tread)'s width
f. The dug soil (point e) is piled up towards cliff at 40% (1.2 m) wide while being compacted one layer by one layer. Around the feet of Individual terrace (horse tread) it is built small bulwark of 25 cm wide, 15 cm high that gets smaller towards the flank
g. Planting hole is made with the size:

> top width 50 cm
> bottom width 50 cm
> deep 60 cm
> the dug soil from planting hole making is used as PENIMBUNG soil for the building of Individual terrace (horse tread)

h. The maintenance of Individual terrace (horse tread) at initial phase is checking any damaged terrace for immediate repair. Further repairing the surface of Individual terrace (horse tread) to keep forming a 10° - 15° angle (18% - 27%) into the inside of cliff/ hill wall / dug soil. Furthermore compacting the edge or small bulwark of Individual terrace (horse tread) by minimum 25% of the total quantity of Individual terrace (horse tread) at each relevant sections in one year.

b) Continued terraces (Contour terrace)

Continued terraces is terrace built at an area with the declivity of above 15° (27%) continuously at horizontal (level) direction so it is obtained a flat planting spot or road lane. The objective of continued terraces is :

1) To provide a flat and suitable planting spot or pathway and a proper facility to support the maintenance and harvesting activity at hilly area
2) To reduce the rate of runoff from rainwater
3) To minimize the occurrence of soil erosion and loss of nutrient
3) To increase water infiltration into the soil in order to maintain soil humidity

There are two types of continued terraces according to its functions and building method:

1) Manual terrace, i.e. terrace (width ± 1.5 m) used as path way that connects between Individual terrace (horse tread) at locations at which mechanical terrace can't be built
2) Mechanical terrace, i.e. terrace (width ± 4.5 m) used as planting spot and way (sidings of fruit, fertilizer, manpower etc)

The building of manual Continued terraces (Contour terrace):

1) The building of manual Continued terraces (Contour terrace) is done simultaneously with the building of Individual terrace (horse tread), i.e. at those locations where it was supposed be built mechanical Continued terraces (Contour terrace) but it couldn't be done due to some reason, e.g. no heavy equipment, the hill was too small etc
2) First it is drawn a line by mattock that connects between terrace pile (between planting spot pile)
3) At each planting spot pile it is built an Individual terrace (horse tread) by such manner described above
4) Then at the area between Individual terrace (horse tread) it is built manual Continued terraces (Contour terrace) by mattock , i.e. soil is dug towards hull to form a 10° - 15° angle (18% - 27%) as far as 1 m. The dug soil is dragged downwards while being compacted layer by layer to generate a terrace width of 1.5 m
5) Along the terrace lip it is made soil heap or bulwark with the width and height 30 cm each, then it is compacted by a beam so it shall not collapse during the rain

The building of mechanical Continued terraces (Contour terrace):

1) First it is measured the average percentage of declivity of slope by drawing a straight line from a spot at the highest place towards the lowest place with sloping angle of the average angle of declivity. At a spot the slope declivity of which is

same to the average angle of declivity obtained, it is measured and pile the distance between contours according to technical norms starting from the top of hill to the bottom of hill

2) At each of this contour pile , it is made a continued pile towards the left and right sides horizontally with 25 m interval by the help of compass or water pass along the slope
3) This contour pile is then become the reference in building terraces
4) The distance of pile depends on the declivity / slope, e.g. north –south direction its pile distance is 9.09 m, then east-west direction its pile distance is 8.33 m. With this distance, at each 100 m it will be found 11-12 terraces. From this spot of pile it can be done the piling for the whole area on water weighing basis
5) The work of Continued terraces (Contour terrace) building starts from a higher place towards the lower place
6) Then bulldozer stats digging the hill's slope from the connecting line between towards the hill, the dug soil is pushed towards the bottom section of terrace lip until it is found a sufficient terrace width (± 4.5 m)
7) Towards the front side, terrace built must be strictly flat (horizontal), while towards the hill the terrace base must be sloping towards terrace wall to form a 10° - 15° angle (18% - 27%)
8) During the building of terrace the dug soil outside of terrace should be crushed while pushing it so it is obtained a pushed soil which is compact and not easily collapsible

5) Drainage ditch (channel)

Drainage ditch (channel) is an artificial or natural ditch useful to dump water excess which is in general found at flat and lower areas. The objective of drainage ditch (channel) making is:

a) to prevent an area puddle from occurring

b) to decrease the surface of soil water so plant's roots shall not be interfered in nutrient absorption and breathing
c) to improve the efficiency in fertilizer use
d) constitutes one of soil and water preservation efforts

In addition to such ditch making objective as mentioned above, there is a type of ditch called plantation circling ditch made specifically to prevent the entry of pig pest into plantation area, and this plantation circling ditch can also function as boundary drain and as the outmost plantation area's borders. This type of ditch will be built at the site of PT BIO INTI AGRINDO in view of the pest high population. Types of drainage ditch:

a) Natural ditch, i.e. drainage channel or ditch formed naturally and functions to distribute water to a lower place. The function of this ditch is to channeling water from inside to outside of plantation
b) Dumping ditch, i.e. a ditch built to contain water from primary ditch and plantation circling ditch to be dumped to natural river
c) Primary ditch, i.e. a ditch built to contain water from secondary channel and flow it to the dumping area or to a place in need of water
d) Secondary ditch, i/e. a ditch built to contain water from tertiary channel to pass it on to primary ditch
e) Tertiary ditch, i.e. a ditch built to drain or flow excess water from inside a block to pass on to secondary ditch. This ditch is usually made inside a block and placed at a lower area
f) plantation circling ditch, i.e. a ditch built as ditch at the edge of plantation functioning in addition to ditch also as the outmost plantation area's borders as well as to prevent the entry of pests particularly pig pest

The cross section shape of drainage ditch (channel) is upside down trapezium or 'V' with the size as presented in the table below.

Table II-3. Types and sizes of ditch, the construction of PT BIO INTI AGRINDO's Oil Palm plantation

Type of ditch	Type of mineral soil		
	Top width (m)	Base width (m)	Depth (m)
1. Natural ditch 2. Dumping ditch 3. Plantation circling ditch 4. Primary (main) ditch 5. Secondary ditch 6. Tertiary ditch		NOTE TO MBAK KARTIKA: Untuk angka-angka dan huruf-huruf yang tidak perlu diterjemahkan, tidak saya buat, mohon maklum tks	

The building of drainage ditch (channel):

a. The lane to be built a ditch must be piled before on both sides at each 25 m distance. Particularly for Plantation circling ditch, the ditch lane follows the outmost area boundaries
b. Dumping ditch, Plantation circling ditch and primary ditch are built prior to the planting or piling. While Secondary ditch and Tertiary ditch are built after the planting
c. The building of ditch starts from the upstream or the higher section
d. Ditch is dug by using excavator or manually according to the size of each ditch
e. Primary ditch and Tertiary ditch are built at the same direction to that of planting lane (North – South), while secondary ditch East – West
f. At crossroads, ditches are built not exactly upright but a little veering towards water channel

g. Primary ditch is built at each 1000 m interval, Secondary ditch at each 250 m interval, while tertiary ditch is at each 2 or 4 or 8 or 16 stem rows depending on area moisture condition

h. The ditch's base surface must be straight and a little descending towards the downstream, it shall not be wavy following the soil surface

6) The building of Cover Crop

On such mineral soils as at the area of PT BIO INTI AGRINDO it is recommended to plant Cover Crop from lentils (LCC) species. Cover crop from lentil species is a spreading plant from leguminose class functioning to cover soil at threshold area between oil palm rows and between oil palm stems. The reason for selecting lentil species (LCC) to use as Cover Crop is:

a. Enriching soil fertility with N element due to its capability to have a symbiosis with Rhyzobium bacteria that is capable of fixating free N from the air

b. Enriching soil physical fertility through the formation of *HUMUS*, upgrading soil's aggregate stability as well as preventing and reducing erosion

c. Enriching soil biological fertility to its organic material contents which decay quickly

d. Minimizing the growth of weed

By the reasons above, the planting land covered by lentil will be guaranteed its sustainability viewed from the chemical, physical and biological fertility aspect, so it will indirectly be capable of increasing the productivity of Oil Palm crop itself.

There are some species of lentil commonly planted nowadays and meet the requirement, namely:

a. *Peuraria Javanica* (PJ); leaf is wide, grows fast but non-resistant to shade so it can't live long upon the meeting of oil palm's peaks

b. *Calopogonium mucunoides* (CM); leaf is wide, grows fast initially and when it has grown can live long and more tolerant to shade but prone to dry condition
c. *Centrosema pubescens* (CP); leaf is small and hairy, initial growth is quite slow, lives long and is tolerant to shade
d. *Calopogonium caeruleum (CC);* leaf is wide similar to PJ, tolerant to shade, initial growth is fast and when it has grown can live long
e. *Mucuna bracteata (MB) ;* known as bengok nut, grows fast, intolerant to shade, and is particularly good to use for quick cover at *rumpukan* of trees

The planting of lentil can be done by seeds and cuttings. In this plan the planting of lentil is done by seeds. Upon the planting of lentil it is done the nursery by cleaning up disturbing weeds growing around lentil and giving fertilizer in order to stimulate the growth of plant.

The building of Cover Crop (the planting of lentil) by seeds method is done as follows:

a. Seeds of lentil selected are the mix of PJ, CM and CP. If CP seed is hard to acquire (relatively expensive), it can be selected the mix of PJ and CM
b. The dosage applied is 11 kg of seeds per hectare with the composition 3 kg of PJ: 2 kg of CM : 3 kg of CP. If it is selected the mix of PJ and CM, then the dosage applied is 8 kg of seeds per hectare with the composition 3 kg of PJ: 5 kg of CM
c. Prior to being planted, lentil seeds shall be firstly inoculated with rhyzobium with ratio 10 kg – 15 kg of PJ, CM and CP mix + 250 cc water + 50 gr rhyzobium being blended evenly then dried by cooling down
d. The inoculated lentil seeds are mixed with RP (Rock Phosphate) fertilizer with ratio 1 : 1
e. Next, lentil is planted at row lane in the middle of threshold or for terrace area planted at terrace lip (space between terraces)
f. In order to guarantee success, it is recommended to do the planting at the beginning of rainy season

g. The planting is done in shallow holes made by mattock or in shallow hole rows made at each 50 cm distance with the interval between holes / rows is 150 cm as many as 4 holes / rows in the middle of North – South threshold or as many as 3 holes / rows at terrace lips. The distance of first holes / rows in the planting of lentil from oil palm rows is ± 175 cm.

h. After lentil seeds are thrown into the holes, said holes are covered with soil of 1 cm thick

i. In order to stimulate the growth of crops at initial stadium, when the crops reach 3-4 weeks of age they are given multiple fertilizer (NPK) 15: 15: 6: 4 with dosage of 15 kg /ha

j. When crops reach 3 months of age they are given RP fertilizer with dosage of 120 kg/ha, and when crops reach 6 months of age they are given RP fertilizer again with dosage of 150 kg/ha

k. Usually lentil has covered 100% when it reaches 4-6 months of age after the planting

The factor highly critical in the success of a cover crop building is selective Weeding. During the first months of manpower employment it feels too high to get lentil cover which is 100% pure. But this can be compensated by the low maintenance cost when the cover lentil crops have covered fully. During the initial period of 0 -3 months of age it is done selective weeding by once in 2 week rotation, then at the age of 4-6 months it is done once in 1 month.

In view of Oil Palm plants' habitus whose peaks have begun to meet at 4-5 years old, usually cover crops which are intolerant to shade can only exist up to 4-5 years old and afterwards replaced by natural cover crops growing spontaneous.

7) Oil Palm seedlings

Oil palm seeding is done in plastic bags consisting of 2 phases, i.e. **Pre Nursery** Phase for 2-3 months and **Main Nursery** phase for 9-15 months. The age of ready to distribute

seeds is 9-15 months starting from Main Nursery or 12-18 months starting from Pre Nursery. This two phase system gives several advantages among others:

a) At Pre nursery, young seeds are gathered in a smaller space of unit so the management is easier and cheaper
b) By seeds selection taken place before they are relocated to main nursery of approx. 10%, the need of land or big plastic bags is lesser
c) Young seeds are in pre nursery for 2-3 months which gives a sufficient time to prepare main nursery and there is no hurry
d) The possibility of sick, damaged or dead seeds during the relocation will be avoided if it is done carefully and in time

Quality seeds constitute an absolute condition that is critical for plants' success, such a seed can only be acquired from plant materials produced by seeding centers recommended by the authorized instances.

a) Source of seeds

Source of oil palm seeds (sprout) can be ordered domestically i.e. through
Marihat Oil Palm Research Center in Medan or from plantations already producing sprout and have been recommended by authorized instances such as Socfindo and Lonsum.

Beside of from domestic, oil palm seeds (sprout) can also be imported from overseas such as from Malaysia (FELDA). Source of sprout from overseas to meet the need of seeds is justified as long as it meets the procedure designated by the government. One of the procedure to be taken is among others a recommendation from the domestic source of seeds stating that they aren't able yet to fulfill the requested order. In this plan, the source of seeds (sprout) used for the planting at PT BIO INTI AGRINDO's area is the mix of imported seeds (FELDA) and seeds from domestic source.

b) The need of sprout

The need of sprout is determined from the planned planting distance of oil palm desired. In this proposed plan, the planned planting distance is 9.4 M x 9.4 M x 9.4 M of equal sides triangle with plants density of 130 stems/Ha. At plants density of 130 stems/Ha it is needed ± 180 sprout / Ha. This closely associates with the dead of sprout and seeds or selection on non-productive seeds at seeding stadium. Therefore, during the planting it will be obtained as many as 138 seeds/Ha including for stitching.

By considering the land productivity upgrading effort, for seeds (sprout) originating from domestic source it is recommended that the varieties of plants used conform to the decrees of the Minister of Agriculture of RI numbers 312, 313, 314, 315, 316 and 317/Kpts/TP.240/4/1985 as presented in Table II-4. While table II-5 presents the schedule and need of sprout in the construction of PT BIO INTI AGRINDO's oil palm plantation.

c) Transportation of seeds

From the source of seeds, sprout must be able to carry immediately by air-flight of Medan/Malaysia – Padang. To keep seeds' purity, it is recommended that the transportation is handled directly by the company.

d) Working plan

The working plan of seeds field building covers Site Selection, Land Preparation, the Procurement of materials and Equipment, soil Filling in small Poly-bags, sprout selection and planting, seeds nursery at *Pre Nursery*, piling, soil Filling in big Poly-bags, Seeds selection at *Pre Nursery*, Planting seeds in big Poly-bags, the nursery of seeds at *Main Nursery*, Seeds selection at *Main Nursery*.

Table II-4. Recommended Leading Varieties, the construction of BIO INTI AGRINDO's Oil Palm Plantation

No	Varieties	Origin of Mother	Productivity		
			TBS (ton/ha)	Oil (ton/ha)	Retainer (%)
1.	Delidura x Psifera H5 and E5	DP Dolok Sinumbah	NOTE TO MBAK KARTIKA:		
	Delidura x Psifera H5 x E5	DP Bah Jambi			
	Delidura x Psifera 424, 968	DP Marihat	Untuk angka-angka dan		
	Delidura x Psifera L2T, L7T, L9T & L14 T	DP La Me	huruf-huruf yang tidak perlu		
	Delidura x Psifera I 239 T, L 718 T	DP Yangambi	diterjemahkan, tidak saya buat, mohon		
	Delidura x Psifera SP 540 T	DP Avros	maklum tks		

Source : Marihat Research Center, 1985

Table II-5. Need of sprout , the construction of BIO INTI AGRINDO's Oil Palm Plantation

Year	Planting area (Ha)	Need of seeds (stem)	Inserted seeds (stem)	Total	Width of seeding area (Ha)	Need of sprout (grain)
0			NOTE TO MBAK KARTIKA: Untuk angka-angka dan huruf-huruf yang tidak perlu diterjemahkan, tidak saya buat, mohon maklum tks			
Total	36.000	4.680.000	288.000	4.968.000	420	6.480.000

Remark : The width of seeding area provided is ± 420 ha (six years of seeding) inclusive for facilities and infrastructure

e) The implementation of Nursery

To get a good plant seeds it is recommended to do a 2 Stage Nursery. For the first 3 months seeds are planted in small poly-bags then relocated to Main Nursery, until the plants are ready to be planted on fields (aged 9-18 months). The correct seeds' age to be relocated to field depends on several factors among others rainfall, field readiness, pest attack especially rats, hedgehog, pig, etc. Some of the requirements need to be

considered in determining the nursery location are: land is flat and free of flood as well as having a good drainage, water is available in a sufficient volume along the year, located in the middle of plantation site, and the nursery location should be close to emplacement (to ease control). In this plan, the proposed ideal nursery location is close to Bian river.

- Pre Nursery

The location of Pre Nursery is recommended to be close to Main Nursery location in order to avoid death risk of seeds and minimize transportation cost when relocating the seeds. For Pre Nursery it is used Poly-bag of 10 x 15 cm size or 14 x 22 cm size with 0.10 cm thickness. As filling material it is used good Top Soil layer with the requirement of approx. 1 kg per Poly-bag.

Since the distance of Padang/Malaysia – Medan is relatively far so to avoid damage to seeds on the way, it is recommended the sprout ordered be added by 5% from the original order. Damage to sprout may take the form of putrefaction, physical damage, or the broken end of sprout's bud. The characteristics of a damaged sprout are : future root or leaf is broken, future root or leaf does not grow, future root or leaf bends, future root or leaf grows in one direction, future root or leaf is short / blunt, and the rotten future root or leaf turns to red due to the attack by Brown germ fungus.

Types of activity conducted during pre nursery are : site preparation, embankment building, shade building, the posting of signage, the filling and arranging of small poly-bags, the planting of sprouts, watering, weeding, fertilizing, consolidation, pest and disease control, reduction of shade and seeds selection.

Sprouts are planted in plastic bags, then arranged at embankments in 1 x 10 M size (capacity 1000 sprouts per embankment) and provided with shade (50%). As shade material it can be used palm leaves or sugar palm leaves widely available at the site., furthermore shade will be reduced gradually, i.e. 40% when seeds reach 4 weeks of age, 30% when they reach 8 weeks of age, and become 30% when they reach the age of 10 weeks.

The care of seeds during Pre Nursery phase shall be highly critical for the success of nursery as a whole. During no rainfall days, seeds are watered twice a day (in the

morning and in the afternoon). During rainy days with rainfall volume of above 10 mm per day, the watering for that day is eliminated.

Weed control is done as requirement, weeds that grow inside Poly-bags to be immediately cleaned up by repealing them. Though pest and disease attack at the seedbed is not frequent, yet the preventive action must be taken still. In some cases, this pest control can be done by using insecticide with prescribed dosage. Initial fertilization is given on two-leaved Sprouts/ seeds (age 28-30 days), the fertilizer given is Urea with dosage 0.2% or 2 grams urea per liter of water, 5 liters of solution are usable for 100 seeds per application. This application is done through leaves fertilization. Fertilization with Compound 15.15.6.4 (NPK) given as the stimulant to supplement nutrient requirement with dosage of 0.2% per week is highly recommended. Fertilization with Slow Release material in which the form of fertilizer is tablet is recommended at the age of 1 month by planting it in an approx. 4 cm deep below the ground. Fertilization with this material will reduce the volume of work so the utilization of manpower shall be more efficient. Slow Release fertilizer in tablet form currently widely distributed in the market, its composition is almost the same to that of Compound fertilizer.

Before seeds at Pre Nursery are relocated to Main Nursery it will be firstly done a seeds selection. Seeds rejected / damaged are characterized from : seeds are turned because they are planted upside down, seeds that grow are stunted, seeds which are rigid and elongated like reeds, seeds which leaves are rolled, seeds the leaves of which are kinky, seeds grow furl and rigid, and seeds attacked by pest and disease. Seeds are selected when they reach the age of 3 months, with rejected quantity of seeds maximum 12%.

- Main Nursery

In Main Nursery, seeds from Pre Nursery are planted / relocated into Poly-bags of 35 x 50 cm size with 0.2 cm thickness which has previously been filled with Top Soil of approx. 20 kg per Poly-bag. To prevent Poly-bags from being damaged, the topside edge of Poly-bag is folded by approx. 5 cm long. Poly-bags are arranged on field at

90 x 90 cm x 90 cm distance of equal sides triangle. In one hectare it can be contained approx. 14.000 seeds.

Types of activity conducted at pre nursery are : site preparation, soil filling, the arrangement of large poly-bags, the making of signage, the relocation of seeds to large poly-bags, watering, weeding, pest and disease control, the giving of mulch, seeds selection, seeds census, and preparation for planting relocation.

The care of seeds at Main Nursery phase shall be highly critical for the success of plants on field. Watering is an absolute thing to do. Seeds being short of water their growth will be under pressure and show Sun-Scorch symptoms. At the condition when rainfall is < 7 mm it is needed 1-2 liters of water / Seed/ per 1 watering. In one day seeds are watered twice (in the morning and in the afternoon), therefore for each hectare of seeds it is needed approx. 28 m3 – 50 m3 water per day. Since the implementation of nursery is conducted in 2 years period, it is recommended that seeds watering is using Sprinkle Irrigation system. Water distribution should be made evenly and each seed receives water in sufficient volume. Any excess water is dumped through drainage ditches of 60 x 40 x 50 cm size. The weeding on weeds that grow both in plastic bags and in between must be destroyed by repealing them. Weeding in plastic bags can be associated with the effort to loosen soil during the fertilization. Fertilization to seeds should be done as recommended. Table II-6 depicts the dosage and frequency of fertilization during the seedlings at Main Nursery, Pests that attack seeds at Main Nursery are usually snail, bag caterpillar, spogonia, grasshopper, 'bugs' and 'cricks', while the diseases are 'anthracnose' and 'curvularia leaf disease'. Pests are generally eradicated by insecticide and diseases by fungicide. Some types of insecticide and fungicide commonly used are as presented in Table II-7 and Table II-8.

Further to get Oil palm seeds with high productivity it must be planted seeds that are really fertile. The criteria of seeds rejected / damaged at Main Nursery are : Seeds are stunted compared to the other seeds at the same age, seeds grow furl and rigid, seeds the leaves of which are collapsed and weak, seeds the leaflets of which are not open or split while the other seeds have opened perfectly, leaf-end conglobates like a cup, leaflet's shape is not perfect such as the leaflet depreciation is very sharp with midrib

stem, leaflet is very narrow, leaflet pieces are short, and leaflet pieces are composed very dense or very rare. Seeds selection is conducted at the ages of 6, 9, and 12 months.

Table II-6. Dosage and frequency of oil palm fertilization at 'Main Nursery'

The construction of PT BIO INTI AGRINDO's Oil Palm Plantation

Age (week)	Urea (Gr/Liter of water)	NPK 15.15.6.4 (Gr/Stem)	NPK 12.12.17.2 (Gr/Stem)	Kieserite (Gr/Stem)
NOTE TO MBAK KARTIKA: Untuk angka-angka dan huruf-huruf yang tidak perlu diterjemahkan, tidak saya buat, mohon maklum tks				

Source : Marihat Research Center , 1985

Remarks :

1. Urea fertilizer is dissolved into fresh water with concentration of 0.2% (2 gr/liter of water) then watered by gembor till evenly distributed (1 liter of solution for 100 seeds, then straightly added with NPK 15.15.6.4 at the dosage of 2 grams/stem spread evenly inside Poly-bag
2. afterwards seeds are watered as required to wash the fertilizer stuck to leaves

Table II-7 Types of insecticide, dosage and technique of application in eradicating several pests that attack at the Nursery, The construction of PT BIO INTI AGRINDO's Oil Palm Plantation

Type of pest	Type of insecticide		Dosage	Application technique
	Active ingredient	Trade name		
Pre nursery				
- Grasshopper	Carbofuran	Furadan 3G	2-5 gr/stem	Spread
- Night beetle	Deltametrine		2-3 cc/ltr of water	Spray
- Leaf bug	Deltametrine			Spray
- Fire worm	B. Thuringiensis		2-3 cc/ltr of water	Spray
- Bag caterpillar	Carbofuran		2-4 cc/ltr of water	Spread
- Cricket	Carbofuran			Spread
- Rat	Brodifacum		2-5 gr/stem	Bait
			2-5 gr/stem	
			2-3 baits	
				Spray
				Spray
				Spray
Main Nursery				
- Leaf bug			0.10%/2 mg	Spread
			0.10%/2 mg	Spray
- Mite			0.12%/2 mg	Spread
- Night beetle			5 gr/stem/1 month	Spread
		Toxic cake		Put
- Grasshopper			0.12%/2 mg	Spray
			5 gr/stem/1	Spread

- Cricket - Snail - Rat - Fire worm			month 5 gr/stem 2 pieces 0.12%/2 mg 5 gr/stem/1 month	

Table II-7 Types of fungicide, dosage and technique of application in eradicating several pests that attack at the Nursery, The construction of PT BIO INTI AGRINDO's Oil Palm Plantation

Type of disease	Type of fungicide		Dosage	Application technique
	Active ingredient	Trade name		
Pre nursery - Root disease - Anthracnose - Leaf spot Main nursery - Anthracnose - Curvularia sp - Pestalotiopsis sp	Mankozeb Mankozeb phosphate acid		2-3 gr/liter 2-3 gr/liter 2-3 cc/liter of water 0.10% / 2 mg 0.20% / 2 mg 0.20% / 2 mg 0.10% / 2 mg	Spray Spray Spray Spray Spray Spray Spray

- Drechslera sp				

2. Planting

Planting is the activity of planting oil palm seeds aged 9-15 months at the designated planting spots. The series of activities in this planting process are: developing the planting plan, piling, the making of planting holes, seeds preparation, transportation and yardage, seeds planting, and at certain locations it is conducted the fencing on newly planted seeds. By time, planting is distinguished in new planting, i.e. the planting done for the first time comprehensively at an area, and inserted planting i.e. the planting conducted to replace dead crops.

1) Planting plan

The construction of a 39.900 ha oil palm plantation belonging to PT BIO INTI AGRINDO in the implementation is proposed in 6 planting phases, i.e. as presented in the table below.

Table II-9 Oil palm Planting program, the construction of PT BIO INTI AGRINDO's Oil Palm Plantation

Description	Width of planting area (hectare)
Project year 0-1 (Phases I and II) Project year 2-3 (Phases III and IV) Project year 4-5 (Phases V and VI)	12.000 12.000 12.000
Total	36.000

The assumptions used to achieve the target of Oil Palm planting are as follows:

- The number of planters and nurses is sufficiently available
- The quantity and heavy equipment available is sufficient

- Season and climate are not different significantly to such condition when this analysis was made
- Land preparation uses mixed system (manual and mechanical)
- While plantation construction is done on own effort, for the implementation of such works among others land preparation and planting will be contracted to a competent contractor
- Effective working days are 300 days per year

2) Piling

Piling is the marking of planting spots by planting piles with a regular distance and rows pattern. The objective of piling is to give an equal access for plants to get sun-ray in order to produce an optimal growth with maximum production.
Based on land declivity, there are two types of piling:

- At flat area to wavy area (> 0° and < 15° or >> 0° and < 27%) the piling pattern used is equal sides triangle (five eyes)
- At hilly / wavy / highly sloping area (> 15° and < 40° or > 27% and <80%) the piling used is contour system with unequal sides triangle pattern

Based on its types, pile is distinguished by:

- Master pile; i.e. pile built at each interval of ± 100 m x ± 100 m (the folds of distance rows x the folds of distance between rows) with pile height of 4 m, the end of pile is colored in yellow. The quantity of this pile is 1 unit per hectare
- Head pile; i.e. row pile built with the interval conforming to planting distance in US direction and pile height 2.5 m, the end of pile is colored in red. The quantity of this pile is 1 row per hectare
- Content pile; i.e. pile built at each planting spot located between head piles with pile height of 1.5 m, the end of pile is colored in white. The quantity of pile per hectare conforms to the number of planting spots

Based on its functions, pile is distinguished by:

> planting pile; i.e. pile built for planting spot colored in white

> road pile; i.e. pile built for road lane plan colored in red

> ditch pile; i.e. pile built for ditch lane plan colored in blue

The essential planning in piling is determining the planting distance that pertains to population (density) of plants per hectare. Planting distance is determined by considering the types of seed used, soil fertility and rainfall. Planting distance commonly used at mineral area such as at PT BIO INTI AGRINDO site, is:

- Plants population 128 – 130 stems per hectare, the density of these plants is reached with planting distance 9.42 m of equal side or 9.42 m (distance in row – US) x 8.16 m (distance between rows – TB)

- Plants population 132 stems per hectare, the density of these plants is reached with planting distance 9.09 m of equal side or 9.09 m (distance in row – US) x 8.33 m (distance between rows – TB)

- Plants population 136 stems per hectare, the density of these plants is reached with planting distance 9.21 m of equal side or 9.21 m (distance in row – US) x 7.98 m (distance between rows – TB)

- Plants population 142 stems per hectare, the density of these plants is reached with planting distance 9.02 m of equal side or 9.02 m (distance in row – US) x 7.81 m (distance between rows – TB)

According to the types of soil, climate and seeds used, in this plan the population of plants per hectare proposed at PT BIO INTI AGRINDO's site is 130 stems. This population is achieved with planting distance of 9.40 m x 9.40 m x 9.40 m in equal sides triangle composition or 9.42 m (distance within rows – US) x 8.16 (distance between rows-TB)

The plants piling (population 130 stems per hectare) at flat to wavy area (> 0° and < 15° or > 0% and < 27%) is done by the following method:

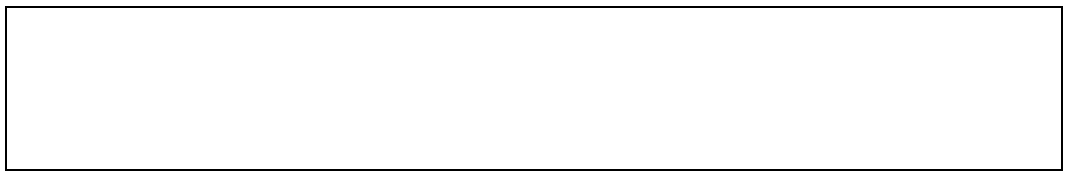
- At initial phase it is built master pile (pile's height is 4 m) at the four sides with the help of theodolite at each interval of 94.20 m (distance folds within rows is 10 stems, US direction) x 106.08 m (distance folds between rows is 13 stems, TB direction)

- Then it is continued by the building of head pile (pile's height is 2,5 m), i.e. the row of piles among master piles the distance of which is 9.42 m US. This activity uses small steel wire of 100 m long already equipped with a mark per 9.42 m

- At each overlay or flat plane it is built a pile basin of ± 1 ha wide, i.e. between 4 master piles. It is this pile basin that will become the reference to built piles around it through shooting. First it is routed a 110 m wire already given a marked per 8.16 m TB direction from one master pile to other master pile, then at the marked spot (per 8.16 m) it is plugged content pile (pile's height is 1.5 m). Then it is routed a 100 m wire with distance mark per 9.42 m US direction between 2 content piles starting from the first row following the row of head piles, in which at each mark on wire it is plugged content pile, then continued up to the last row from pile basin sequentially, where in each move the wire row is shifted in US direction into ½ distance in the row.

- Further, for area beyond pile basin, it is done the piling by shooting method i.e. shooting the meeting of three different row directions by referring to the existing head piles and content piles. For this, three persons each acting as shooter towards one same spot, while another person plugs content piles and assisted by another person as the carrier of pile child.

- An illustration of piling system is shown in the figure below:



NOTE TO MBAK KARTIKA : KARENA ISINYA TIDAK BISA DITRANSLATE, JADI TIDAK SAYA BUAT TKS

Remarks

(gambar bintang)	master pile
(gambar wajik)	head pile
[redacted]	dead pile
°	content pile

The piling of plants (population 130 stems/hectare) at hilly / mountainous / highly sloping area (> 15° and < 40° or > 27% and <80%) used is contour system with unequal sides triangle pattern. The implementation of plants pile making is done by the following method:

- First it is done measurement on the average slope declivity angle by compass or inclinoemeter (angle metering device)
- Distance within rows at contour system is the same to such distance in rows at equal sides triangle system (five eyes). As for the distance between rows in contour system is the same to the projected distance between rows at equal sides triangle system (five eyes) with the real distance according to declivity is as follows:

Declivity	`interval between contour (m) Population 130 stems/ hectare
0° to 15°	NOTE TO MBAK KARTIKA:

	Untuk angka-angka dan huruf-huruf yang tidak perlu diterjemahkan, tidak saya buat, mohon maklum tks

- At spots the slopes' declivity of which are same to the average declivity's angles obtained, it is measured and piled the distance between contours according to technical norms starting from hill-top to the bottom side
- At each of these contour piles, it is further made continued pile towards the left and right sides horizontally with interval 25 m by the help of compass or water pass along the slope
- Once the terrace building has completed, at said piling starting point it is again plugged a reference pile at each contour terrace the direction of which is straight from the top towards the bottom of slope
- Then at the first terrace, it is made subsequent piles to the left and right of said reference pile with the interval conforming to the distance beween stem rows. Then at the second terrace it is plugged two piles to the left and right of reference pile at ½ the distance in rows from reference pile, then reference pile is repealed and the piling is continued to the left and right at same interval with the distance between rows. Next on, odd terrace is same with first terrace and even terrace is same wih second terrace.
- At hilly area it is no need to make a master pile or head pile, except that at a flat hill peak section it can be made a head pile as reference. The piling pattern formed at a hill's slope usually has the enqual sides triangle shape.

3) `the making of planting holes

Planting holes should be made one week before the implementation of planting, hole's shape is cylinder with upright wall. Hole's diameter is 50 cm and hole's depth

is 60 cm. Topsoil dug is put to the north of holes while the sub-soil is to the south of holes.

The making of planting holes is done by the following method:

- At each pile it is made hole circle of diameter 50 cm with pile as the center of circle, afterwards pile is repealed
- Holes are dug by mattock / scoop following hole's diameter as deep as 60 cm, the wall must be upright
- Topsoil (0-30 cm) is put to the north of holes, while the sub-soil (30 -60 cm deep) is put to the South of holes
- Holes are measured by mal of hole, if mal is unable to enter yet then holes must be fixed until the mal of hole is capable of entering the holes

4) Seeds preparation

Seeds to be planted should have reached the age of between 9-18 months and have passed selection. One to two weeks before seeds are planted, seeds must be rotated. For seeds having the age of above 12 months their leaves should be shaved first by 1 m high. What's need to be cared for prior to the relocation of seeds to the field, they must be watered until saturated.

The preparation of seeds that needs to do for the planting on field is:

- group of seeds to be planted must be checked and selected two weeks prior to the planting. Rejected seeds must be removed and destroyed
- one week before the planting, seeds must be rotated to cut those roots getting into the soil and give a chance for the growth of new root's hair prior to the planting on field. In addition, this is to give a chance for seeds to adapt after the rotation
- one day before the planting, seeds that have passed the selection and have been rotated are gathered into groups for each one trip of transporting. For seeds aged above 12 months their leaves are shaved first at 1 m high so when it is planted on field their leaves shall not collapse or tend

- in the morning prior to carrying them to the field, seeds must firstly be watered until saturated

5) Transportation and Yarding

In transporting seeds it needs to consider when getting them onto the truck, arranging them on the truck, getting them down from inside the truck and yard them on the field. Lifting seeds to get them onto and down the truck as well as yarding them on field shall not by carrying the leaves but it must be held the bottom section of poly-bag, while their arrangement inside the truck is maximum two levels. One planting block must be planted with one seed variety and shall not be mixed. The condition of seeds upon arriving on field must be kept as such so their condition is the same to the condition during at nursery.

The working procedure of seeds transporting and yarding is:

- on the truck basin, seeds are arranged in two layers, i.e. firstly it is arranged one layer densely then inbetween of seeds' butt it is arranged another layer until basin is full
- once the basin is full, vehicle to go to the planned planting location according to the types of seeds. Run the vehicle carefully (low velocity) to avoid any shock to seeds
- on arriving at the planting location unload the seeds carefully, for one unloading point the seeds unloaded are ± 50 stems at the interval of unloading point as needed
- from the unloading point, seeds are taken to field by barrow or by using hanging yoke to each planting point (hole)

6) Planting

The seeds planting working procedure on field is as follows:

- Check first the size of planting hole, i.e. it must conform to the requirement. If it does not suit to the size of mal (maybe collapsed), hole must be re-fixed
- Blend topsoil with 0.5 kg RP fertilizer (per hole) till distributed evenly then insert it into the hole and spread evenly at 10 cm thickness
- Seeds are collapsed, poly-bag's base is slashed by using a razor blade then released
- Next, seeds are introduced into the hole with upright position and exactly in the middle of hole, then poly-bag's side is slashed (poly-bag is not released yet)
- Around the poly-bag is backfilled with topsoil+RP mix until a half of high, then the poly-bag already slashed is released
- Then the backfilled soil around polybag is compacted, afterwards hole is backfilled entirely with topsoil+RP mix while being compacted by stepping around it, so seeds can stand upright and shall not easily be collapsible by wind
- Planting pile is again plugged around the planted seeds, then the used polybag is hung at the end of pile wood
- Once the planting completed, at the afternoon (the same day), the polybag hung at the end of pile must be picked up by planting foreman while counting the seeds already planted

7) Fencing

At certain locations at planting area it needs to do the fencing of plants (individual fence). The objective of this fencing is to avoid the newly planted seeds from being attacked by pests particularly hedgehog pest. Plants fencing is done by the following method:

- material for fence is brought to the pre-designated location
- material of fence is made of hard wood, then plugged around the plants at radius 0.5 m as many as 4-6 stakes

- if fence material uses plate zinc, then it is needed plate zinc with the size of 280 x 45 cm, which is then wound around the wood stake circle, afterwards nailed at the top and bottom sides of said plate zinc, then stake is hit so part of zinc's bottom side gets into the soil
- if using barbed wire, the barbed wire is wound aound the stake circle while being nailed at each stake starting from the bottom as many as 7 levels at 8 cm distance, then stake is hit once again so the wire winding gets tightly close with soil
- if using board, board of 2 x 25 x 70 cm is nailed at the stake around stake's circle as many as 2 levels
- If using bamboo, split bamboo of 5 cm diameter and 1 m long is nailed around stake's circle horizontally as many as 5 levels at the distance of 8 cm starting from the bottom to the top
- If using 'pest guard' net, net is wound around stake's circle while being nailed at each stake on its top and bottom sides

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3. ***Non-producing plant (TBM) Nursery***

1) Hunting reeds

If any reed grows it must be eradicated immediately. This work is done manually or chemically. By manual, it is used fork. Reed is forked so all rhyzomas get out, then clipped or put upon the cuts of palm midrib. By chemical method, it is used wiping system by using reed killer such as Dowpon or Round-up. The rotation of work is carried out once in a month or as needed

2) Weeding

On mineral soil all types of grass except lentil must be cleaned up. selective weeding is done so he growth of pure lentil keeps being maintained. Harvesting road and control road are carded clean. Disc is carded clean at 1.3 m radius. All woods, kittens, jarongan,

whitens and bamboos are dug out so the roots are all removed. Then those woods are clipped as in the eradication of reeds

3. Fertilization

Before fertilizer is applied, plant's disc must be in clean condition. Fertilziation is done at the beginning and at the end of rainy season in order to avoid fertilizer being washed out. In view of fertilizer's expensive price amnd for efficiency, the fertilization work should be done on internal manpower under the supervision of assistant Section. The correct fertililization dosage is suggested to follow recommendation from the study result on land fertility and the unity of leaf sample

4. Castration

Castration is the removal of male , female or neutral flowers when oil palm crops have reached 14-20 months of age. The benefits of this castration are among others to eliminate sources of disease due to the presence of fruit bunches not yet qualified to harvest, more uniformed and JAGUR vegetative growth so the production can be improved more, the first harvesting of bunches can straightly be sent to the plant for having met the harvesting requirement, and the time of first harvesting can be arranged as planned. Castration shall at least be done once in every 4 (four) months, young flowers are gathered and then dumped at threshold

5. Pollination

Polinating insects to use are by optimizing local polinating insects. So, it is not introduced foreign insect (Elaedobius camerunicus) to avoid any negative impact of the foreign insect that might change the ecosystem chain.

6. Shooting effort

Plant at the age of 18 months should be removed its sand TUNAS, all of old leaves at the bottom side are cut close to stem and the cuts are heaped at threshold, this work is useful to ease the cleaning up of disc

7. Pests and Diseases control

Oil palm crops located at field are not free from the attack of pests and diseases either. Pests frequently attacking are rat, pig, fie worm, and bag caterpillar. Rat is eradicated by

using toxic bait. Pig is controlled by hunting or shooting, and for more effective way is by making plantation circling ditches.

Bag caterpillar and fire worm are eradicated by using insecticide currently distributed in the market among others Thuricida, Bactosfein etc. In handling this fire worm and bag caterpillar it must be remembered not to let the attack spreads within a relative short time. therefore it is needed to run an 'early warning system'. By this method a regular census on caterpillar population will be able to warn in the event that any explosive attack of pests is going to occur, so the preventive act can be taken quickly and correctly.

Some diseases commonly attacking are crown disease, Ganoderma sp and Marasmius. It is known that crown disease is caused by genetic factor and its eradication is by not using sprouts from a mother having the characteristics. Up to presently it is not found yet any powerful method to eradicate Ganoderma sp disease which usually shows symptoms at the Productive Plant (TM) age. Marasmius disease can be avoided by doing plantation sanitation.

4. ***The building of Road network***

Road meant here is land transportation facility, i.e. it can at least be passed by four wheeled vehicles as transportation lane at oil palm plantation. Another type of road that can only be passed by two wheeled vehicles or human (carry/harvesting road) is not discussed in this sub-chapter.

Road network system constitutes one of the most important factors in supportng and guaranteeing the smoothness of transportation particularly for materials of plants' requirement, the gathering and transportation of products to plant. The opening of road network to be built should be adjusted to the topographic condition and requirements at the plantation (the width of area). The shape and area of block will affect the length of road needed. In the construction of PT BIO INTI AGRINDO's plantation, the area in 1 (one) block is 25 Ha (250 m US x 1000 M TB)

Based on their functions, types of those roads above are distinguished as follows:

a. Axis road

Axis road is the road connecting plantation office, plant and plantation gate (asphalted road) which is built in TB and US directions (according to field condition). The function of this road is as transportation facility from inside to outside of

plantation (asphalted road) and vise versa as well as it is frequently passed by trucks of 15- 20 tons capacity. This road is used to transport CPO and Kernel to asphalted road, in addition it is used also for the transportation of plantation facilities and infrastructure (e.g. fertilizer) from the outside to main warehouse at the offices complex and the transportation of production (TBS) to the plant.

b. Main road

Main road is the road connecting plantation office, nursery location and plant to each section. The function of this road is for the transportation of production (TBS) to the plant or required materials to section. This road is built at each 2 (two) planting blocks or each 2000 M in North-South direction and upright to Production road

c. Control road

Control road is the road located inside section that connects between Production road. This road serves to ease supervision by plantation management (foreman, assistant, Head assistant and Manager). In addition, Control road is also used as the transportation road of production facilities such as fertilizer and drugs. Control road is built at each 2 (two) planting blocks or each 2000 M in North-South direction and upright to Production road.

d. Production road

Production road is fruits gathering road inside section which is upright to Main road and leads to Control road / Main road. This suits to a harvester, a normal distance to PIKUL fresh fruit bunches (TBS) of oil palm to production gathering road where it is built a TPH (Yield /TBS gathering place) is 125 M. Production road is built at each 1 (one) planting block or each 250 M in East-West direction

The sizes of the abovementioned roads' parts are as presented in the following table.

Table II-10. Sizes of parts of Axis, Main, control, and production roads, The Construction of PT BIO INTI AGRINDO's Oil Palm plantation

No	Part of road	Axis road	Main road	Control road	Production road
1	Width of area belonging to road Width of road body Width of road-shoulder Width of road ditches Width of street side Depth of road ditches Road interval Road closeness *) Road direction				

Remark *) highly depending on topographic shape, in the planning of said road closeness it is corrected between 1,3 – 1.6 according to the situation and condition of PT BIO INTI AGRINDO's area.

Area belonging to road

Road side road ditches road-shoulder road body road-shoulder road ditches road side

Figure II-3. Sketch of road construction

The working procedure in said road network building is as follows:

a. The building of road is based on the pre-designated area blocking

b. At flat land to wavy land, the building of road is done simultenously with land preparation activity, while at hilly land it is done after land preparation (trees felling down)

c. At left and right sides of the lane to built a road are posted piles at the border of ditch edge according to the respective type of road (0.9 – 2.5 m from the nearest planting piles) with interval between piles is 25 m

d. Lane between two rows of piles is cleaned up from wood stumps, big stones and other objects by using bulldozers

e. Road body is shaped by grader while flattening road body and making road ditches, where the dug soil of ditches is moved to the middle of road. The shape of road is convex like bamboo with declivity 2.5 ° (5%)

f. For crossing road, the declivity of road cliff is maximum 60°. While the declivity of ascending road is 7 ° (12%)

g. Road body and road-shoulder are compacted by 3-4 times of compactor (roller) grinding

The working procedure of the abovementioned road hardening is as follows:

a. road body and road-shoulder are shaped and flattened back by grader

b. it is done the compacting of road body and road-shoulder by compactor (roller)

c. a suitable and ready available stone-sand is spread onto road body. For axis road the thickness of sirtu layer is 20 cm (two times the application @ 10 cm), while main road, production road and collecting road, the thickness of sirtu layer is 10 cm (one time application). Sirtu spread onto road body is flattened by grader

d. sirtu layer on road body is compacted by compactor (roller) until a half part of sirtu layer is submerged into road body

e. if sirtu layer can’t be compacted and shifts to road-shoulder (frequently occurs due to vehicles traffic), then before being compacted it must be done first a raking by grader to blend and bind sirtu with soil

f. at those points where water is usually puddling and trapped in road ditches because there is no dumping road, it is made an absorbing hole (basin) of 1 x 1 x 1 m inside block at the distance of ± 10 m from road side

g. at the point where the absorbing hole is unable to contaimn excess water (usually at swamp road or lower road), it is made dumping ditches towards the lower part (swamp) in road cutting direction and covered further by posting small POLONGAN or small titi

h. dumping ditches have 50 x 50 cm size from road ditches towards absorbing hole

5. <u>The procurement of facilities and infrastructure</u>

The non-plant physical building (infrastructure) is absolutely needed to support all plantation activities such as the building of Company's building, housing building, plant, the procurement of transportation facility etc

1) Offices and housing buildings

The construction of offices and housing buildings should meet the following requirements:

a) office building should be able to accommodate all of administrative activities, while Housing building should be able to accommodate all employees and staffs

b) protected from rain and the walls are not humid

c) light that enters is sufficient, sun-ray is not directly exposed

d) bulding ventilation is adequate

e) rainwater does not puddle at yard

f) the envitonmental health is adequate by completing water facility for household purpose, having a trash dumping area, avoiding sourcing places of disease such as water puddle

g) WC location is not too close to houses and dug well

h) If possible it can be provided a yard at the back of house for planting vegetables and raising livestock

Company buildings consist of master office, Section office, warehouse, workshop, vehicles garage, water cleaning installation and mess

2) Transportation equipment

To smoothen the activities, Management, staff and assistants are provided with various types of vehicles such as Rocky, Kijang and Trail motorcycle. For TBS transportation from field to Plant, both in rainy season and dry season it is used truck, truck pool and Wheel tractor. As for the transportation of Palm Oil (CPO) and oil palm kernel (PKO) it can be used Tank truck by land road

6. *The construction of Oil Palm processing Plant*

* The construction of Plant

The width of area allocated for plant and IPAL is 80 Ha. The site of PT BIO INTI AGRINDO's oil palm processing plant is planned to have a distance of ± 800 meters from Bian river.

The water body to use for this plant, both as source of water and waste containing body is Bian River. A sufficient supply of water source is one of the most important factors that must be considered in determining the location of a plant site.

The selection of this plant site has been done by taking into account the presence of commonly applicable boundaries, among others with regard to the use of water source from river so that the supply of water need for processing shall run all along the year. The ideal topography to select for a plant is a flat one, however for the building of loading ramp it is needed a place higher from Sterilization unit so it needs to do a landfill.

The selected location has a quite good land supporting capacity, since land must be able to support all buildings and equipment of the plant built on it.

In addition, the plant site must be free from flood and has a good drainage, another consideration to note is the direction of wind frequently occurring at the site, it must be ensured that the smoke from plant's chimneys does not pollute air within the employees' housing complex or the surrounding community, including its noise level.

The supporting facilities of PT BIO INTI AGRINDO's oil palm processing plant built covering: weighing bridge, TBS receiving and Loading ramp, Sterilization station, Thresching station, Pressing station, Clarification station, Depericarping station, Kernel extracting station, Kettle station, Power plant, CPO stockpile tank, oil trap recovery, Effluent treatment and sludge decanter system, water supply pond, Office building, Laboratory, Workshop, Worshipping place and Guarding Post.

* The building of IPAL

The building of Waste water Treatment Plant (IPAL) intended to manage liquid waste from plant operation is planned by an-aerobic / aerobic working system. The location of IPAL will be close to plant at ± 200 meters.

c. Operation phase

1. ***Productive Plant (TM) Nursery***

1) Hunting reeds

If any reed grows it must be eradicated immediately. This work is done manually or chemically. By manual, it is used fork. Reed is forked so all rhyzomas get out, then clipped or put upon the cuts of palm midrib. By chemical method, it is used wiping system by using reed killer such as Dowpon or Round-up. The rotation of work is carried out once in a month or as needed

2) Weeding

Oil palm disc with the radius of 1.5 – 2.0 M must be clean to ease the strumming of 'brondolan' and inline with the increase of plant's age then disc can be enlarged. In order to avoid any cavity the direction of scratching must be changed once in each month. Carrying road and Harvesting road need to be cleaned up. 'gawangan' should be cleared away lightly with the frequency of once in each 2 months, and to improve the efficiency

of ‘gawangan’ weeding it can be used herbicide with the frequency of once in each 6 months.

3) Shooting effort

Shooting effort is conducted by ‘songgo dua’ system, which means that two leaves under the oldest fruit bunches to be cut at the next harvesting rotation are left and the rest are cleaned up. Shoots should be as close as possible to the stem and with the shape of outward horse palm to avoid any brondolan from getting caught during the harvest. Leaf midrib resulting from shooting effort is cut into two then put at the ‘gawangan’ not used as Carry road. During the shooting effort, fern species, male flower and rotten fruit are also discarded.

a) Fertilization

fertilization policy on Productive Plant (TM) constitutes the combination of age, production, rainfall, fertility, and leaf analysis. Therefore there is no universal dosage of fertilization for all plantations. Notwithstanding a tentative fertilization dosage can also be given as shown in the following table.

Table II-11. Fertilization dosage of Oil palm plant (Kg/stem) by the age of plant,

Type	0	1	2	3	4-5	6-13	>14
Mineral soil Urea RP KCL Kieserit Borax	NOTE TO MBAK KARTIKA: Untuk angka-angka dan huruf-huruf yang tidak perlu diterjemahkan, tidak saya						

	buat, mohon maklum tks						

Remarks : * at plant's hole

x Janjang ash is applied once in each 3 years as the replacement to KCI

xx dolomite is applied once in each 3 years

b) Control on plant's pests and diseases

Oil palm crops located at field are not free from the attack of pests and diseases either. Pests frequently attacking are rat, pig, fie worm, and bag caterpillar. Rat is eradicated by using toxic bait. Pig is controlled by hunting or shooting.

Bag caterpillar and fire worm are eradicated by using insecticide currently distributed in the market among others Thuricida, Bactosfein etc. In handling this fire worm and bag caterpillar it must be remembered not to let the attack spreads within a relative short time. Therefore it is needed to run an 'early warning system'. By this method a regular census on caterpillar population will be able to warn in the event that any explosive attack of pests is going to occur, so the preventive act can be taken quickly and correctly.

Some diseases commonly attacking are crown disease, Ganoderma sp and Marasmius. It is known that crown disease is caused by genetic factor and its eradication is by not using sprouts from a mother having the characteristics. Up to presently it is not found yet any powerful method to eradicate Ganoderma sp disease which usually shows symptoms at the Productive Plant (TM) age. Marasmius disease can be avoided by doing plantation sanitation.

2. ***Yield pickup (harvesting)***

Oil palm crops having reached the age of approx. 30 months usually have started producing (sand fruit) and can be harvested soon. By the use of leading plant and a correct technical culture, it is expected that the bunches' weight has reached approx. 4-5 kg.

4) Harvesting preparation

At least 6 (six) months prior to the start of harvesting, Carry Road, Harvest Bridge, Yield gathering place (TPH), Main road and Production road have already constructed.

5) Carry Road

Carry road is built with North – South direction, width 1 meter and length to follow the rows of plants. For each two rows of plants it is made one Carry Road

6) Yield gathering Place (TPH)

Yield gathering Place (TPH) is built to gather harvesting yield on the relevant day prior to being carried to plant. The size of TPH is 3 x 3 M and must be clean from dirt and weed interference.

7) Harvest Bridge

Harvest Bridge can be made of bamboo, wood or reinforced concrete with the width of approx 40 cm and length as needed. For a long-term investment the Harvest bridge should be made of reinforced concrete. The function of Harvest Bridge is to cross drainage ditches for the smoothness of fruits transportation from inside the plantation to TPH.

8) the criteria of Yield pickup

An Oil palm plantation field is already harvestable when it meets the requirements: harvest population 60%, bunches' weight is 4 kg in average, and harvest spreading rate is 5.

Since harvesting is a work to do along the economic age of plants, then it is recommended to implement the harvesting by plantation's workforce. This closely connects to manpower's skills in order to achieve the maximum crops productivity. Furthermore, in connection to area's topography it is recommended that harvesting is done by fixed random system.

To achieve the productivity desired, it should be defined the basic criteria of harvesting the rate of which depends on the age of crops, annual production, topography, climate and working hours.

All bunches ready to harvest can be cut by harvesting tools, i.e. chisel or 'egrek', and it must be ensured that no harvest ready bunches are left behind. Branch cut must have the

shape of horse palm tilting outward and closing tightly to stem. As for the criteria of harvest ready bunches are as presented in the table below.

3. ***Waste water control***

The control on Oil palm waste water has come to a technological challenge in the future. By the widening area of plants and the increasing quantity of Oil Palm processing plant, pollution issue must be handled since the beginning.

On February 1, 1991, the State Minister of KLH issued Decree no. KEP-03/MENKLH/II/1991, concerning Quality Standard of liquid waste for any operating activity as presented in the table below.

Table II-12. Quality Standard of liquid waste for Oil Palm Industry.
The construction of PT BIO INTI AGRINDO's Oil palm plantation

The maximum debit of waste of 6 M3 per ton of product		
Parameter	Maximum degree	Maximum pollution load
1. BOD 2. COD 3. Suspended solid Total : 1. Oil and Grease 2. NH3-N (Total ammonia) 3. pH	NOTE TO MBAK KARTIKA: Untuk angka-angka dan huruf-huruf yang tidak perlu diterjemahkan, tidak saya buat, mohon maklum tks	

According to Processing Material Balance it is obtained that in each 1 ton of Clean Oil produced it will occur 2.44 tons of waste water with the composition:

- water : 2.30 tons

- NOS (non oil solid) : 0.12 ton
- Oil : 0.02 ton

Based on BOD, waste water of Oil Palm plant ranging between 25.000 – 40.000 ppm is still higher than the applicable regulation (500 ppm), however though waste water is free from toxic material its waste's characteristic is easy to get rotten (Bio degradable) so it is relatively easy to handle it.

The handling of Oil Palm plant's waste water is recommended to use combined method of An-aerobic and aerobic decomposition, since up to today the method is still the best method. The handling on Oil Palm plant's waste is conducted on 3 different types of phase, i.e.:

1) Preparation

Drab water dumped out by Plant, to be firstly pumped to Oil extracting Basin (Drab basin).

Water dumping from extracting basin is firstly neutralized at the tank with the addition of Alkali to increase the pH of Waste (pH 7). Then waste water is pumped up to cooling tower to decrease its temperature to become approx. 45º C - 50 º C so bacterial may live there. Next, the cold waste water is channeled to Breeding pond with the addition of bacterial.

2) Anaerobic decomposition

The principle of this treatment is to decrease BOD with the help of bacterial in a deep pond, without an aeration. Bacterial will add the organic material to become Methane gas and Carbon dioxide. This method is recommended to use 2 (two) 2 serial ponds, where the last pond has the longer hydraulic containment period.

3) Aerobic decomposition

The principle of Aerobic decomposition is by catalyst , bacterial will oxidize organic material at an open aeration pond. This method may decrease BOD. Up to this phase waste water can already be released to river.

Waste water treatment by 3 phases above has already capable of decreasing BOD which is originally 25.000 ppm to become 100-200 ppm

4. ***Recruitment of Manpower***

The manpower procurement plan for PT Bio Inti Agrindo is divided into 2 (two) groups, i.e. : local manpower and cross-regional workforce (AKAD). The recruitment of manpower for PT Bio Inti Agrindo is prioritized for local manpower (≥ 70%) and AKAD (≥ 30%) and subsequently the composition will change according to the preparedness level and working skills after the provision of training and education to local manpower.

The recruitment of plantation manpower at construction phase, covers manpower for the activities: land opening, non-plant physical construction, seedbed and seedlings, land and water conservation, plant nursery as well as the construction of plant and IPAL. The number and specifications of PT Bio Inti Agrindo's manpower are presented in ***Table II-13 and Table II-14.***

Table II-13. The number and specifications of PT Bio Inti Agrindo's manpower

No	MANPOWER SPECIFICATIONS	THE EXISTING MANPOWER (PERSON)
1	Permanent manpower A. SENIOR PLANTATION MANAGER B. ASSISTANT HEAD C. HEAD OF ADMINISTRATIVE DEPT D. ASSISTANT SECTION AND TRACTION E. SECTION HEAD	
2	MONTHLY AND DAILY EMPLOYEE A. HEAD OFFICE B. SECURITY FORCE C. WORKSHOP D. TRACTION E. SECTION	

	LOOSE DAILY WORKER	
	TOTAL	3.092

Table II-14. The recruitment of Manpower for Oil Palm processing Plant

No	MANPOWER SPECIFICATIONS	MANPOWER RECRUIMENT PLAN (PERSON)
1	PERMANENT EMPLOYEE A. PLANT MANAGER/HEAD B. ASSISTANT PROCESSING C. ASSISTANT LABORATORY / ENVIRONMENT D. ASSISTANT ENGINEERING (PLANT'S MACHINARY) E. HEAD OF PLANT ADMINISTRATION DEPT.	
2	MONTHLY AND DAILY EMPLOYEE A. PROCESSING (PRODUCTION) MANPOWER B. LABORATORY/ENVIRONMENT MANPOWER C. ENGINEERING MANPOWER D. ADMINISTRATIVE MANPOWER E. DRIVERS AND DRIVERS ASSISTANTS (CPO AND KERNEL TRUCKS) F. SECURITY FORCE	
	TOTAL	240

d. Post Operation phase (year > 25)

Post-operation phase constitutes the final phase of this oil palm plantation construction activity. At post-operation phase, it will be conducted land rehabilitation / reclamation activity which constitutes the recovery of area's function from plantation area back to become forest area.

T this land rehabilitation / reclamation activity, these oil palm crops aged 25 years which are no longer productive are then cleared away to subsequently be planted with forest plants (reforestation) so the plantation area is recovered to its initial condition, i.e. forest area.

C. CONNECTION BETWEEN THE ACTIVITY PLAN AND OTHER SURROUNDING ACTIVITIES

The other activity components existing around the working area are the oil palm plantation of PT Papua Agro Lestari, PT Ulilin Agro lestari, and PT Pusaka Agro Makmur.

LIVING ENVIRONMENTAL COLOR

A.PHYSICAL-CHEMICAL COMPONENTS

1. Climate

The calculation results by Scmidt & Ferguson method, the location of PT Bio Inti Agrindo's which was observed from the nearest Weather Observatory station (Tanah Merah Meteorology station) during observation period of 1997-2006, is included in Climate A type with Q value 0%. The climate affecting Ulilin district in Meruake regency is Tropical climate.

Based on the pattern of rain type it is classified as type A, i.e. an area with one rainfall peak. A relatively high rainfall occurs in April (432 mm/month), and a relatively low rainfall occurs in August (286 mm/month). The average annual rainfall is 4.196 mm/year with total rainy days of 252 days/year.

The rain intensity showing the rate of rainfall per rainy day, the highest one occurs in April, i.e. 20.57 mm/hh. In average it is ± 16.65 mm/hh, if applied into the Criteria and procedure of determining Protected Forest and Production forest - Kep. Mentan no. 837/Kpts/Um/11/1980, concerning the Criteria and procedure of determining Protected Forest ; and Kep. Mentan no. 683/Kpts/Um/8/1981, concerning the Criteria and procedure of determining Production Forest - it is include in low rain intensity category (I2). Data of rainfall and rainy days at Tanah Merah Meteorology station during the last ten years (1997 -2006) is shown in Table III-1.

Table III-1. Data of Climate at PT Bio Inti Agrindo's Oil palm plantation area

No	Parameter	Month												Total / average
		Jan	Feb	March	Apr	May	Jun	Jul	Aug	Spt	Oct	Nov	Dec	
1	Rainfall (mm)													
	Rainy day (hh) Intensity (mm/hh)													
	Air temperature (ºC)													
	- Average - Maximum - Minimum													
4	Humidity (%)													
5	Water balance													
	1. CH													
	2. Air temperatur													

	e													
	3. Standard daily ETP													
	4. Correction factor													
	5. ETP													
	6. CH-ETP													
	7. APWL													
	8. KAT													
	9. dKAT													
	10. ETA													
	11. Surplus													
	12. Deficit													
	13. Ro													

Source : Tanah Merah Meteorology station (1997 to 2006)

GRAFIK

NOTE TO MBAK KARTIKA : KOMPUTER SAYA APLIKASI GRAFIKNYA TIDAK BERFUNGSI JADI TIDAK BISA SAYA BUAT

Figure III-1. Graphic of Rainfall and Water Balance in the territory around the study area

The measurement on micro climate elements, i.e. temperature and air humidity was done at several locations, i.e. at Protected area, Plantation area, and Open area (Open land). Based on the vegetation cover, the measurement was done at the ex-felling down area and non forested area. The measurement was done between 11.00 am to 13.30 pm in good sky condition.

Area with the type of non-forest vegetation cover had a higher temperature than that of forested area. The highest temperature resulting from said measurement at non-forest area was 32.6 ºC.
Air humidity are the study area ranged between 81% to 85%, with the implementation of measurement on daylight, which showed that the air humidity at reserved area was quite high. The condition of micro climate (air temperature and humidity) is given in detail in Table III-2.

Table III-2. The condition of micro climate at the area of PT Bio Inti Agrindo

No	Observation location	Temperature (ºC)	Humidity (%)	Land allocation
1	Ex felling down			Protected area
	Ex felling down			Plantation area
	Ex felling down			Plantation area
	Non forest			Settlements
	Non forest			Base Camp

2. Geology and Land's Shape

Based on Geological Map of Papua Province at Scale 1: 1.250.000, type of rock at the study area consists of one type of rock i.e. mixed rock between sandstone and pebble (Qs), visually, the spread of types of rock at the study area is presented in Figure III-2.
Land System at the study area is included in MWA land system group, i.e. nicked ex beach plain land system including the flat small remains. The spread of land system is given visually in Figure III-3.

3. Physiographic and Shape of Territory

Based on the planimetric measurement on slope class map sourcing from Radar Image Map of DEM SRTM, slope A class (flat) is more spacious compared to slope B class (sloping). In detail, the class of slope found at the study area is presented in Table III-3, with the spread as illustrated in figure III-4.

Table III-3. Slope class at PT Bio Inti Agrindo's Oil palm plantation planned area

No	Slope classification (%)	Class	Area (hectare)	Percent (%)
	Flat (0 – 8)	A		
	Sloping (8-15)	B		
	Total			

Source : Radar image Map of DEM SRTM

4. Hydrology

The working area is included in Bian and Fly watersheds. Most of natural drainages within the project's area are drained to Bian river. This river is not affected by seawater's tidal pattern.

Table III-4. The area of DAS at the study area of PT Bio Inti Agrindo

Name of DAS	Location at the study area	Area (Hectare)	Percentage (%)
Bian	Western part of study area		
Fly	eastern part of study area		
Total			

Source : Radar image Map of DEM SRTM

- Morphometry of DAS

On Hydrological basis, the study area is located in DAS territory of Bian and Fly. Rivers existing around the area and flow into the working area of PT Bio Inti Agrindo are S.Bian of ± 80 km long and ±40 m wide and Fly river of ± 50 km long and ±60 m wide. The area of Bian's DAS is 37.148 hectares and Fly's DAS is 2.752 hectares.

- Sediment load

The effect of erosion that occurs in the study area will cause a sedimentation at those rivers passing the area. The magnitude of erosion shall be parallel with the rate of erosion that occurs. The results of analysis on sedimentation load for each DAS are presented in Table III-5.

T\able III-5 Sediment load of DAS in the study area (LOA)

No	DAS	Effective area (ha)	Debit (m3/day)	Erosion		SDR (%)	Qs (ton/day)	Sediment	
				Ton/ha/year	Ton/year			Ton/m3	Gr/lt
1	Bian								
2	Fly								

GAMBAR PETA FORMAT LANDSCAPE di hal III-4

(TIDAK BISA DITRANSLATE)

Figure III-2 Geology Map at PT BIO INTI AGRINDO area

GAMBAR PETA FORMAT LANDSCAPE di hal III-6

(TIDAK BISA DITRANSLATE)

Figure III-4 Slope Class Map at PT BIO INTI AGRINDO area

GAMBAR PETA FORMAT LANDSCAPE di hal III-5

(TIDAK BISA DITRANSLATE)

5. Water quality

The quality of river's water available within the study area is in general good, shown by the physical appearance of water, i.e. smell, taste, temperature, color, turbidity and dissolved solid substance. The people use river's water for their daily needs (MCK), water abundance is available the whole year.

Observation/measurement on the quality of river's water both physical and chemical characteristics was conducted in situ / on field and laboratory. The parameters of physical characteristics observed were: pH, ammonia, chloride, fluoride, total hardness, nitrate, nitrite, sulfate, arsenic, iron (Fe) etc.

The temperature of water in those rivers existing at the study area ranges between 25.0 – 26.0 ºC, temperature at S Mandob outlet (DAS of Fly) is relatively same with the temperature at S. Hut outlet (DAS of Bian). The value of dissolved solid is between 152 - 158 mg/l, the concentration of dissolved t solid at S. Mandob outlet (DAS of Fly) is higher than it is at S. Hut outlet (DAS of Bian). The turbidity of river waters ranges between 0.2 – 0.5 NTU, turbidity at S. Hut outlet (DAS of Bian) is higher than it is at S. Mandob outlet (DAS of Fly). A detailed information on the quality of river's water existing at the study area is presented in Table III.6.

Table III-6. The physical and chemical characteristics of water at PT Bio Inti Agrindo's area

No	Parameter	Unit	S Mandob outlet (DAS of Fly)	S. Hut outlet (DAS of Bian)	QUALITY STANDARD
I	Physics				
	1. Smell		Does not smell	Does not smell	Does not smell
	2. Taste		Does not taste	Does not taste	Does not taste
	3. Temperature *)				
	4. Color				
	5. Turbidity	NTU scale			
	6. Dissolved solid substance				
II	Chemistry				
	7. pH				
	8. ammonia				
	9. chloride				
	10. fluoride				
	11. total hardness				
	12. nitrate				
	13. nitrite				
	14. sulfate				
	15. arsenic				
	16. iron				
	17. cadmium				
	18. chromium				
	19. manganese				
	20. mercury				

	21. lead				
	22. copper				
	23. zinc				
	24. organic substance				
	25. chloride				

*) in situ analysis by field survey team

GAMBAR PETA FORMAT LANDSCAPE di hal III-9

(TIDAK BISA DITRANSLATE)

Figure III-5. Map of DAS at PT BIO INTI AGRINDO'S area

GAMBAR PETA FORMAT LANDSCAPE di hal III-10

(TIDAK BISA DITRANSLATE)

Figure III-6. Map of area's functions (regional spatial arrangement) at at PT BIO INTI AGRINDO'S area

6. Air quality

The air quality to be observed at the study area covers several parameters among others: carbon monoxide, nitrogen dioxide, sulfur dioxide, oxidant, ammonia, hydrogen sulfide, hydrocarbon, dust, humidity, and noise.

The quality of air at the plantation area is natural enough, since the condition of cover crops is the form of oil palm plantation so up to presently the air quality at the study area is relative good and the noise level is still quite comfortable < 65 dBA (the permitted threshold of comfort).

7. Space, Land, and Soil

a. Regional Spatial Arrangement

based on the Map of Forest and Waters areas, the status of agreed forest at the study area is included in Conversion Production Forest (HPK) as presented in Figure III-6.

b. Cover Crops

based on Landsat Image TM5 Band 542 Path 100 Row 65 of 2007, the study area consists of several types of cover crops as presented in Table III-7. The type of bushes cover crops is more dominantly at the study area as presented in Figure III-7.

Table III-7. Types of Cover crops at the study area of PT Bio Inti Agrindo

No	Type of cover crops	Area (hectare)	Area (%)
1	Secondary dry land forest		
	Bushes		
	Open land		
	Total		

Source : Landsat Image TM5 Band 542 Path 100 Row 65 of 2007

c. Soil

based on Map of Land System and Land Suitability RePPProt serial of 1986, scale 1: 250.000, type of soil at the study area is included in Podsolik soil (Paleustuffs). According to erosion sensitivity level, Podsolik soil type is classified as prone to erosion (T4). The spread of types of soil existing at the working area is presented in Figure III-8.

- Physical characteristics of Soil

The physical characteristics of Soil reviewed cover texture, bulk density, porosity, and soil permeability. Those three soil characteristics close associate with the rate of erosion occurring, as one of factors in determining erosion according to USLE.

Soil texture (composition of soil compiling particles) determines the water arrangement in soil in the form of infiltration, penetration velocity, as well as water binding capability by soil, so it is highly determinative to the rate of erosion to occur. Soil texture at the study area includes dusty clay up to sandy clay. The soil texture at the area of PT Bio Inti Agrindo's plantation is presented in detail in Table III-8.

Bulk density (specific gravity) shows the undisturbed aggregate weight of soil per volume unit. This parameter constitutes is an input in \the calculation on the weight of eroded soil. The rate of soil transportation through this erosion has a close correlation with the rate of soil's specific gravity (BD). Soil at the plantation area of PT Bio Inti Agrindo has the specific gravity between 0.75 – 1.41 g/cc (Table III-8). This condition causes a relatively high infiltration rate, sol the runoff becomes relatively smaller.

Porosity constitutes the quantity percentage of empty spaces (macro and micro pores) in a certain volume unit. The value of soil porosity at the study area is classified very high (46-\ 71%) as presented in Table III-8.

Soil permeability shows the soil capability in letting through water in saturated condition. The rate of permeability value highly depends on the texture and structure of soil. Soil permeability at the study area varies from moderate (2.17 cm/hour) to very high (14.25 cm/hour) as presented in Table III-8.

Table III-8 the physical characteristics of soil at the construction area of PT Bio Inti Agrindo's Oil palm plantation 1)

No	Sample code	Texture of 3 fractions (%)			Bulk density	Porosity	Water degree (% volume) at pF				Drainage pore (% volume)			Water available	Permeability
		Sand	Dust	Clay	Gr/cm3	(%)	pF1	pF2	pF 2.54	pF 4.2	Rapid	quick	Slow	(% vol)	Cm/hour)
1															
2															
3															

4															
5															
6															
7															
8															
9															
10															
Top limit															
Average															
Bottom limit															
KK (%)															

Remarks: 1. Analysis results of SEAMEO BIOTROP laboratory Bogor
2. tested at SK = 95%

- Chemical characteristics of Soil

Soil's chemical characteristics reviewed are: soil reaction (pH), replaceable AI, replaceable alkali (Ca, Mg, Na and K), kation exchangeable capacity (KTK), C-organic, N-total and P-available. The criteria of soil's chemical characteristics assessment is done based on the assessment from Soil research center (1983).

Soil reaction at the study area is sour with pH value varies between 4.50 to 5.20. AI content is low to moderate.

Alkali content at the study area is low to moderate, with alkali saturation low to moderate. C-organic content is low to very high, N-total content is very low to moderate, P-available content is in general very low. The low content of this element is affected by soil composing key material which is low in nutrient. The chemical characteristics of Soil is presented in detail in Table III-9.

Table III-9 Chemical characteristics of Soil at the construction area of PT Bio Inti Agrindo's Oil palm plantation 1)

No	Sample code	pH (1:1)		C-organic (%)	N-total (%)	C/N	P-available Bray I (ppm)	dd alkalis (extract of NH4-Acetate 1,0 N pH 7,0 (meq/100 gr)					KTK (meq/100 gr)	Alkaline saturation (%)	AI/H dd (meq/100 gr)	
		H2O	KCl					Ca	Mg	K	Na	Total			AI	H
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
Top limit																
Average																
Bottom limit																
KK (%)																

Remarks: 1. Analysis results of SEAMEO BIOTROP laboratory Bogor
2. tested at SK = 95%

- Erosion

Based on USLE equation, the erosion rate occurring is affected by rain erosivity factor (rainfall and rainy days), erodibility (soil's physical-chemical characteristics) , length and

angles of slope as well as land cover / use and land conservatory act. The estimation on erosion rate was made on various area's sloping and types of vegetation covers.
The estimation on erosion rate was made from sloping area to quite sloping area with cover type of ex felling down forest vegetation (LOA). The rate of erosion estimated to occur at the study area for each land unit (LTI) is presented in Table III-10.

Table III-10. the estimated erosion rate at the construction area of PT Bio Inti Agrindo's Oil palm plantation

No	Land unit	Type of soil	Erosion (ton/ha/year)
			LOA
		Podsolic	
		Podsolic	

GAMBAR PETA FORMAT LANDSCAPE di hal III-14
(TIDAK BISA DITRANSLATE)

Figure III-7 Map of cover crops at PT BIO INTI AGRINDO's area

GAMBAR PETA FORMAT LANDSCAPE di hal III-15

(TIDAK BISA DITRANSLATE)

Figure III-8 Map of Soil at PT BIO INTI AGRINDO's area

B BIOLOGICAL COMPONENTS

1. Onshore biota

a) flora/Vegetation

Based on the field survey , species of flora/vegetation and wood potential at the study area are presented in Table III-11

Table III-11 Wood potential per hectare in average at the construction area of PT Bio Inti Agrindo's Oil palm plantation *) in the entire forest (ex Felling down)

No	Type of tree	\quantity (stem / ha) and volume (m3/ha) of trees in diameter class											
		30-39 cm		40-49 cm		50-59 cm		60 cm and up		50 cm and up		30 cm and up	
	Resak												
	Matos												
	Mersawa												
	Other meranti												
	Bintangur												
	Forest guava												

	Medang												
	Forest nutmeg												
	Kelat												
	Pine												
	Acacia												
	TOTAL												

Source : *) forestry service of Papua province, 2007

b) Non-wood forest produce and protected vegetation

based on the survey results and interviews with local community as well as by referring to PP number 7 of 1999, it was identified some types of non-wood forest produce and protected vegetation existing at the working area of PT Bio Inti Agrindo as presented in Table III-12

Table III-12 non-wood forest produce and protected vegetation existing at the working area of PT Bio Inti Agrindo as presented in Table III-12

No	Type of vegetation	Criteria	Diameter limits (cm)	Remark
1	Rattan			All are protected because they are needed for human's interest and as a feed for wild animals including protected wild animals
	resin	Sap producer	< 50	
	Matoa	Fruit producer	< 50	
	Olive	Fruit producer	< 60	
	Canary	Fruit producer	< 60	
	Forest jackfruit	Fruit producer		
	Lawang wood	Oil producer	< 25	
	Orchid	Flower producer		

The types of non-wood forest produce identified at the study area are rattan, fruits, and sap and oil producing woods. Species of fruits which are potential and used by human and wild animals for their daily life, are among others matoa.

Plant which is extracted its sap is resin. Resin tree (Agathis damara) is usually utilized by community for illumination (torch light) at the night.

c) Fauna

the species of wild animals living at the study area are among others (1) mammalian : boar (Sus crofa), cuscus (phalanger gymnotis), Tree kangaroo (dendologus ursinus), and deer (Cervus timorensis), (2) Aves : cassowary (casuarius casuarius), Fish eagle (Pandion halietus), big beak parakeet (Tanygnathus megalorinchos), blue chest cendrawasih (Ptiloris magnificus), and yellow crest Cockatoo (Cacatua galerita), and (3) Reptile : fresh water crocodile (Crocodilus novaeguineae), and lizard (Varanus gouldi). Data on wild animals and the remaining habitat condition is presented in Table III-13.

Table III-13 identified species of wild animals at the area of PT Bio Inti Agrindo

No	SPECIES	REGION'S NAME	STATUS	Quantity	PROTECTION REGULATION/LAW	HABITAT
A	MAMMALIAN					
	Macrooididae					
	Denrolaqus ursinus	Brown tree kangaroo	Protected		PP number 7 of 1999	Plain forest and hills, arboreal (living and sleeping on forest floor)
	Phalangeridae		Protected		PP number 7 of 1999	
	Phalanger gymnotis	Dotted cuscus				Plain forest and

						mountain, living on trees
	Cervidae		Protected		PP number 7 of 1999	
	Cervus timorensis	Deer				Plain forest, swamp and hills
	Suldae		Not protected			
	Sus crofa	Boar				Plain forest and mountain
B	REPTILE					
	Crocodylidae		Protected		PP number 7 of 1999	
	Crocodylus novaeguinaeae	fresh water crocodile				Swamp, spring, lake, slow current muddy river, active in the night
	Varanidae		Not protected			
	Varanus gouldii	Lizard				Plain land and

						mountain, living on trees and water
C\	AVES					
	Columbidae		Protected		PP number 7 of 1999	
	Goura cristafa	Mambruk				Plain forest and mountain
	Tanygnathusidae		Protected		PP number 7 of 1999	
	Tanygnathus megalorinchos	big beak parakeet				Plain forest and mountain
	Philorisidae		Protected		PP number 7 of 1999	
	Ptiloris magnificus	blue chest cendrawasih				Plain forest and mountain
	Bucerotidae		Protected		PP number 7 of 1999	
	Rhyticeros plicatus	Taon-taon (papua's hornbill)				Plain forest and mountain

	Cassuaridae		Protected		PP number 7 of 1999	
	casuarius casuarius	Cassowary				Plain forest and mountain
	Psiticiadae					
	Frichaglossus goldiei	Green parrot	Not protected			Plain forest and mountain
	Psittacidae	yellow crest Cockatoo	Protected		PP number 7 of 1999	Plain forest and mountain
	Cacatua galerita					
	Psittacidae		Protected		PP number 7 of 1999	Plain forest and mountain
	Lorius domicellus	Red parrot				

2. Aquatic Biota

a) Plankton and Benthos

plankton comprises of two species i.e. phytoplankton and zooplankton, pythoplankton species found at river waters of study area ranges between 4 -9 taxa with individual quantity of 176.868 – 273.350 /m3, diversity ranges between 1.32 – 1.52, uniformity 0.60 – 0.85 and dominance 0.14 – 0.36. The presence of zootoplankton at waters in addition to depends on water quality also to the abundance of phytoplankton as its source of feed. The existing species of zooplankton ranges between 1-2 taxa with with individual

quantity of 1.068/m3, diversity 0.19, and dominance 0.50-1.00. The detailed data of phytoplankton and zooplankton species existing at the waters of study area is presented in Table III-14 and Table III-15.

Benthos is one of aquatic biota components living at the base of waters, benthos' life is affected by basic substrate, current velocity, turbidity / clarity, and chemical and biological factors. Benthos identified at the study area comprises of 2 taxa with individual quantity ranges between 1.034 – 1.256 /m3 as presented in Table III-16

Table III-14 the abundance of phytoplankton at waters around the study area

ORGANISM	OBSERVATORY STATION	
	S Mandob outlet (DAS of Fly)	S Hut outlet (DAS of Bian)
BACILLARIOPHYCEAE		
Cymbella sp		
Gysasigma sp		
Nitzschia sp		
Diatoma sp		
Surirella sp		
Navicula sp		
Cocconeis sp		
Fragillaria sp		
MYXOPHYCEAE		
Number of taxa		
Individual quantity /m3		

Diversity index (H)		
Uniformity index (E)		
Dominance index (C)		

Table III-15 the abundance of Zooplankton at waters around the study area

ORGANISM	OBSERVATORY STATION	
	S Mandob outlet (DAS of Fly)	S Hut outlet (DAS of Bian)
PROTOZOA		
ROTIFERA		
COPEPODA		
Number of taxa		
Individual quantity /m3		
Diversity index (H)		
Uniformity index (E)		
Dominance index (C)		

Table III-16 the population of benthos at waters around the study area

ORGANISM	OBSERVATORY STATION	
	S Mandob outlet (DAS of Fly)	S Hut outlet (DAS of Bian)
CRUSTACEAE		

GASTROPODA		
Number of taxa		
Individual quantity /m3		
Diversity index (H)		
Uniformity index (E)		
Dominance index (C)		

b) Nekton / fish

the presence of fish at waters is affected by water quality, phytoplankton, zooplankton, and other small fish. The loss of certain fish species constitutes a clue that the environment has suffered a change to such a condition not good for fish life, since there has occurred a degradation to environmental quality.

Based on interviews with people around the river, all of the rivers have the almost same diversity. Species of fish which are important and have economic value existing at the study area are among others: (1) arowana, (2) gabus, (3) catfish, (4) bolana and (5) river shrimp

C. SOCIAL ECONOMIC AND CULTURAL COMPONENTS

Based on the division of territories according to governmental administration, the Working Area is included in the territory of Papua province, Merauke regency, exactly in Ulilin District.

1. Demography

a) structure of population

family members in the district around the study area are 4 persons in average, the population of male people in each district is always bigger compared to female as presented in Table III-17

Table III-17 population and ratio of genders in kampongs in the district around the study area of PT Bio Inti Agrindo

No	Kampong	Head of family	Male	Female	Qty	Ratio

1						
2						
Total						

Source : Results of field survey in the ANDAL study for the Oil palm plantation of PT Bio Inti Agrindo in Ulilin district, 2008

b) Population level

Ulilin district has a territory area of 1.573 km2 with population density of 3.01 persons/km2. The most spacious kampong is Mandekman kampong of 163 km2 with population density of 1.57 persons/km2, while the most populated kampong is Kumaaf kampong with population density of 5.89 persons/km2 and territory area of 123 km2. The population density in kampongs in Ulilin district, Merauke regency, is given in detail in Table III.18

Table III-18 The territory area and population density of kampongs in the district around the study area of PT Bio Inti Agrindo

No	Kampong	Area (km2)	Population (persons)	Density (persons/km2)
1				

2				
Total				

Source : Results of field survey in the ANDAL study for the Oil palm plantation of PT Bio Inti Agrindo in
Ulilin district, 2008

2. Social Economy

The prospective Oil Palm Plantation of PT Bio Inti Agrindo is located in Ulilin district (expansion from Murting district) , Merauke regency, Papua province. Kumaaf kampong is the capital city of Ulilin district so compared to the other kampongs it is relatively better with relatively more complete facilities. Ulilin people are the owner of communal land of said plantation's prospective area. This district is located to the north of Muting district. The people's houses are made of board (walls and floors) and roof of zinc.

Based on said reference of communal ownership, the scope of study area for social economy is Ulilin district, as the receiver of direct impact from the construction activity of oil palm plantation.

a) Accessibility

In fact Ulilin district can be reached by four-wheeled vehicle, but because there is no sufficient bridge or crossing facility yet for cars on Bian river, so it is still used motorcycle or by chartering an 'ojek' from Merauke.

b) Livelihood

Almost all the population do the relatively same activity in fulfilling their living requirement. The population's livelihood activity is conducted more to meet their primary needs and of subsistent nature, i.e. food for the family, anchoring sago in the forest, hunting deer, pigs and crocodiles as well as fishing in the river. As for the higher level of requirements (secondary, tertiary) it is inadequate. Main livelihood is nomad dry field and hunting.

In Kumaaf kampong there are livelihoods that produce money, i.e. hunting deer, kangaroo, cassowary, crocodile and fishing on Bian river, and working on dry field.

* Deer (Cervus timorensis russa) hunting

Deer hunting can be done either in the morning or in the evening. Hunting in the evening is usually easier than that of in daylight. Equipped with torch and chopper, archer or air rifle, the hunting can be begun. Usually with a dark condition in the night and helped by a torch, a hunter only has to imitate deer's voice, the nearest deer will come close and quickly with the help of the torch the deer shall be easily slashed by chopper; if the deer is at a far distance, and the hunter carries an air rifle, the deer will be shot.

To make it easier, hunting on daylight is usually assisted by a hunting dog. With a strong smelling, the dog will hunt a deer easily, almost no deer shall be capable of getting free from the munich of this hunting dog. When this happens, the hunter only has to use their arch, and the hunting finished. The hunting result can be sold through an 'ojek' driver to be taken to Merauke. Currently the price of deer from hunters to collecors is ± 8000 – 10.000 /kg purely with no bone. The price of deer meat in Merauke is currently Rp.30.000 – rp. 35.000 per kg.

* Kangaroo / Yamay (Dendrolagus spp) hunting

kangaroo hunting can be done either in the morning or in the evening. Hunting in the evening is easily done by using motorcycle, since this animal usually wandering around on an open field, so a hunter can shoot his air rifle while riding on a motorbike. This exciting hunting may generate a dozen of kangaroo within four to six hours. The price of a big kangaroo in Kindiki kampong is approx. Rp. 50.000 per animal.

The meat of this kangaroo is usually sold to Merauke city also in fresh meat or in processed form usually smoked meat. Kangaroo from Macropodidae, is classified in animal with pocket (infra class : marsupialia) and mammalian (class : mammalian).

This species of animal only exists in Papua and is included in protected animals even though its population is quite abundant due to so many hunting done on this mammalian. Since 70'an kangaroo has been prohibited to hunt and protected by law.

Name for this animal suits the way it lives. Tree kangaroo lives on trees though it sometimes gets down to the ground for drinking. This group used to live among the thick forest and bushes.

Ground kangaroo has far smaller front feet compared to its rear feet, its tail sharpens at the end and has no hair. Its muzzle is not too sharp and has no hair as it does tree kangaroo. Its claws are also smaller.

In Papua there exist three species of tree kangaroo. Tree kangaroo comes from denrolagus clan . Those most frequently encountered are from dendrolagus goodfellowi species, with dark brown skin.

In Papua there are five species of ground kangaroo from dorcopsis, wallabsis, and thylogale species. These species live at coastal area to mountain area and their body length is up to approx. 1 meter.

* Cassowary (casuarius casuarius) hunting

Hunting cassowary is usually using a kind of trap, i.e. in the form of cage made of sago leaves sized ± 1 adult person's body. The person going to trap enters into the trap space provided with a kind of window. From inside of the space the hunter waits for and peering through a peering hole, when a cassowary passes he will imitate cassowary's voice, usually the cassowary will seek for and get closer to the 'call' sound, and when the animal gets nearer the hunter will let his arch or air rifle go through the INTIP hole to kill the cassowary. Usually this method of hunting is done during daylight since this wild animal is active on daylight (diurnal).

Cassowary constitutes a big bird with heavy body (60-75 kg) , only found on Papua island, Aru islands, Seram and northeast Australia. A close relative to Camel, Emu, Kiwi, Rhea and Tinamou classified in Ratiles or un-flying birds. Cassowary is capable of running at the speed of 40 km per hour with one jump passing through a barrier. It has a strong pair of feet with three fingers equipped with sharp and long nails or claws.

Cassowary is classified as diurnal animals, i.e. doing their activities on daylight. In the open nature, cassowary roams the forest individually (solitaire) or with their children or with spouses during intercourse season. During the intercourse season this animal looks nervous and ready to attack anyone near it. Towards and at the beginning of intercourse season, the male starts approaching the female and at this time there often occurs a fight among male cassowary for the female.

Cassowary constitutes one of species doing an intercourse on polyandry system. A female cassowary will marry more than one male cassowary. After one clatch of birth-giving, a female cassowary will leave its spouse and will seek for and make love with another male cassowary until the next clatch of birth-giving.

* Crocodile (Crocodylus novaeguineae) hunting

In hunting a crocodile (Ayah) the people usually do it easier on swap area. For the hunting preparation, it is usually needed he following standard equipment:

(1) spear, to kill, if there is none, using a sharpened bamboo

(2) wood to beat

(3) knife to remove skin

(4) salt to preserve

(5) torch, used to hunt in the night

(6) sampan for transporting the hunting team to river or swamp

(7) paddle as supplement to sampan

(8) provisions during the hunting trip. i.e. sag

Crocodile hunting is usually done in groups, one group may comprise of approx. 10 person. In the implementation, out of the 10 persons it will be divided into 2-3 persons per sampan during the hunting, usually relatives. If one group consists of two persons, one person drives the sampan and another holds the spear. Usually for this hunting they

needs 1-3 weeks traveling along the river, with the hunting is done between 19.00 pm – 07.00 am, since crocodile is a nocturnal wild animal or active during the night.
Currently the price of crocodile's skin is Rp. 22.000 per inch; 1 crocodile usually has 12-35 inches. A crocodile child is sold at the price of Rp. 15.000 – 30.000 per animal.
Papua fresh water crocodile (Crocodylus novaeguineae) is one of crocodile species the spread of which is only on fresh waters in the inland of Papua, Indonesia. the common appearance of this species is similar to estuary crocodile, but smaller and its skin darker.

* Hunting other animals

In addition to hunting wild animals to make money, male population also hunt other wild animals for the need of family's feed. The result is only for the family's feed not for sale. the hunting is done in the forest by using tools such as arch, bow, chopper, axe and accompanied by one or more hunting dogs.
Other animals used to hunt by the people are among others : boar (wui), Mambruk (Moghu), cockatoo (haya), Cendrawasih/paradise bird (food), big rat (tiso turo), lizard (weleibi), forest dove (bekom), forest cock (kacoh), Taon-tan (sewo), and turtle (sabu).
The hunt in addition to getting by arching, spear and chopper, can also be got by trap. For this trapped hunt the people usually raise them as livestock. Commonly the trapped animals are among others, cassowary and other species of bird.

* Anchoring sago

Sago as the staple food of Yeinan and Marin Anior Bian in Kindiki kampong still inherited from generation to generation. Though nowadays the community is already familiar with eating rice from Bulog, i.e. Raskin (poor rice), yet eating sago is never left and un-replaceable. Currently (January 2008) the community hunt gambier skin, so they forget to anchor sago, since rags of rice are dropped to the hunters of gambier skin while building a camp in the forest.
Usually the tools used in anchoring sago are as follows:

(i) Baksih, i.e. chopper for clearing away

(ii) Axe, used to fell down and split or anchor

(iii) Wood, to beat

(iv) Sago PENAPIS, made of coconut SABUT

(v) Bag of nibung skin, i.e. a tool for the place of sago TAPISAN

(vi) Bag of nibung, i.e. the place to contain flour

* working at dry field

The community of Ulilin district in addition to living by hunting and anchoring sago, are also familiar with cultivating cassave, sweet potato, banana, jackfruit, taro, melinjo, coconut and betel nut.

The community are usually still doing the nomad dry field, to open a dry field from the forest it is usually by the following phases:

(1) Cutting down, i.e. doing the clearing of forest floor from bushes and small bushes as well as plants by cutting down them until the forest floor is clean

(2) Felling down, once the forest floor is clean, then it is begun the felling down of big trees

(3) Burning, on the trees already felled down and cut down forest floor so it becomes dry

(4) Cleaning up, the results of burning are then cleaned up to make the land ready for planting

(5) Planting by way of sowing, land ready to plant is then planted by a sowing tool

(6) Nursing, it is done periodic nursery by cleaning up and eradicating disturbing weeds

(7) Harvesting, crops ready to harvest are then taken the produce

The above dry field produce for the population of Ulilin district are to meet the family's need only, not for sale.

c) Settlements

The people settlements in Ulilin district are currently made of board (walls and floors), yet there are some still made of sago midrib, while roof is made of zinc or nibung leaves. Floor, in addition to stage shaped, there is also one having floor of ground. This is not good for health, since the condition is humid and dirty.

The community are in need of help from the government of Merauke regency, in the form of a healthy and comfortable house, made of board (walls and floors) and roof of zinc.

3. Social culture

a) Education

in educational sector, Ulilin district of Merauke regency only has Elementary school (SD) and SLTP. To continue to SLTA one has to go to Muting district or Merauke.

Table III-19. Public facilities and infrastructure of Kampongs around the study area of PT Bio Inti Agrindo

No	Kampong	Educational facility			Place of worship			
1		SD	SLTP	SLTA	Mosque	Church	Pura	Vihara
2								
3								
4								
5								
6								
7								
8								
9								

10								
11								
	Total							

Source : the results of field survey in ANDAL study for the oil palm plantation of PT Bio Inti Agrindo in Ulilin district, 2008

b) Religion and Faith

in 2005, in Merauke regency there were 189 worshipping houses. Catholic church was the most worshipping houses built, as many as 114 worshipping houses (60.32 %), Christian protestant church amounted to 29 churches (15.34%) , while it was recorded 5 mosques (2.65%). The number of religious leaders from various religions was 131 persons, 102 persons were Christian protestant religious leaders, 16 persons were Islamic religious leaders and 13 persons Catholic religious leaders.

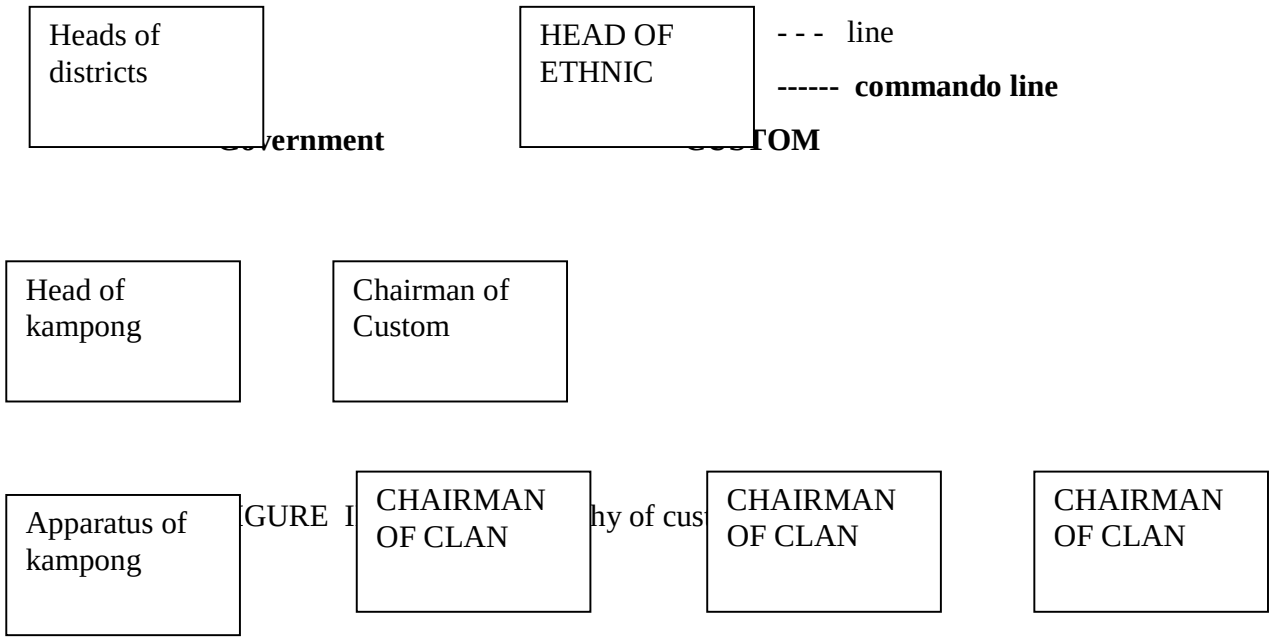
The original faith of Marin Anior Bian in Ulilin district was worshippers of sun which they called KETAN. Ketan was the god of Marin ethnic, i.e. the sun. they did not dare to breach their faith's rules and norms, for example stealing, committing a crime, making damage on earth, since they would be seen directly by KETAN (Sun). parents would teach their children not to do any naughty act or breach the rule, and would say to their children, 'watch out there is a big eye, do not commit any crime or steal, Ketan is watching us!'. Usually parents in the past did a offerings of 'sesajen' at worshipping house named Mayam at a certain location. The person doing a sacrifice with 'sesaji' would take two units of offerings N, e.g. the offerings of deer from hunting, then the deer held in right hand would be raised and crying by the language, 'Okambe!!' which meant 'this for You' while facing the sun, and the deer held in left hand was lifted and it was said : Noknambe!!' which meant 'this belongs to us', then the deer in the right deer would be left as such until it was lost or got rotten, as the offerings to Ketan.

c) Customs

* Structure of Custom

Structure of custom in the community of Yeinan and Marin ethnics can be explained as follows:

1. Head of Ethnic (Commandant) leads their respective ethnic, i.e. Yeinan or Marin ethnic in Ulilin district
2. in the Kampong there is the Chairman of Custom leading their respective chairmen of clan , i.e. of Yeinan clan or Marin clan
3. The existing chairman of clan leads the existing clan in kampong



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*** Marriage, Birth and Death**

Population in Kindiki comprises of two ethnics, i.e. Yeinan ethnic and Marin Anior Bian ethnic with the almost same custom and are already mixed. Below it will be explained, one of the ethnics, i.e. Marin ethnic.

Marin ethnic, which means Mariner ethnic. The original Marin ethnic has high and big posture, but once they have occurred cross marriage with other ethnic population this excellence body is quite reduced. Maybe it is due to this excellent posture that Marin

ethnic controls the coastal area, as the winner of wars in the past when there occurred inter-ethnic wars. It is only a historical pride left.

Usually the faces of native Marin people are decorated, e.g, at the ears it will be given bracelet made of cassowary bone, nose is decorated with boar canine and ears are decorated with earrings of cassowary hair.

Marriage custom (Raremini); to be able to marry a woman a man shall have to provide a dowry in Kindiki the dowry presented is highly unique, i.e. a plant named Wati. Wati is shrub crop consumed by chewing its stem, this crop will create the effect of anesthesia, i.e. causing 'dead to sense' and makes the body and hinges becoming limpy and causing a sleepy feeling (sleeping drug). This crop is presented according to the number of clan from the woman's side who will attend the marriage. The price of this crop in Kindiki Kampong can reach Rp. 500.000 per clump. However, for a marriage event, the bridegroom is not allowed to give purchased wati, but must be the crop planted by himself.

Another material is sago (du) in the form of wadh (sago is rolled in sago midrib) of about 3 kilograms given during the marriage of 3 wadhs. It is also presented in the presentation event coconut fruit (onggat), taro (kem), potatoes, banana (puapet) as served food during the wedding party.

Magic is also known as suwanggi, i.e. a kind of teluh in Sundanese or santet in Javanese. The person being the object of suwanggi might die suddenly, or there enter into his body sharp objects such as glass, nail etc. so suwanggi is no other than black magic used to kill an enemy.

* **custom law** on stealing, robbery, and adultery

Usually a one time deed is just admonished and asked to return the stolen goods, but if it has been done again and again and makes the people restless, then it shall be imposed a custom law, i.e. by carrying a bamboo around the kampong in Marin ethnic's custom, but in Yeinan ethnic it is enough by returning the stolen goods or compensating it with an equal one.

If there occurs an adultery between man and woman, either those married or single, then it will be punished both of them (woman and man) by having their genitals burnt by a

cigarette's butt, making them blistered and shouting in pain. This applies to Marin ethnic, which is different from Yeinan which requires to get them married (between singles) with a redemption penalty, i.e. axe, chopper and household appliances.

* Communal right

Each Fam in Yeinan / Marin ethnic has a certain controlled territory in utilizing natural resources (forest/dry field). The people are allowed to hunt, extract forest produce or dry field produce only in their communal land. It is prohibited to do any activity on other people's communal land, for those committing it will be shooted with arrows or will suffer a disaster (on faith basis) of dying in the forest. Only by the permit of land owner , it is allowed to work on dry field, hunt or others. If there is any outsider wishes to work a dry field, it must be agreed upon a profit sharing with the land owner.

Boundaries between custom lands, are usually natural borders or agreed borders, i.e. : (1) River, (2) big trees, (3) the place where paradise birds play/ the trees; (4) capes.

The names of kampong leaders of Yeinan ethnic are as follows: (1) Mathius Kewamijai, (2) Bonifasius Mandaljai, (3) Paulinus Kabaljai, (4) Abraham Binaujal and (5) Yanuarius Tanjai.

In respect of land ownership right in Papua Province, the regional government had issued a Papua Governor's Decision letter number 184 of 2004, concerning Standardized compensation giving for Custom Community on Collected wood at Communal right area in Papua province. In the decision letter in Chapter III article 4 on Standardized compensation cost, it is explained that:

(1) standadized compensation cost for custom community for communal right payable by hoilders of HPH, IUPHHK, IPK, and ILS based on the volume of log sale / use realization under those terms as follows:

- Indah wood : Rp. 100.000 per m3
- Merbau : Rp. 50.000 per m3
- Non-Merbau : Rp. 10.000 per m3
- Mangrove wood : Rp. 3.000 per m3

(2) the payment of compensation is inclusive the use of land, road, base camp, log pond, plants, trees and road building materials.

The above decision letter replaced the Decision letter of the Governor of Irian Jaya Number 50 of 2001 concerning Standardized compensation giving for Custom community for woods collected at Communal right area in Irian Jaya province. According to the above decision letter it is stated that Communal right constitutes a regulation on the authority which under custom's law belongs to certain custom community being the living environment for their people to take the benefit and natural resources including land within the territory for their living and life continuity that emerges from physical and mental relationship from generation to generation and is not interruped between said Custom Law community and the relevant territory.

d) Community's perception

From the results of socialization on Oil palm plantation construction with the community in the study area there develops community's perception as follows:

(1) Community requests that the company pays intensive visits and be able to give a sufficient explanation

(2) The company may hold a meeting with the community leading figures, custom and religion leaders as well as the chairmen of kampongs having the communal land to discuss the company's presence in Ulilin district

(3) Hunting locations, sago dry fields and water springs are not permitted to convert into an oil palm plantation, since the hunting and sago anchoring activities are not replaceable yet, most of the community still live as gatherer, highly depending on the nature

(4) It is the chairmen of kampongs who will be decisive on whether their kampongs be converted into an oil palm plantation or not, whether partly or none at all. Since it is the chairmen of kampongs who know where are the good places for hunting and which places are permitted to open as an oil palm plantation

(5) Community wishes a good cooperation with the company, to pay attention to unemployment , health, education and worshipping issues.

(6) The company must be able to educate the population and upgrade the quality of human resources in Uilin district, so they shall not only work as daily free workers, but there must be an upgrading so they will gradually get the suitable skills required by the company, such as becoming a heavy equipment operator, driver and other jobs that need skills

(7) There must be a custom community's representative assigned at the company as the representative and information balancer, so there shall not occur any information gap that may cause mis-understanding and result in a non-constructive one-sided act. Therefore the company may run and produce well and the community is not harmed

D. ENVIRONMENTAL AND COMMUNITY'S HEALTH COMPONENT

1. Environmental health

The availabilty of fresh water sources for village community around the area of PT BIO INTI AGRINDO is at sufficient level. To suffice the need of drinking and cooking water, community highly relies on well water and rain water. For MCK purpose, community utilizes the presence of river's water. A less healthy utilization of water shall make it easier for community to catch diarrhea and skin diseases.

2. in cidence and disease prevalence

Some of diseases frequently suffered by the community are among others: malaria, acute respiratory tract infection (ISPA), skin disease, and diarrhea. The intensity of those diseases usually increase during hot weather, i.e. : August to September.

3. Nutrient and Food sufficiency status

Nutrient issues relate to Short Protein energy (KEP), Short A Vitamin (KVA), Nutrient anemia and health problems due to Nutrient shortage (GAKI), due to food and infectious disease factors. The nutrient and food sufficiency status of village community around the plantation area of PT BIO INTI AGRINDO is relatively good. Based on secondary data, it never occurred any nutrient insecurity due to food shortage. By livelihood, most of the population are farmers.

4. Health facility

The existing health facilities and infrastructure are relatively quite sufficient, assisting Puskesmas are generally located in each district as presented in Table III-20.

Table III-20 health facilities – infrastructure in the district around the study area of PT Bio Inti Agrindo

No	Kampong	Puskesmas / pustu	Polindes	Posyandu	Medical staff	Diseases widely suffered
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
	Total					

Source : the results of field survey in ANDAL study for the oil palm plantation of PT Bio Inti Agrindo in Ulilin district

IV SCOPE OF STUDY

A. IMPORTANT IMPACTS REVIEWED

From the results of scoping in KA-ANDAL on the PT Bio Inti Agrindo\'s Oil Palm plantation and processing plant, it is generated a set of potentially impacted environmental parameters which become a hypothetic important impact at the oil palm plantation site of PT Bio Inti Agrindo, Merauke regency, Papua province. Those

paraemters are judged as parameters having the possibility to be reviewed mote deeply, covering:

1. Physical chemical
    - Erosion; Lnd Preparation (land opening) and Road network building activities are potential to erode topsoil
    - Sedimentation; sedimentation constitutes the final result of an erosion process upon having been taken with river current. In addition to erosion contents, sedimentation is also affected by river's debit, in this matter river's water also plays the role as carrier of sedimentation materials to river's downstream\
    - River's water quality; erosion taken materials are not of physical form only, but may take the form of chemical substanxces also. Erosion and sedimentation process are estimated to affect the quality of river's water at DAS/Sub-DAS potential to be affected by the impact of activity
    - Air quality and noise; Mobilization of heavy equipment, land preparation (land opening) , and road network building activities are potential to affect the air quality and noise around the study location
    - Micro climate; Mobilization of heavy equipment, land preparation (land opening) activities make the area becoming open. The opening of this area is estimated to micro climate (temperature and humidity) at the study area. The micro climate condition is influential to the growth of oil palm crops
    - Foresr burning; land preparation (land opening) activity is potential to cause a forest burning occurring at locations around the study area

2. Biology
    - Flora / Vegetation; land preparation (land opening) , and road network building activities in the felling down block area is highly potential to damage the structure and vegetation potential in general term including cultivation vegetation or the other non-wood potential such as rattan, forest mango, durian, etc. In addition it is also estimated to potentially damage and disturb the existence of protected flora functioning as flora's sperm plasma.

Table IV-1. Matrix of Identification on potential impact in Analysis on environmental impact

The Construction of PT Bio Inti Agrindo's Oil Palm plantation, Papua province

No	ENVIRONMENTAL COMPONENT PARAMETERS	CONSTRUCTION OF OIL PALM PLANTATION & PROCESSING PLANT ACTIVITY											
		A1	A2							A3			A4
		K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12
1	PHYSICAL-CHEMICAL												
	(1) Land erosion												
	(2) Sedimentation												
	(3) Water quality												
	(4) Air quality and noise												
	(5) Micro climate												
	(6) Forest burning												
II	ECOLOGY												
	(1) Flora/vegetation												
	(2) Onshore fauna / wild animals												
	(3) Aquatic biota												
III	SOCIAL ECONOMIC CULTURE												
	(1) Conflict of land ownership & use												
	(2) Accessibility												
	(3) Employment and business												

	opportunities												
	(4) Income level and living standard												
	(5) Economic activity												
	(6) Population mobility and spread												
	(7) Community's perception												
IV	COMMUNITY'S HEALTH												
	(1) Community's health condition												
	(2) Medical staff and health facility												

Remarks:

■ = potential occurence of environmental impact

A1 = Pre-construction phase activity

A2 = Construction phase activity

A3 = Operation phase activity

A4 = Post-operation phase activity

K1 = Certification and constultant's study (licensing) sub-activity

K2 = land preparation (land opening) sub-activity

K3 = planting sub-activity

K4 = TBM1 to TBM 3 nursery sub-activity

K5 = road network building sub-activity

K6 = facilities-infastructure building sub-activity (base camp etc)

K7 = heavy equipment mobilization sub-activity

K8 = PKS and IPAL construction sub-activity

K9 = harvesting and yield transportation sub-activity

K10 = PKS waste and pollutant management sub-activity

K11 = manpower recruitment and community nurturing sub-activity

K12 = land rehabilitation /reclamation sub-activity

NOTE TO MBAK KARTIKA

BAGAN DI HALAMAN IV- 3 INI SANGAT KOMPLEKS, SAYA SECARA TEKNIS TIDAK MAMPU MEMBUATNYA, MOHON MAKLUM

BAGAN

Figure IV-1 Flow-chart of the impact from PT Bio Inti agrindo's Oil palm plantation construction activities

- Onshore fauna /wild animals ; the construction activity of oil palm plantation as a whole is potential to degrade the quality of wild animals' habitat existing at the study area. In addition to habitat, this activity is also potential to decrease the abundance of animals' feed in the form of vegetation (herbivora) and animals (carnivora). In the review on wild animals preservation, it is not only the protected wild animals need to maintain, but also the other animals being the feed of carnivora that need to maintain.

  The activities estimated to damage wild animals' habitat is land preparation (land opening) and road network building activities
- Aquatic biota; as the subsequent impact of the degraded water quality is the degradation of aquatic biota's habitat (plankton, nekton and benthos)

3. Social-economic-culture
   - Conflict of land ownership and use; Certification and constultant's study (licensing) activity is potential to raise a conflict with community affected by the plantation's bordering stakes
   - Accesibility; the company's presence is expected to be able of increasing the accessibility of people in the surrounding villages. Though those villages already have road facility, yet the company's presence is expected to able to help the road maintenance or expand the existing road
   - Employment and business opportunities; by the presence of company's activities it will be opened the chance to work at the company and the business opportunity that pertains to the oil palm plantation construction activity
   - Income level and living standard; as subsequent impact of the increasing employment and business opportunity, it is estimated to be able to increase the income and living standard of local community\
   - Economic activity; as subsequent impact of the increasing accessibility, employment and business opportunities at the study location, it is expected to be able to stimulate the growth of economic activity at the study area

- Population mobility and spread; as subsequent impact of the increasing accessibility, employment and business opportunities as well as the growth of economic activity, it is expected to be able to drive the increase of population mobility and spread to do the economic activity
- Community's perception; the form of local community's reaction or perception towards the company's presence shall highly depend on the characteristic of that activity. As long as the community is not harmed, the perception that emerges is good. Community's perception towards the company's presence needs to dig as objective as possible since in the link the impact of this aspect will affect other aspects which in the end may hamper the dynamic and continuity of oil palm plantation construction as a whole

4. Community's health
    - Community's health condition; as subsequent impact of the upgraded work and family's income level, it is expected to allocate some of their income to take care of their health problems
    - Medical staff and health facility ; the company's effort to upgrade the community's health needs to be supported also by the provisionb of medical staff and the health facility, it is expected that the construction of facilities-infrastructure will focus on this activity

The environmental color's components reviewed are the parameters of environmental components being the translation from the four aspects of important impact centralization above covering:

(1) The sustainability of production function: The sustainability of production function of PT Bio Inti Agrindo's oil palm is indicated by oil palm production parameters (Fresh fruit bunches / TBS and raw palm oil / CPO) as well as potential nekton of economic value

(2) the sustainability of ecological function; the sustainability of ecological function of PT Bio Inti Agrindo's plantation area constitutes the resulting behaviors of two

environmental important impact components (hypothetic) which relate one to the other, i.e:

(a) Land and Water conservation, which is indicated by the essential changes to parameters : erosion, sedimentation, and water quality

(b) Bio diversity, which is indicated by the essential changes to the following parameters :

- flora / vegetation existence (potential non wood vegetation and protected vegetation)
- Fauna / wild animals existence (both those protected and not protected by law)
- Aquatic biota potential (plankton, nekton, and benthos)

(3) The upgrading of surrounding community's welfare; The upgraded welfare of community around the plantation area of PT Bio Inti Agrindo is judged from the income level, education, and health (physical / mental)

(4) Company's contribution to the regional development; this aspect is indicated by the extent of construction at locations around the plantation area done by the initiator, such as the construction of road or buildings the result of which can be enjoyed by local community. In general this aspect consitutes the result of three important impact components which telate one to the other, i.e.:

1. Local economic activity, which is characterized by essential changes to the following parameters:
   - accessibility
   - employment and business opportunities
   - income level and living standard
2. demography, which is characterized by essential changes to people mobility and spread parameter
3. social processes, which is characterized by essential changes to the following parameters:
   - conflict of land ownership and use
   - community's perception towards the company

B. STUDY AREA BOUNDARIES AND DEAD LINE OF REVIEW

The study area boundaries covering the space and time dimension for preparing the ANDAL on PT Bio Inti Agrindo's oil palm plantation construction constitutes the results of dealienation from four critical factors, which are determined phase by phase, i.e. (a) activity borders, in this matter is particularly the spread of area blocking plan locations, (b) ecological borders, (c) administrative borders and (d) social borders.

1. ACTIVITY PLAN BORDERS

The activity plan borders are defined based on physical borders of the oil palm plantation construction realization, i.e. area blocking plan. Review on these activity borders covers the spread of area block locations, oil palm processing plant up to base camp site. The acticity plan borders are alienated clearly in the Map of Working Area included in the Map of Study area borders and Sampling locations scale 1: 25.000 (attached)

2. ECOLOGICAL BORDERS

Ecological borders are focused on nature's ecosystem which is unique in giving a response to the treatment or the construction activity of oil palm plantation. The nature's ecosystem deemed relevant as the ecological borders is the resultant of : land unit, vegetation cover, and DAS. Land unit is an analysis unit consisting of the combined slope (L), soil type (T), and rain intensity (i). These three land unit shapers are essentially the critical factors of an erosion. The erosion that occurs will degrade the water quality in the rivers affected by erosion runoff

Criteria of slope class (L), Soil class (T), and rain intensity (i), are stipulated by SK of the Minister of Agriculture no. 837 /Kpts/Um/11/1980 concerning Criteria and procedure of determining Protected forest and SK of the Minister of Agriculture no. 683 /Kpts/Um/8/1991 concerning Criteria and procedure of determining Production

forest. The spread of land unit is presented in the Map of Study area borders and Sampling locations (attached).

Consideration on DAS as the review on ecological borders is that (1) DAS constitutes a place where all impacts that pertain to land and water conservation are concentrated, (2) the environmental impact of oil palm plantation construction activity does not take place in situ but can also expand to outside of working area borders (e.g. sedimentation). In view of the spread of working location/area, the ecological borders cover DAS of Bian and Fly.

3. ADMINISTRATIVE BORDERS

Administrative borders are to anticipate any social impact (territorial) of oil palm plantation construction activity, these borders cover the governmental administrative borders. In view of the territory condition and the study area location, the construction activity of PT Bio Inti Agrindo's oil palm plantation is estimated to cause an impact to the territory of governmental administration : Ulilin district, Merauke regency, Papua province.

4. SOCIAL BORDERS

The determination of social borders is based on (a) the community of people living within the activity borders, (b) the community of people living within the ecological borders as well as (c) the location of people's community situated beyond the activity borders and ecological borders, but is potential to be affected by the essential impact of the activity plan through manpower absorption, the building of public facility and social facility.

District as the people's community located around the working area and is estimated as potential to be affected by the activity's impact is Ulilin district of Merauke regency, Papua province.

Resultants of the above study area borders (activity plan borders, ecological borders, administrative borders and social borders) are presented in the Map of Study area borders and Sampling locations (attached).\

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5. TECHNICAL LIMITS

The determination of technical limits is made by calculating technical constraints in the form of limited manpower, time, and cost available by considering the representativeness of living environmental color reviewed. With such technical limits, in gathering data of several parameters it will only be taken samples.

6. DEADLINE OF REVIEW

What's meant by time frame of study is the reachout of time in estimating any impact of the activity planned with the assumptions that when the study has completed there shall not occur any essential change caused by the activity. Therefore the time reachout of study is determined as covering 1 (one) rotation of an oil palm plantation construction or for 25 years.

f. Wild Animals

* Relative Abundance

- Relative abundance of aves species by using IPA is expressed in the form of Species Important Value Index constituting the accumulation of Relative Density and Relative Frequency, by such formula as in the calculation on relative abundance of vegetation
- Relative abundance of mammalian / reptile species by using transect lane method, the calculation is applying the same formula with that of relative abundance of aves species

* Species Abundance is calculated by applying Shanon Diversity Index (H) formula

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Where

H : Shanon Index of General Diversity

i : Species Important value index / KR of 1st species

- Habitat quality; to find out the quality of wild animals' habitat it was conducted regression analysis on vegetation analysis results and data of micro climate taken at sample plot

g. Aquatic Biota

* Abundance, species diversity and equitability parameters were analyzed for plankton and benthos, while for nekton it would analyzed \its economic and ecologic values

- Abundance

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Where

N : abundance (plankton /l)

n : total individuals of 1st species

A : area of covering glass (mm2) (for benthos it is the area of dredge opening 20 x 20 cm2)

B : area of viewing field (mm2)

C : volume of filtered water (cc)

D : volume of 1 drop of water (cc)

E : volume of water filtered

Diversity Index

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Where

H1 : Shanon Diversity Index

pi : ni/N

ni : total individual of 1st species

N : total all individuals

- Equitability:

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- Nekton's Economic/Ecologic value; from the results of interviews and secondary data tracing, it was analyzed the composition of species and the extent of utilization on said resources by local people. To find out species of nekton which are classified as rare and protected, it was used the list of rare and protected fauna species issued by the Directorate General of PHPA

h. Social-Economic-Culture

* Social –economic-cultural data of quantitative nature would be analyzed by cross tabulation and frequency. If there was available historical data, it was also conducted trend analysis, which was displayed using graphic method

* Qualitative data would be analyzed by content analysis technique on daily logs grouped on the basis of interview topics. Quantitative and qualitative analyses were integrated. Qualitative analysis was of explanatory on the phenomena that emerged during quantitative analysis, or maybe on the opposite

* some of mathematic formulas applied were:

(1) Income Level

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Where :

Y = average income per capita (Rp/ year)

y = total family income (Rp/ year)

A = total family members

(2) Population

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$$D \text{ (persons/km2)} = \frac{\text{Total population}}{\text{Area of territory}}$$

(3) Dependant to Load ratio (DR)

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Where

Po-14 = population aged 0-14 years old

P>=65 = population aged 65 years old and above

P15-64= population aged 15-64 years old

k = 100 (constant)

METHOD OF STUDY

A. THE METHOD OF DATA GATHERING AND ANALYSIS

1. the method of data gathering

The method of data and information gathering is distinguished by the sources and the manners of data and information taking which have relevance to the subject matter of ANDAL on the Construction of PT Bio Inti Agrindo's Oil palm Plantation.

Primary data and information were gathered by field observation, measurement and sampling on field, interviews and questionnaire. Secondary data and or information were gathered by recording and duplication from those publications relevant to their intended use from various related institutions and instances, namely Puslitbang of Geology, Plantation service, BPN office, BKLH of Papua province and Merauke regency, Bakosurtanal, BPS, Transmigration service, Agricultural service, Public works service, Census and statistic office of Regency, Puslitbangtanak and Climatology station at the study location. Based on the scooping results, data and information required in this study are briefly presented in Table V-1.

In its connection to primary data and or information gathering, where between one parameter and the other have a relationship, then in the determination of observation location and sampling is based on the following considerations:

a. The causing sources of environmental important impact is considered as part or totality of a Construction activity of oil palm Plantation that forms a series

starting from pre-construction phase activity (certification and consultant's study), construction phase (land preparation, planting, TBM1 to TBM3 nursery, the building of road network, the building of facilities – infrastructure, and heavy equipment mobilization), operation / production phase (harvesting and yield transportation, oil palm waste management), as well as post-operation phase (land rehabilitation / reclamation).

b. The study design was developed on the basis of unique ecosystem's diversity being the resultants of (1) land unit, (2) area blocking design, (3) vegetation cover and (4) DAS potential to be affected by impact

   As the consequence of plantation construction activity, each unique ecosystem is estimated to cause some environmental impact to certain environmental components. Land unit and DAS will be oriented to environmental impact that connects to land and water conservation (KTA). Vegetation cover is oriented to environmental impact that connects to biological components and micro climate.

Table V-1. Recapitulation on types of data and its method of gathering in the context of ANDAL on the construction of PT Bio Inti Agrindo's oil palm plantation, Papua province

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ENVIRONMENTAL COMPONENTS AND SUB-COMPONENTS	ENVIRONMENTAL PARAMETERS	UNIT	GATHERING METHOD AND ANALYSIS METHOD	TOOLS USED
1 PHYSICAL-CHEMICAL				
1. Physiography and slope	• Altitude	m dpl	• Field measurement	• Altimeter
	• Gradients	%	• Field measurem	• Clinometer

				ent	
	2. Soil physical characteristic	• Effective depth	M	• Land boring/profile • Comparing effective depth among soil types	• Land bore
		• Permeability	cm/hour	• Soil sample taking based on land map unit (land unit)	• Soil sample ring, label, plastic, stationery
		• Porosity	%		
		• Soil's texture	-		
		• Soil's structure	-		
		• Bulk density	g/cc		
	3. Erosion	• Volume of solid transported	Ton/ha/year	• USLE • Comparing erosion at each gradient and vegetation cover	• Stationery, calculator
	4. Sedimentation	• Volume of solid deposited	Mg/l	• Empirical calculation	Stationery, calculator
		• pH	-		• plastic bag

	5. Soil chemical characteristics	• N-total	%	* soil sample taking * laboratory analysis \	• land bore/ mattock • label, stationery
		• P-available	ppm		
		• K, Ca, Mg and Na	Me/100 gr		
		• Cation exchange capacity	Me/100 gr		
		• Alkaline saturity	%		
		• C-Org	%		
		• H, AI contents	Me/100 gr		
	6. Water quality	• clarity	Cm	* water sample taking * laboratory analysis	• secchi disc
		• turbidity	NTU		• turbidimeter
		• color	PiCo unit		• spectrophotometric
		• temperature	ºC		• thermometer
		• dissolved solid	Mg/l		• analytical weighs
		• suspended solid	Mg/l		• analytical weighs
		• Ph	-		* pH meter
		• DHL	Phos/cm		• Conductimeter
		• Dissolved oxygen (DO)	Mg/l		• DO meter
		• BOD	Mg/l		• Titration

		• COD	Mg/l		• Titration
	7. Air quality	• Dust content in the air	g/m3	• Measurement on dust content and other gases in the air	• Gravimeter
	8. Micro climate	• Temperature	ºC	• Field measurement • Comparing between altitude and vegetation cover	• Thermometer • Psychrometer
		• Humidity	%		
B. BIOLOGY					
	1. Flora / vegetation	• Density	N/ha	• Calculation on quantity of trees / ha	• Tally sheet, stationery
		• Frequency	p/P	• Calculation on plot (p) it is found species in all observatio	

				n plots	
		• Dominance	m2/ha	• Calculation on the area of each species' base plane • Calculation of INP at each vegetation cover	
		• Protected species	N/ha	• Calculation on quantity of trees / ha	
	2. Non wood forest produce	• Potential economic vegetation • Spread of species • Level of population's dependency	-	• Observation, calculation, recording and interview • Analysis on economic value of non wood forest	• Tally sheet, stationery, recording device

				produce	
	3. Fauna / wild animals	• Diversity	H	• IPA method (aves) and King method (mammalian & reptile)	• Compass, stationery, other survey equipment
		• Abundance	Species	• IPA method (aves) and King method (mammalian & reptile)	• Compass, stationery, other survey equipment
		• Rare animals	Species	• IPA method (aves) and King method (mammalian & reptile)	• Compass, stationery, other survey equipment
		• Habitat (type of feed, etc)	-	* observation	* stationery, camera
	4. Aquatic biota				
	a. Plankton	• Diversity	H	• River's	

		• Abundance	Individual/ltr	water sampling • Shanon index	• Eikman grab
	b. Benthos	• Diversity	H	• River's water sampling • Shanon index	• Eikman grab
		• Abundance	Individual/ltr		
	c. Nekton	• Species of economic value • Species and production (potential) • Population's dependency	Ton / year	• Interview, literature, market survey	* statistical data
C. SOCIAL-ECONOMIC-CULTURE					
	1. Population mobility and spread	The population or family members going out the village according to commuter,	Person	• Interview and duplication	• Frequency and cross tabulation

		circular and permanent			
	2. Employment opportunities	Working age population x manpower requirement	Person	• Interview and duplication	• Frequency and cross tabulation
	3. New job/ business field	The number of formal/informal business unit before and after the presence of activity	Unit	• Interview and duplication	• Frequency and cross tabulation
	4. Livelihood pattern	Types of livelihood before and after the presence of activity	-	* Interview and duplication	• Frequency and cross tabulation
	5. Educational level	• number of students to school age population ratio	%	• duplication and calculation	• tabulation and stationery
		• the availability of educational infrastructure	Unit	• duplication and calculation	• tabulation and stationery

	6. community's perception	• response of community around the study area towards the activity	-	* interview and questionnaire	* questionnaire
	7. contribution to regional development	• the last year PDRB	Rp	• duplication	• stationery
D. COMMUNITY'S HEALTH					
	1. community's health condition	• number of patients to population ratio	%	• duplication and calculation	• tabulation and stationery
	2. medical staff and health facility	• the availability of health infrastructure	Unit	• duplication and calculation	• tabulation and stationery

d. the environmental impact that occurs in the study area is estimated as not only caused by the construction activity of oil palm plantation, but can also be caused by other activities taking place around it which subsequently spreads into the study area. Reversely, the environmental impact of oil palm plantation

construction does not only take plaxe in situ, but may spread out beyond the borders of working area (like sedimentation), therefore it is needed an analysis unit capable of reviewing holistically all behaviors of said environmental impact. For the relevance of holistic review on the behaviors of this impact spread it is developed the inlet and outlet analysis unit approach for rivers at DAS potential to be affected by the impact.

Based on the above, in determining the location of observation site or the location of sampling in the ANDAL study for the construction of PT Bio Inti Agrindo's Oil palm plantation, Papua province.

Table V-2 Direction on the determination of model site in the context of ANDAL for the construction of PT Bio Inti Agrindo's oil palm plantation, Papua province

ENVIRONMENTAL COMPONENTS AND SUB-COMPONENTS	ENVIRONMENTAL PARAMETER	DIRECTION ON THE DETERMINATION OF SAMPLE LOCATION	
		LINKED WITH ENVIRONMENTAL CONDITION	LINKED WITH ACTIVITY
A. PHYSICAL –CHEMICAL			
1. Topography and slope	Altitude and slope	DAS and land unit	Land preparation
2. Soil's physical – chemical characteristics	Effective depth, Permeability, Porosity, Soil's texture, pH, N-total, P-available, K, Ca, Mg, Na, KTK,	DAS, type of soil, area sloping, territory's climate and vegetation cover	Construction phase (year 0-4)

		KB, C-org, H, AI		
	3. Erosion and sedimentation	Volume of soil transported and sedimented	DAS, type of soil, area sloping, territory's climate, vegetation, space and time	Land preparation, road network building, and moblization of heavy equipment
	4. Air quality	NOx, SOx,H2S, NH3, CP, PM10	vegetation, space and time	moblization of heavy equipment
	5. Water quality	Clarity, turbidity, color, temperature, suspended solid, dissolved solid, pH, DHL, DO, COD, BOD, hardness	DAS, inlet-outlet	Land preparation, road network building, and moblization of heavy equipment
	6. Micro climate	Temperature and air humidity	DAS, type of soil, area sloping, territory's climate and vegetation cover	Land preparation, road network building, and moblization

				of heavy equipment
B. BIOLOGY				
	1. Flora	Species, population, dominance frequency, protected species	DAS, vegetation cover and land unit	Land preparation, road network building, and moblization of heavy equipment
	2. Non wood forest produce	Spread of species, economic potential, dependency	DAS, vegetation cover, land unit and settlements	Land preparation, road network building, and moblization of heavy equipment
	3. Wild animals	Habitat, diversity, abundance, rare / protected animals	DAS, vegetation cover and land uni	Land preparation, road network building, and moblization of heavy equipment

	4. Aquatic biota	Diversity and abundance of plankton, benthos, potential nekton	DAS and settlements	Land preparation, road network building, and moblization of heavy equipment
C. SOCIAL-ECONOMIC-CULTURE				
	1. Population mobility & spread	Population, population density, livelihood, number of road and market	Community's welfare	Totality of activity
	2. Employment opportunities			
	3. New job / business field			
	4. Livelihood pattern			
	5. Accessibility			
	6. Community's perception			
	7. Economic activity			
	8. Contribution to regional			

	development			
D. COMMUNITY'S HEALTH				
	1. Community's health condition	Population, population density, livelihood,	Community's welfare	Totality of activity
	2. Medical staff & health facility			

a. Soil

- Observation on soil components covers those parameters having the contribution to the level of soil erosion and soil fertility
- Samples of soil taken are two types. i.e. (a) undisturbed soil sample for analysis on soil physical characteristics at 0-30 cm and 30-60 cm deep by using sample ring and (b) sample of composite soil for analysis on soil chemical characteristics at 0-60 cm and > 60 cm by using sample plastic. Soil samples were then analyzed at the laboratory
- The location of observation and sampling was done at effective area, protected area and non-effective area. The locations and quantity of soil sampling spots are presented in Table V-3 and Map of Study area borders and Sampling locations (attached)

Table V-3 Sample plots of soil observation

Envitonmental components and sub-components	Environmental parameter	Land condition	Type of soil (PPT)	Sensitivity to erosion	Cover crop	Quantity of sample spot

Soil's physical – chemical characteristic	Depth, Permeability, Porosity, Soil's texture, pH, N-total, P-available, K, Ca, Mg, Na, KTK, KB, C-org, H, AI	Dry	Podsolik		Bush forest	
			Podsolik		Bushes	
			Podsolik		Non forest	
			Total			

b. Micro climate

- The measurement on micro climate (temperature and air humidity) was done by sling psychrometer device, the results of this measurement was used to analyze the change to micro climate. Forest condition was deemed as the ideal condition of micro climate
- To describe the environmental color from climate components it was also reviewed the rainfall, rainy days and air humidity
- The determination of micro climate sampling site was based on the diversity of vegetation cover covering forest and non forest. The locations and quantity of micro climate sampling are presented in Table V-4.

Table V-4 the quantity and locations of micro climate observation

Environmental components	Environmental parameter	Land condition	Cover crop	Quantity of sample

and sub-components				spot
Micro climate	Temperature and air humidity	Dry	Forest and non forest	4

. c. Hydrology

- Unique ecosystem that suited to review on hydrological aspect is watershed (DAS), with the parameters reviewed covers (a) erosion, (b) sedimentation and (c) river's water quality

- Sedimentation constitutes the subsequent process from erosion process that occurs at rain catching area. The observation was done directlyby observing the sedimentation that occurred on field supported by analysis on sediment transportation at the relevant river

- Water quality reviewed covered physical and chemical characteristics, water samples were taken by water sampler and done compositely at each location spot (inlet and outlet). Some of parameters changing rapidly were measured on field (in situ), other parameters were measured at the laboratory

- The location of observation and water sampling was done at those rivers potential to be affected by the impact crossing the area, as presented in Table V-5

Table V-5 The location of observation and sampling of hydrology and aquatic biota

No	Environmental components and sub-components	Environmental parameter	Sub DAS / river	Remark (inlet/outlet)	Quantity of sample spot
	Sedimentation	Volume of sediment			
	Water quality	Clarity, turbidity,			

		color, temperature, suspended solid, dissolved solid, pH, DHL, DO, COD, and BOD	Bian and fly rivers	Inlet and outlet	4 (four)
	Aquatic biota	Plankton, benthos and nekton			

4. Vegetation

* the sampling of vegetation was intended to get the data of diversityand abundance of vegetation covering (a) stands dominance, (b) youth condition, and (c) uniqe flora (protected vegetation) and cultivation vegetation

* the approach to determine sample locations was based on area allocation and type of vegetation cover. Each observation plot was surveyed by transect lane by quadrat method. The locations and quantity of observation plot are presented in Table V-6

Table V-6. Locations and quantity of observation plot on Vegetation and wild animals

No	Environmental components and sub-components	Environmental parameter	Land condition(wet/dry)	Land vegetation	Quantity of sample spot
	Vegetation	Species, density, dominance frequency, protected species	Dry	Forest and non forest	3 (three)
	Non wood forest produce	Spread of species, economic	Dry	Forest and non forest	3 (three)

		potential, dependency			
	Wild animals	Habitat, diversity, abundance, rare/protected animals	Dry	Forest and non forest	3 (three)

- the implementation of vegettation plot observation is as follows:

- determining transect line with cuntour upright direction, transect length was determined on the basis of minimum sampling intensity which ecologically represented each type of vegetation cover
- at each transect line it was determined observation plots systematically with random start. Systematically the placement of observation plots are illustrated in figure V-1
- parallely, during the observation of seedlings level (2 x 2 m plot), pile (5 x 5 m plot), and pole (10 x 10 m plot), it was also done the observation on cultivation vegetation (non wood) and the diversity of flora / sperm plasma

GAMBAR PETAK

Figure V-1 Scheme of Transect placement and Vegetation observation plots

Remarks:

A = measurement plot for seedlings and base vegetation (2 m x 2 m)

B = measurement plot for pile (5 m x 5 m)

C = measurement plot for pole (10 m x 10 m)

D = measurement plot for trees (20 m x 20 m)

e. Wild animals

* type of data gathered covered (a) composition and diversity of species, spread and migration of animals as well as regional mascot, (b) the abundance of animal species, (c) the quality of wild animals' habitat and (d) species of protected and rare wild animals as well as their utilization by community
* method of data gathering on wild animals was done directly (direct encounter with wild animals) and indirectly (through footprints and other clues). The observation was done on aves, mammalian and reptil species by IPA method (Indices Point of Abundance), Line transect sample count, and interviews, the use of which depended on the wild animal species
* Data gathering by IPA method was done by stationary observation at an observation spot with a certain observation radius (depending on field condition) for ± 15 minutes. The quantity of observation spot ranged 2-3 spots for one habitat type
* the method used to collect data on the relative diversity and abundance was IPA and transect lane method. data recorded in IPA method were spot number, species of aves viewed, number of individuals, activities and type of trees/vegetations where the activities were conducted
* the method used to collect relative diversity and abundance of reptile was tansect lane method. Observation data covered species and number per time unit or transect length as well as observation on the locations of species' activity in its connection to habitat utilization
* the observation on wild animals was done purposively based on habitat diversity of each wild animal. For indicator animals it was used special method (habitat, behavior and population). The location of wild animals observation was the same to that of vegetation observation (Table V-6)

f. Aquatic biota

* Aquatic biota reviewed were all forms of life existing in the river, as follows:

> Plankton; comprised of zoonplankton and phytoplankton

> Nekton; in the form of fish species existing in the river

> Benthos; organism existing on the river base

- plankton samples were collected by filtering 100 liter of water by using plankton net number 25. water filtered was collected by vertical (from bottom/base layer up to surface layer) and horizontal (several sampling spots at river/lake segment) composite way by using Kammerer Water Sampler device. Water filtered in the container of 25 cc was preserved by formalin 4% or lugol. Miscroscopic species identification was conducted at the laboratory.

- To find out the species of nekton existing in river or lake, it was done data collection by :

  - visual observation on field

  - interviews with local people, covering species consumed by the population and those species frequently fished or encontered

  - tracing down secondary data, covering statistic data of regency, scientific publication / results of research and other sources

  Data recorded were species, spreading area and fishing (when consumed / sold), the estimation on fished quantity and fishing devices.

- samples of benthos were collected by using Eichman grab device (for waters of mud, sand base and the current was calm/small) or Surber device (for river with strong current, stony and having < 0.6 m depth). Benthos was separated from its substrate by using sieve set of US Standard no. 30, then preserved by formalin 4%. Miscroscopic species identification was conducted at the laboratory.

- The sampling of aquatic biota was done on waters body which was estimated to be affected by the impact of activity. The locations of aquatic biota sampling were to maximum extent same to the water quality sampling spots (Table V-5).

g. Social economic culture

* Data gathered according to its sources, comprised of primary data and secondary data. In connection to the collection of primary data sourced from respondents and of more quantative nature, the sampling technique was important
* Secondary data was collected from the initiator and various institutions/ instances which selectively were capable of providing information and data on those variables to analyze. These instances were BPS, Census and statistic office of province / regency, Plantation service, Bappeda of Province and regency, Bapedalda, Economic department of Merauke regional government, etc
* primary data collection was done by observation technique and interviews. Specifically for primary data tending to be of qualitative nature was collected through observation and non-structured interviews. Non-structured interviews were made with key informants. Though it was non-structured, free interviews were still being directed by an interview guidance. The results of interviews were recorded or noted in a daily log. Primary data which tended to be of quantitative nature was collected through interviews with respondents by using a questionnaire
* the target respondents were the heads of households, sampling was conducted purposively
* the determination of sample villages was done purposively based on (a) the formulated space of impact, (b) accessibility and reachadable of settlements to plantation area and (c) the distance between settlements and the location of plantation to be constructed by PT Bio Inti Agrindo
* Based on the above considerations, those kampongs made as target study's sampling were as presented in Table V-7
* Data collected both for environmental color purpose and for impact estimation covered local economy, demography, and social processes

Table V-7 Kampongs of Social economic cultural data sampling in Ulilin district

No	Name of kampong / village	Locations of kampong / village	
1	NOTE TO MBAK KARTIKA, UNTUK KATA-KATA YANG TIDAK PERLU	Beyond the working area	Inside the working area

	DITERJEMAHKAN, SEPERTI BIASA TIDAK SAYA BUAT		

2. METHOD OF DATA ANALYSIS

a. Erosion

* the sounding of erosion by using USLE equation (Arsyad, 1989), with the following equation:

NOTE TO MBAK KARTIKA, UNTUK RUMUS YANG TERDIRI DARI HURUF-HURUF TIDAK SAYA BUAT (KARENA TIDAK PERLU DITERJEMAHKAN)

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Where

A = erosion (ton/ha/year)
S = slope angle factor (%)
B = rain erositivity factor
C = land use or covering factor
K = soil erodibility factor
P = land management or conservation factor
L = slope length factor (m)

- the value of rain erosivity factor (R) was determined on the following formulation:

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Where

EI-30 = monthly rain erosivity index = 6, 119 (P) 1.21 (H) -0.47 (MP) 0.53
P = average monthly rainfall (cm)
H = average monthly rainy days (day)
MP = maximum rainfall for 24 hours each month (cm)

- soil erodibility factor (K) is calculated on Wischmeier and Smith equation (1978) as follows:

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Where

M = (% fine sand + dust) x (100- % clay)

a = % organic substance, i.e. 1.724 x % C-organic

b = soil structure code

c = soil profile permeability structural code

GAMPAR PETA YANG TIDAK BISA DITERJEMAHKAN
DI HALAMAN V-12

Figure V-2 Map of study area borders and Sampling locations

- topographic factor (LS) was calculated on Wischmeier and Smith equation (1978) as follows:

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Where

L = length of slope (m)

S = slope angle (%)

- land use or covering factor and land management act or land conservation (P) was predicted based on field observation by referring to the literature of research on C and P values in such conditions suitable to the condition of study area
- data from erosion measurement result collected was then compared to Erosion hazardous level (TBE) according to the Decision letter of Dirjen RRL (1986) as presented in Table V8

Table V-8 Erosion hazardous level (Dirjen RRL (1986)

Depth of soil (cm)	Erosion class (ton/ha/year)				
	1	2	3	4	5
>90					
NOTE TO MBAK KARTIKA, UNTUK ANGKA-ANGKA YANG TIDAK PERLU DITERJEMAHKAN, SEPERTI BIASA TIDAK SAYA BUAT					

b. Sedimentation

* the condition of momentary TSS was measured by water sample laboratory analysis, TSS inlet was deemed as base color, TSS difference between inlet and

outlet constituted a acontribution from the study area. Data collected from said water sample was only the information on momentary condition. In fact, TSS that occurred was parallely compared to erosion rate of the relevant water catching area (DAS), and the rate was affected by the occurrence of rain

* the average contribution of study area to the rate of sediment load was calculated on the basis of its proportion (SDR) from the erosion rate occurring per year with the following formula:

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Where

SDR = sediment carrying rate (%) a = 0,868322

S = average slope class (%) b = 0,201882

A = area of DAS

π = Manning surface hardness coefficient = 0,029

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Where BS = sediment load (ton/m3=gr/liter)

Cs = DAS sedimentation rate (ton/day)

E = erosion rate at each land system (ton/ha/year)

A = the width of effectively worked on area (ha)

c. Micro climate

Analysis in micro climate was done by comparing the types of vegetation cover, i.e. forest

and non forest.

d. Water quality

analysis on water quality was done partly on field and partly at the laboratory. The results of water quality measurement were compared with the regulation of the Minister of

Health of the Republic of Indonesia No. 416/Menkes/Per/1990 concerning the Determination of Water quality standard.

e. Vegetation

* Formula used in the calculation on vegetation analysis by quadrate method is (Soerianegara and Indrawan, 1985):

Population of any species' individuals
Density : ----------
(individual) Area of all Plots

Total individuals of a species
Relative density: ---------- x 100%
(%) total all species

Basal area of a species
Dominance : ----------
(m2/ ha) Area of all Plots

Dominance of a species
Relative dominance : ---------- x 100%
(%) dominance of all species

Total filled plots of a species
Frequency: ----------
Area of all Plots

Frequency of a species
Relative frequency : ---------- x 100%
(%) frequency of all species

Important value index (INP) = relative density + relative dominance + relative frequency

Specifically for seedling level, pile, and pole, INP is calculate by formula:

Important value index (INP) = relative density + relative frequency

- to calculate the Index of Similarity it is applied the formula as follows:

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Where

IS : Index of Similarity

W : Important value index which is same or smaller than the same species of vegetation in both communities being compared

A : Total Important Value index of Community A

B : Total Important Value index of Community B

- To calculate Shanon Index of General diversity and Equitability index it is applied the following formula:

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Where

D : Shanon Index of General diversity

nl : the Important value index of a species

N : Total Important value index of all species

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Where

J : Uniformity index

H : Shanon Index of General diversity

H max : In S (S = population of species)

- To calculate forest potential(volume) it is applied the following formula:

Volume of tree stands (m3/hectare) = BA x Tb x N x 0.7

Where

BA	: area of base plane (m2)	N :	total number of trees (stem/ha)
Tb	: branch-free height	0.7:	constant of tree shape factor

VI ESTIMATION ON SIGNIFICANT AND IMPORTANT IMPACT

A THE DETERMINATION OF SIGNIFICANT AND IMPORTANT IMPACT

Estimation of significant and important impact is based on the scoping already described in Chapter-IV. In the estimation of impact, those components having been scoped would be reviewed and analyzed on the basis of initial color acquired from the results of field survey and secondary data by impact triggering activities through empirical, analogue, quality standard calculations and experts' assessment. The results of said review will raise either important or non important positive / negative significant impact.

Method of impact estimation analysis uses the calculation of impact estimation matrix, which generates the weight of impact, degree of impact and nature of impact. Said impact estimation matrix is shown in Book of Attachment, and in this chapter it will only be addressed the results of analysis. While to find out the impact calculation process in quantitative form it can be followed such impact estimation method in Chapter III of KA-ANDAL.

The components of activity plan potential to cause an environmental impact are as follows (1) Pre-construction Phase activity covering : (a) Certification and Consultant's study, (2) Construction phase activity consisting of: (b) Land preparation / Land Opening, (c) Planting, (d) TBM 1 to TBM 3 Nursery, (e) Road network Building, (f) Facilities-Infrastructure building, (g) Heavy equipment mobilization, and (h) the Construction of Oil Palm Processing Plant, are estimated to potentially cause either positive or negative impact; (3) Operation Phase activity, i.e. in Harvesting and Yield transportation sub-activity (i), Waste and PKS pollutant Management (j), as well as Manpower Recruitment

and Community Nurturing (k); (4) Post-construction Phase activity covering : (l) Land Rehabilitation / Reclamation.

1. Certification and Consultant's study (Licensing)

The environmental parameters to be affected by Certification and Consultant's study (licensing) activity are among others conflict of land ownership and use, since community will feel that the company takes over right on their land, and community's perception constituting a derivative impact from the foregoing environmental parameters that shall end in security issue.

2. Impact of Land Preparation (Land opening) activity and Road Network building

Land Preparation and Road Network building sub activity will have an impact on the erosion environmental parameter and its derivative, i.e. sedimentation and water quality, abundance and diversity of protected wild animals, abundance and diversity of aquatic biota, accessibility, employment and business opportunities, income level and living standard, economic activity, population mobility and spread, as well as community's health condition.

3. Impact of Planting and TBM1 to TBM3 Nursery Activities

Planting and TBM1 to TBM3 Nursery sub-activity will have an impact on employment and business opportunities, income level and living standard, as well as community's perception environmental parameters. This is because by the presence of planting and TBM1 to TBM3 Nursery activities will absorb many employees and kiosk opening opportunity to supply employees' needs.

4. Impact of Road network and Facilities-infrastructure building activities

Types of environmental parameters affected by an impact due to Road network and Facilities-infrastructure building sub-activity are employment and business opportunities, income level and living standard, economic activity, community's perception, as well as the number of medical staff and health facility.

5. Impact of Heavy equipment mobilization activity

Heavy equipment mobilization sub-activity constitutes a source of impact for soil erosion, sedimentation, water quality, as well as air quality and noise environmental parameters/

6. Impact of Oil Palm Processing Plant Construction activity

Oil Palm Processing Plant Construction sub-activity will have an impact on water quality, employment and business opportunities, income level and living standard, economic activity, as well as community's health condition

7. Impact of Harvesting and Yield transportation activity

Types of environmental parameters affected by an impact due to Harvesting and Yield transportation sub-activity are employment and business opportunities as well as income level and living standard

8. Impact of Oil palm factory's (PKS) Waste and pollutant Management activity

PKS Waste and pollutant Management sub-activity constitutes a source of impact for community's perception and community's health condition environmental parameters

9. Impact of Manpower Recruitment and Community Nurturing activity

Manpower Recruitment and Community Nurturing sub-activity will have an impact on employment and business opportunities, income level and living standard, economic activity, as well as community's health condition environmental parameters

10. Impact of Land Rehabilitation / Reclamation activity

Types of environmental parameters affected by Land Rehabilitation / Reclamation sub—activity are soil erosion, sedimentation, water quality, community's perception, and community's health condition

B. THE SOUNDING OF 8IGNIFICANT AND IMPORTANT IMPACT

Result of impact identification and prediction as spelled out in the document of Reference Framework on Environmental Impact Analysis (KA-ANDAL) is that the subject matters of impact due to this activity plan of oil palm plantation project construction and the construction plan of PT Bio Inti Agrindo's processing plant, in Papua province are as follows:

(1) the degradation of Bian River's and Fly River's water quality
(2) the increasing rate of soil erosion
(3) the disturbance to protected Flora /vegetation and Fauna/wild animals
(4) local community's complaint and restlessness (community's perception)
(5) community's health

Further, to review and re-test, whether said subject matters of impact as spelled out in KA-ANDAL document are still relevant or developing, below it is presented a description on the identification and estimation on the impact of activity to its surrounding environment.

1. IMPACT TO PHYSICAL-CHEMICAL ENVIRONMENT

(a) Impact to Micro climate

The impact of oil palm plantation and processing plant construction activity plan on micro climate raises in conjunction to the presence of investment phase activity particularly land preparation (land opening) activity causing the loss of natural vegetation covering soil. This land opening is intended for the planting of oil palm (36.000 ha). By the presence of said activity, land which is previously covered by natural vegetation will change to become an opening land (temporarily) and be projected to cause an impact on the increase of air temperature and soil temperature, the degradation of air humidity as well as increasing evaporation on that open land.

The increase of air temperature and soil temperature is a reasonable consequence of the activity and is unavoidable since the existing vegetation must be cleaned-up for the construction and planting activity of oil palm as well as for the other supporting facilities purpose. At this open land, air temperature on the daylight is projected to have an increase of around 1.0 – 1.5°C , soil temperature between 2-4 °C from the previous condition. Further, the difference in air temperature between that in the daylight and that in the night (fluctuation of daily temperature) shall become bigger.

Said increase of soil temperature will have an impact to the increase of evaporation rate from soil which will indirectly evaporate and carry nutrient elements easily evaporating being on soil surface, such as nitrogen. Another impact of said condition is capable of reducing manpower productivity due to the quick occurrence of tiredness process.

The degradation of air humidity is caused by the degrading transpiration of plants due to the loss of the existing vegetation and the increase of air temperature. This increasing soil temperature and degradation of humidity shall take place as long as the land is in open condition and the plants are not high yet, so the effort need to do is among others an immediate planting of cover crops vegetation, both leguminosa (lentil) species and the building of yard land.

Local air humidity in the daylight is estimated to decrease to become 5-10%, while air humidity in the night is projected to suffer less significant change. This change to humidity has a relatively small effect to the environment. While the change to micro wind pattern is caused by the loss of original vegetation functioning as a 'wind break' having only a micro impact.

The impact of this micro climate change is reversible, which means that it is recoverable when the cover crops vegetation covers perfectly and oil palm plants grow big (4 years). Therefore the nature of this impact is not permanent. As for the effect of this impact to the other environmental components are limited to the degrading fertility of surface soil (open area) due to the evaporation of the most part of nutrient element which evaporates easily (nitrogen). The act taken to minimize this impact is to do an immediate planting of cover crop vegetation (LCC), re-vegetation of land at emplacement areas, yard land, and doing the fertilization.

By considering the above description, it can be narrated that the construction activity of PT Bio Inti Agrindo's oil palm plantation and processing plant on the change to micro climate is deemed as a non-important negative impact.

(b) Impact on Air quality

The impact of said plan of PT Bio Inti Agrindo's oil palm plantation and processing plant's construction activity on air quality is the upgrading degree of CO, CO2, SO2, NOx gases, and particulate dust. Said impact comes from the fuel burning activity, i.e. quarry transportation and goods transportation vehicles at construction phase as well as the presence of TBS transportation and the operation of oil palm processing plant at operation / production phase.

To anticipate any possible land (forest) fire hazard and to avoid any smoke hazard, the burning activity of ex-felled down vegetation for the project construction is not done and it is taken the preventive measure. This conforms to the governmental regulation concerning prohibition to the burning of ex-felled down remains.

Impact of transportation traffic of harvesting yield in the form of TBS at operation phase (production/exploitation) on air pollution is projected to have an upgrading degree of dust particularly along the transportation road lane. This dust impact is deemed quite important by the considering that:

(1) the road going to use to carry TBS will partly be inter-village connecting road, so it has to pass through settlements area
(2) the quantity of this TBS transporting vehicle is projected to be > 10 trips per day
(3) inter-village connecting road is usually located around settlements, so the upgrading degree of dust by the presence of these TBS transporting vehicles is relatively high
(4) the analysis results on rainfall data show that the spread of impact time will occur when there is a deficit of water or during dry season, i.e. in September, where the condition of soil texture in this area shall commonly be dusty so dust shall be easily flown

This dust degree is estimated to cause a quite important impact only but needs a management particularly at the inter-village connecting road lane. In addition to TBS transporting vehicles, at production phase, the dust degree is also projected to upgrade in conjunction with the PKS operation activity, which uses shells and fine fiber as steam generating fuel in the plant process. For this matter, PKS has been designed in package with the building of Dust Collector.

The impacted area is limited to around the plant site and the number of people affected is also relatively small, particularly plant employees. Estimation on the number of human affected by the impact of this PKS operation is projected to have a small effect, since the distance between PKS to the people's villages is relatively far (>5 km).

Further, to find out the level of air pollution caused by the operation of oil palm processing plant (PKS) based on the analysis results of air quality (analogue) from those

oil palm factories having quite similar specifications with those going to build by PT Bio Inti Agrindo is as presented in Table VI-1.

Table VI-1 Estimation on the Air quality around PKS site (*)

Parameter	Unit	PKS center	200 m from PKS	500-700 m from PKS	NAB (**)
Dust					

Source : (*) Report of SEL plantation and PKS Tinjowan, PTP VI, 1993
(**) Threshold value (NAB) by SK of the State Minister of Living environment no. 13 of 1996

Data of such analogous results as in the table above shows that gases and dust mix generated by the presence of PKS activity are still under the designated threshold. However when viewed from the natural quality, this PKS activity will upgrade air pollution degree, particularly for dust particulate parameter.

As an illustration it can be viewed dust pollution, where at the distance of 500-700 m from the factory site (in the same direction with dominant wind) the dust degree has degraded, from 218.37 ug/m3 (200 m from PKS center) becomes 87,43 ug/m3. Similarly, the other gas pollution parameters tend to become under the designated threshold.
Based on the above description, it can be assumed that the effect of oil palm processing plant (PKS) operation plan on air pollution is deemed as having a less important negative impact by considering:

(1) the dust pollution degree from gases produced by PKS is deemed as still under the threshold designated by the government, so its subsequent impact is estimated to be relatively small

(2) the area of impact spread is limited to around the factory and at the distance of 700 m from PKS site this air pollution degree is already under the designated threshold, so the designed PKS' operation distance from the people's settlements is deemed as quite sufficient

(3) the number of human affected by the impact is limited to PKS employees who are every day at the factory emplacement managed by emplacement construction which is designed to be at the radius of > 400 m from PKS and the location where this emplacement is built is at the shadow (opposite) area to the biggest wind.

(4) Based on its characteristics, said impact of air quality (dust) is a reversible impact by considering the presence of external factor i.e. a sufficient rainfall along the year in this area, so it will help in degrading the existing pollution of dust and gases, where the accumulation level of impact may decrease naturally

(5) The other environmental components affected by the impact are the possible increase to the disturbance of top section respiratory tract particularly in employees/workers at factory department, so it needs to provide a health facility for workers

(c) Impact on Noise

Noise impact is projected to occur during the operation of oil palm processing plant. The other sources of noise impact (small and temporary) come from the workshop activity and traffic vehicles. The source of noise at PKS operation comes from the use of steam generating boiler to drive generator turbine and other steam engines inside the plant operating mechanically. In addition, the plant machines running also the potential source of noise.

Based on the analogy from the monitoring results on noise level coming from the operating PKS is as presented in Table VI-2

Table VI-2 Measurement results on noise at PKS (*)

Location of observation	Noise (dBA)	NAB (**)
Boiling station		
Pressing station		
Clarification station		
Nut crushing station		
Boiler room		
Incinerator room		
Settlements (300 m from PKS)		

Source : (*) Report of SEL plantation and PKS Tinjowan, PTP VI, 1993
(**) Threshold value (NAB) by SK of the State Minister of Living environment no. 13 of 1996

From the above table it is illustrated that inside the factory area, in general the noise level that occurs exceed the designed threshold, i.e. 85 dBA for continuous noise level, particularly at Boiling station, Clarification station, and Nut crushing station. Further, the noise level outside of factory at the distance of > 300 mm, the noise level has met a comfort level (85 dBA).

Based on the above description it can be narrated that factory's activity against the noise is deemed as having a less important negative impact, but it is needed further management, by considering:

(1) that the noise level occurs inside the factory in average exceeds the designated threshold, but only has a limited impact to factory employees, so it is needs to implement the use of K3 such as ear plug and shift system. By the use of this ear plug the noise level suffered by employees can be reduced to 60%, so the noise level shall become ± 49-55 dBA, under the designated threshold

(2) the number of human affected by the impact is limited to PKS employees only who at the peak operation period is ± 141 personnel, but from this number not all of them will be affected by the impact, since not all employees are going to work inside those noise generating spaces

(3) the time-length of impact is continuously, so to reduce the impact continuously, it is needed an ear plug, the implementation of shift system. Mutation of workers from the noisy department to another which is not by shift system as well as doing a periodic checkup to employees prone to the noise

(d) Impact on Land burning potential

Land fire is highly un-expected by any oil palm plantation business, so the preventive act to eliminate any possibility of land fire hazard must be keep doing. This is understandable since fire at an oil palm plantation will cause a very big loss, both in short term (loss of investment) and in long term (the decrease of TBS harvesting yield).

Based on interviews with local people, land fire at area around the oil palm plantation of PT Bio Inti Agrindo had never occurred for the last five years. in addition, the type of soil at the study area is all mineral soil and there is not peat soil, so it is estimated that the possibility of land fire to occur is relatively small.

(e) Impact on erosion rate

As an anticipative act towards the possibility of land and water damage, from the possible increasing of erosion rate at the study area land, the construction of an oil palm plantation is generally designed by considering the preservation of the environmental carrying

capacity. Land and water conservation act has been considered since the land selection phase up to its utilization.

The calculation result on the erosion rate at study area shows that the erosion rate at each cover crops and slope level indicates a very tolerant class (H), both at oil palm land, reeds, bushes and secondary forest. This is supported by the slope condition which in general is relatively flat to wavy and a quite good soil porosity / permeability.

Table VI-3 Prediction on current erosion rate with oil palm land

Code	Land use	Type of soil	Slope (%)	Current EP (ton/ha/year)	Tolerance class	EP of oil palm*) (ton/ha/year)	Tolerance class
	Oil palm	Podsolic					
	Oil palm	Podsolic					
	Bushes	Podsolic					
	Bushes	Podsolic					
	Secondary forest	Podsolic					
	Secondary forest	Podsolic					

Remark : calculation on potential erosion (EP) uses USLE formula, FAO 1978

*) estimation on erosion if land is planted with oil palm + LCC crops with a quite good cover

Tolerance class : Ni = intolerant, loss of soil > 2 cm/year (> 2000 tons/ha/year) , soil age of profile < 50 years

S = less tolerant, loss of soil 1- 2 cm/year (1000 - 2000 tons/ha/year) , soil age of profile 50 -100 years

M = quite tolerant, loss of soil 0.5- 1 cm/year (500-

1000 tons/ha/year) , soil age of profile 100-200 years

N = tolerant, loss of soil 0.1 - 0.5 cm/year (100-500 tons/ha/year) , soil age of profile 200-1000 years

H = highly tolerant, loss of soil < 0.1 cm/year (<100 tons/ha/year) , soil age of profile 1000 years

By looking at the table above it seems that the impact of oil palm plantation construction on erosion has an indication to increase if the land is undertaken with oil palm, particularly at land with slope of 8-15% which is previously a secondary forest, i.e. the erosion rate from 0.3176 tons/ha/year to become 5.3522 tons/ha/year or there occurs an increase by 95.00% with the spread of impact area of only about 6,027 ha (15.11% of total area).

At land which is previously bushes, by the development of this oil palm crops, the average erosion rate in general will decrease by a range of 66,67%. This is because at the oil palm soil it has been done the planting of LCC (Legume cover crops) i.e. by the use of Peuraria javanica (4 kg/ha), Callopogonium muconoides (4 kg/ha), and Centrosema pubescens (6 kg/ha) species. In six months, the land which is previously open will be immediately covered tightly by those lentils crops species.

The immediate covering by this LCC crops has the functions among others to minimize the growth of weeds, add soil nutrient (fixation of nitrogen by crops' root) , generating high humus quickly, so it improves soil aeration and increases the availability of water for plants.

Next, on land newly opened, at the interval between land opening activity and the growth of LCC crops until this crop covers soil perfectly (6-8 months), it is estimated that the erosion rate on this open land is quite high but is still within the highly tolerant range (H) at slope 8-15% or slope 0-8%. The impact of erosion on an open land at this oil palm only occurs for 6-8 months while the impact on emplacement land is estimated to occur quite long

Table VI-4 Prediction on current erosion rate with an open land

Code	Land use	Type of soil	Slope (%)	Current EP (ton/ha/year)	Tolerance class	EP of oil palm*) (ton/ha/year)	Tolerance class
	Oil palm	Podsolic					
	Oil palm	Podsolic					
	Bushes	Podsolic					
	Bushes	Podsolic					
	Secondary forest	Podsolic					
	Secondary forest	Podsolic					

Remark : calculation on potential erosion (EP) uses USLE formula, FAO 1978

*) estimation on erosion if land is open

Tolerance class : Ni = intolerant, loss of soil > 2 cm/year (> 2000 tons/ha/year) , soil age of profile < 50 years

S = less tolerant, loss of soil 1- 2 cm/year (1000 - 2000 tons/ha/year) , soil age of profile 50 -100 years

M = quite tolerant, loss of soil 0.5- 1 cm/year (500-1000 tons/ha/year) , soil age of profile 100-200 years

N = tolerant, loss of soil 0.1 - 0.5 cm/year (100-500 tons/ha/year) , soil age of profile 200-1000 years

H = highly tolerant, loss of soil < 0.1 cm/year (<100 tons/ha/year) , soil age of profile 1000 years

To reduce the impact above, the preventive act can be done through the determination on land opening time that is scheduled during dry season or in the month with low rainfall and to immediately to the planting of cover crops when rain starts. The fertilization of LCC crops is done by the purpose of accelerating its growth which speeds up also the land covering.

Next, on peat moss soil, the erosion process or soil drifting may occur at the wall and embankment of drainage channel, but it is estimated that this impact is not dangerous, since in the building plan of drainage channel it is designed by keep taking note of water flow rate and the safe sloping of embankment so soil collapse can be reduced.

Based on the above description, it can be concluded that the impact of oil palm plantation construction on erosion rate is deemed as less important negative impact , by considering among others:

(1) the percentage of erosion rate increase on land going to open is in general within the permitted tolerance limit, particularly on land with slope 0-15%, both on oil palm soil and open soil

(2) on land in the form of bushes, with the opening of land for oil palm shall be more advantageous in long term since the erosion rate tends to decrease by about 66.67% from the original condition. The spread of its impact reaches 66.26% of the total area

(3) on an open land with land slope of 8-15% the erosion rate tends to increase from the initial condition (highly tolerant), but the spread of its impact is relatively very small i.e. 147 ha (0.37%) of total area and the time of occurrence is relatively short i.e. 6-8 months. Further, the erosion rate will be back to normal, once LCC crops start covering soil perfectly

(4) the environmental components going to be affected by the impact is relatively not real since the land undertaken for oil palm crops has the slope of 0-15%, which is less prone to erosion

(f) Impact on river's water quality

Based on the sources of impact, the impact of oil palm plantation construction on the change to water quality is grouped into two parts of activity, i.e. 1) impact caused by oil palm plantation activity and the open land for emplacement activity and 2) the operation activity of oil palm processing plant.

1) impact from plantation activity and open land

The land opening activity for the construction of oil palm plantation and the construction of facilities and infrastructure such as the building of road, residences, and offices will speed up the erosion rate which continues to the upgrade of turbidity and suspended solid.

This water quality parameter will increase its value during the land opening activity takes place (construction phase), which has the impact time of about 6-8 months. In the following year, on oil palm land at 0-3% slope it will have a better impact than the previous condition which has bushes vegetation.

At emplacement land used for residences, offices, seedling area, and factory emplacement, the surrounding land in general must be opened by cut & fill system, so the overlay is peeled. At this land has in general a quite long open space and time, so the impact of erosion will increase.

The rivers going to be affected by the impact are Bian river and Fly river which has its respective estuary directly to the sea.

In addition, the cultivation activity of oil palm crops agriculture will have an impact to water quality in the form of the increase of nitrogen compound, phosphor, potassium, and pesticide caused by the use of fertilizer in the effort to improve soil fertility and pesticide to eradicate pest and plant diseases. Nitrogen compound will be in the form of nitrate (NO3) and ammonia (NH3), while phosphor compound covers orthophosphate and total phosphate. The use of pesticide is highly recommended by using those types recommended by the National Pesticide commission team, with active ingredients soluble in water.

This compound will increase simultaneously with the runoff which carries those compounds into the waters body. The use of kieserite, MOP and Borate, is estimated to affect the water quality in the form of oxide , boron, and chloride compounds. The use of this fertilizer dosage, is projected not to affect the quality of river's water existing at the project area at blooming level or excessive fertilization in the waters, since the characteristics of rivers at the project area are having a quite strong current.

The use of pesticide to control pest of plant diseases is estimated as less than 5% only that will drift and enter the waters body and the average use of this pesticide is usually less than 0.25 l/ha/year. In addition, the active ingredients of pesticide used are active substances easily decomposed (easily soluble in water), s the danger to human health and safety is deemed as relatively small. The use of pesticide is highly recommended by using those types recommended by the National Pesticide commission team, with active ingredients soluble in water.

By considering the above description, then the impact of non-factory activity on water quality is deemed as less important negative

2) Impact of PKS activity on river's water quality

Oil palm processing plant (PKS) will be built by 2 units to contain TBS. the source of water used for the processing need at PKS will come from Bian river.

The planned PKS capacity which will operate is totally 120 tons TBS/hour so the volume of waste to produce is also relatively high. The volume of waste water to release from this PKS by using decanter device is ± 0.40 ton of waste water /ton of TBS, so the volume of maximum liquid waste if the plant operates full for 24 hours per day at PKS is 576 m3/day in Bian river. The source of this PKS waste water comes from : condensate water from sterilizer (15-20%), clarification water (70-75%) , and hydrcyclon water (5-10%).

By using analogue, the quality of this PKS waste water is in general having a very good quality and exceeds the defined threshold (SK of the Minister of LH No. Kep-51/MENLH/10/1995) i.e. pH, temperature, BOD, COD, oil and grease, total solid, suspended solid, and ammonia. As an illustration, it is used secondary data from the analysis results on the quality of factory's waste water before it is done the processing as presented in table VI-5

Table VI-5 The quality of PKS waste water

Parameter	Unit	Value (*)	NAB (**)
BOD5			
COD			
Suspended solid			
Oil and grease			
Ammonia			
pH			

Source : Chin, 1981 and Tobing, P.L. & Naibaho, PM, 1993
NAB (**) SK MENLH No. 51/MENLH/10/1995

Based on the data from the table above, it seems that the key parameter of PKS waste water quality before it is done the processing, is in general far in excess the defined threshold.
The waste produced from this process is organic waste so its processing system must follow the organic waste processing norm. the assisting chemical substance dangerous to environment in this factory process is practically not used.

In addition to PKS waste, it is found also used oil from the use of engine lubricant and factory equipment of ± 100 l/week. This used oil is managed by the collection in a drum, then resold to the supplier. This used oil is not dumped into the river.

By basing on the quality of waste water, it is obtained the calculation on pollution load from PKS waste with the capacity of each PKS at the peak waste water debit (which each year follows the production). the waste pollution load at PKS peak capacity, if the waste water produced is without processing is as follows:

Table VI-6 Pollution load of PKS waste before the processing at waste water treatment plant

Parameter	BPA (kg/ton of product)	BPM (kg/ton of product)	BPAi (kg/ton of product)	BPMi (kg/ton of product)
BOD5				
COD				
Suspended solid				
Oil and grease				
Ammonia				

Note : calculation result, 1999

1) NAB : SK MENLH No. 51/MENLH/10/1995
2) volume of PKS liquid waste, CPO production and oil palm kernel are presented in the table

According to Kepmen LH No. Kep-51/MENLH/10/1995, it is stated that BPA shall not be more than BPM and BPAi shall not be more than BPMi. By viewing data from the table above, as a whole at each parameter analyzed the level of its pollution load before the waste water is processed at IPAL tends to exceed the defined threshold, so it is projected to potentially pollute the waters environment. this is proved, that to avoid any pollution to public waters due to this PKS liquid waste, the construction plan of PKS at

PT Bio Inti Agrindo is designed to use a plant construction package which is equipped with waste treatment unit with ponding system, i.e. an-aerobic, facultative and aeration ponds, since this PKS waste contains multiple organic substances that are easy to biodegrade and can easily be processed biologically.

a) Sludge processing unit

This unit functions to process sludge separated by continuous decanter and nozzle separator which contains about 30-80% water, 1-2 % oil and 13-16% NOS. by sludge conveyor, this sludge is sent to rotary sludge drier to be dried. At the waste treatment process here it will emerge solid waste (dry sludge) which is usable as plant fertilizer, since this dry sludge is already free from pollutant, so it is not dangerous to plant.

The drying of sludge is done by using hot steam exhausted from steam kettle at the temperature of 300 C. the dried sludge will be contained in a refinery to be later inserted into rags and used as fertilizer. The quality of this dry sludge is in general contains + 9% water, 4% oil, and 30% NOS but having obtained the recommendation to be used as plant fertilizer.

b) Processing unit of sterilizer condensate, clarification waste and Hydrocyclon water

The construction plan of this Waste water treatment plant (IPAL) is designed to use an-aerobic / aerobic pond system and aeration system with the details of pond as follows:

1. Fat Pit
2. Cooling ponds
3. mixing ponds
4. an-aerobic ponds
5. sedimentation ponds
6. aeration ponds
7. test ponds

The detailed description on IPAL working process as well as the specifications at PKS according to the capacity, is given in the Environmental management plan.

Based on the above description, it can be concluded that the impact of oil palm processing plant on the degradation of surface water quality is deemed as negative important impact with the weight of impact is big (-3) based on the following considerations:

(a) the Oil Palm processing plant will also produce waste in a big volume, i.e. 0.40 m3/ton of TBS, so all PKS will produce a quite high waste (1.440 m3/day)

(b) the quality of PKS waste water before being processed at IPAL has a quality that exceeds the defined threshold (SK of the Minister of LH No. Kep-51/MENLH/10/1995) i.e. pH, BOD, COD, oil and grease, suspended solid and ammonia are deemed as potential to pollute the body of surface water (S Bian)

(c) based on the calculation result on pollution load (table VI-6) it is seen that the pollution load of each parameter is in general also exceeds the defined threshold if this PKS waste water is not processed in a perfect IPAL (BPA value is higher than that of BPM and BPAi value is higher than that of BPMi)

(d) the contribution of impact by the presence of this factory's liquid waste into the waters' body may cause a derivative impact, i.e. the disturbance to aquatic biota life, i.e. the degradation of plankton and benthos productivity that might cause a disturbance to the ecosystem in Bian River waters

(e) this disturbance to water quality also triggers the emergence of water using community's restlessness, especially Bian river which is used by the people for daily need, i.e. bathing, washing, and defecating. Further, this impact might also disturb the esthetic of river as well as degrading the environmental sanitation

(f) the dumping of PKS waste water in such big volume will occur continuously as long as the factory operates, so it is potential enough to disturb the quality of water body containing the waste (Bian river), if the processing result does not yet meet the threshold

(g) the cumulative nature of this PKS waste is reversible, since the waste produced is organic waste which will suffer a natural purification in the waste receiving water body

(h) the other environmental component going to be affected by the impact of this PKS liquid waste if the waste processing is not good enough, is deemed as quite complex, i.e. the biodegradation or decomposition of organic waste that occurs in Bian river's water body. In the decomposition process of this organic substance it will occur a degradation of water quality and odor that may disturb the ecosystem of aquatic biota and disturb the community using said water

Based on the above description, before the PKS waste water is dumped to public waters, it is needed a treatment on said PKS waste water in IPAL, so the waste water getting into the public waters is able to meet the threshold value defined by SK MENLH no. Kep-51/MENLH/10/95.

2. IMPACT ON BIOLOGICAL ENVIRONMENT

(a) Impact on Vegetation

The construction of PT Bio Inti Agrindo's oil palm plantation and plant will change the structure and degrade the diversity of he existing natural vegetation, from the initial condition of secondary forest, reeds, and bushes into monoculture forest of oil palm crops, settlements, road, and other facilities. the impact of this degradation to vegetation diversity is unavoidable, since the condition of the existing vegetation must be cleaned up. Indicators of changes that occur to this vegetation are the structure and potential of vegetation, diversity of species, dominance of species, and type of cover crops.

These lost species of vegetation are those vegetation species commonly found at tropical forests on Sumatra island, these species of vegetation are still widely found in the forests around the study area and in Merauke regency. In addition, if viewed from the status of

forest's function, the reserved area is a forest area that can be converted (HPK), in this matter will be changed and converted into an oil palm plantation area.

The spread of impact of oil palm plantation and processing plant construction activity directly on vegetation is 39.900 ha, consisting of:

* oil palm plant conversion 36.000 ha
* facilities-infrastructure building conversion 3.240 ha

The remaining land of 660 ha is allocated as conservation area (protected area), including river bank and water spring area.

In addition to that impact, a vegetation damage is possible to occur due to the activity of local people to meet their need of wood, both for burning wood and house renovation. This act may expand the opening area (becoming bushes) and degrade its potential vegetation.

Another impact estimated to occur by the presence of oil palm plantation project is the forest encroachment around the study area due to an easy accessibility into such forest places not opened yet, which in the end will also change the cover crops which continue to the degradation of species diversity, from secondary forest to become reeds or bushes. This condition of lost vegetation going to open is permanent at the place, and gradually will be replaced by oil palm crops, lentils crop and nurtured plants at yard land and emplacement.

Based on the above description, the impact of land opening on the vegetation environmental component is deemed as having an important negative impact with impact weight is big (-3) based on the following considerations:

(1) the lost of initial vegetation by the spread of impact of 39.000 ha area will cause a derivative impact on the other environmental components such as sedimentation process, water quality degradation, and the occurrence of

protected wild animals migration to another area and those animals potential to become pest of plants like pig and rat

(2) the potential loss of initial vegetation around the study area of PT Bio Inti Agrindo, is projected to increase by the easy accessibility built as well as the increase of population going to enter the project, i.e. workers at the company of ± 3,332 persons

(3) the impact on this vegetation change is permanent, so for the remaining land not undertaken as oil palm crops (660 ha) must be retained as a conservation area

(4) the presence of outsiders and the opening condition of area due to the easy accessibility will have an impact on the presence of protected wild animals, both by hunting system and the ownership through purchasing from people around the project. in addition the increase of social activity of people to the forest around and sees the animals as an added free protein so the hunting on animals is estimated to increase. Particularly the hunting on boar needs to do since it is deemed as going to become a pest for plants and its population is high

Based on the above description, it needs to take management and monitoring acts to be able to optimize the vegetation function.

(b) impact on change to wild animals

The wealth of endemic animals and protected animals which is diverse enough is found at the study area, both from mammalian , aves, and reptile classes.

The land opening activity will change the vegetation structure which initially is a habitat for those wild animals. For mammalian class, the impact of this animals migration will spread to the surrounding area being forest area (primary and secondary) with the status of Conversion Production forest (HPK), so the other disturbances due to the opening of land at said Production forest are of small possibility. The species of protected

mammalian going to be affected by the impact are among others: cuscus (Phalanger gymnotis), tree kangaroo (Dendrologus ursinus), and deer (Cervus timorensis).

While the migration of aves class to around of the project area that is going to occur quite significant are species of aves relying their lives on canopy and base of tree, such as cassowary species (casuarius casuarius), fish eagle (Pandion haliaetus), big beak parakeet (tanygnathus megalorinchos), blue chest Cendrawasih (Ptiloris magnificus), and yellow crest cockatoo (cacatua galerite).

In addition to such direct impact in the form of migration of said animals due to land opening, the impact deemed as serious enough is the number of persons coming to the company as manpower (3.332 persons). In addition to that manpower, it is also still added by the number of manpower from services and contractor sector.

The impact of manpower presence is the tendency to add load and pressure on the protected wild animals, either through direct hunting or by ownership through purchasing from native people, especially those exotic species of animals. The projection of animal species hunted to consume their meat is particularly deer. As for those wild animals going to be owned to raise for their beauty and commercial value are aves species such as Blue chest Cendrawasih (Ptiloris magnificus) and yellow crest cacatua (cacatua galerita).

To deal with this impact, the company shall have to strictly apply prohibitions to outsiders manpower on hunting and prohibition to own any protected animals by imposing a strict sanction, by coordination with local BKSDA.

The impact of oil palm plantation and processing plant construction activity on this wild animals is deemed as an important negative impact with significant weight of impact (-3) based on the following considerations:

(1) the loss of original vegetation will reduce the population of protected wild animals of quite wide diversity, due to the loss of their habitat functioning as a place to find feed, nesting, egging, and breeding, even though certain animals will undergo a migration out of the study area

(2) the presence of outsiders working at the project area, tends to cause a potential decrease of unique wild animals, due to a demand for being owned and raised (for aves species) even for being taken their meat (deer) through hunting
(3) the migration of wild animals particularly boar and rat will potentially become a pest for plants, either oil palm plant or community's feed plant, that might impact on the death/damage of cultivation crops which shall be detrimental to the community
(4) the impact characteristic of this wild animals' migration can be classified as permanent impact, except for mobile species (certain aves)

By taking note of the above condition, it needs to do further management, such as the prohibition to hunt, having a firearm, or owning protected wild animals on workers

3. IMPACT ON SOSEKBUD ENVIRONMENT

The construction of oil palm plantation and processing plant will utilize capital and resources (nature and human) in a large volume, so beside of positive impact that is acquired, it will also generate a negative impact. The positive and negative impact due to the activity estimated to occur cover : employment and business opportunities, income level and living standard of community, and community's health.

(a) Impact on employment and business opportunities

Impact of oil palm plantation and processing plant construction activity on employment and business opportunities constitutes a positive impact. The employment opportunity offered is estimated at approx. ± 3.332 manpower, which is divided into 3,092 manpower of plants section and 240 manpower of factory.

From such number of manpower mentioned above it is exclusive manpower in the secondary sector, i.e. formal and informal like the emergence of transportation services,

building construction services, restaurant, small grocery store / kiosks as well as manpower coming from the other sectors.

Impact on the employment and business opportunities from this construction activity of oil palm plantation and processing plant is deemed as important positive impact by considering that, in this project it will be absorbed a number of skilled and non-skilled manpower from several layers of educational level, that can be filled-in by local community.

From the abovementioned number of manpower, about 90% of manpower need will be utilized by the surrounding people, according to their educational background, also not requiring a high skill, so the impact on the surrounding communities, both in Ulilin district area, and at the regional scale of Merauke regency, Papua province is important positive impact.

(b) Impact on Income Level and Living standard

The impact of oil palm plantation and processing plant construction activity on the income level and living standard of the community is estimated to occur to two groups, i.e. income from the workers/community directly working at the study area and the government's income from tax sector and other retributions.

The number of workers at this company who might enjoy directly this impact is ± 3.332 persons. Based on the results of analysis on salary structure it is obtained a picture that the total expense that must be paid by the company to workers during the peak season shall be at approx. Rp. 833 million per month.

By the distribution of wage and salary money from those workers it is estimated that at micro level within Merauke regency area it is deemed as having a significant effect to drive the regional economic activity, which shall have a positive economic impact.

In addition to the income to receive by workers, the government will also get revenue from tax sector, i.e. income tax, land and building tax, as well as company tax. The results of calculation on tax to be received by the state during the peak season of oil palm harvest, it is estimated as follows:

- income tax : Rp. 833 million / year
- land and building tax : Rp. 2.757 million / year

- company tax : Rp. 1,150 billion /year

Based on the above description it can be concluded that the impact of PT Bio Inti Agrindo's oil palm plantation and plant construction activity is deemed as an important positive impact with the moderate weight of impact (+2) on the upgrading of income and living standard of community and the development of regional economy, so the target to be achieved from this activity can be met.

(c) Impact on Community's perception

The construction of this oil palm processing plant constitutes an activity going to utilize the natural resources and human resources intensively, so the emergence of community's complaints and restlessness shall come easily. Below is presented the possible sources of community's complaints and restlessness, which are caused by the company's activity, either directly or indirectly, among others:

1) the use of local population's communal right of land

The study area to use as an oil palm plantation is a forest land which by local people can be claimed as their communal right of land, even though the land is not undertaken for any agricultural business activity. However in this connection, it is worth to do an approach through elucidation, providing compensation money as well as undergoing a custom ceremony for the settlement process. This impact may occur on local population around the study area.

2) The increase of Boar pest

The opening of forest land for the construction of an oil palm plantation will change the function vegetation which is previously a habitat for wild animals particularly boar. By such change to this habitat's function, boar will do a migration to another place, where in this migration the boar will find a place capable of fulfilling its need of feed. Due to the lack of space to find its feed, this boar will usually approach any area potential for its feeding.

3) Water quality degradation

The operation of oil palm processing plant will produce waste in a big quantity and the quality of waste water shall not meet the defined threshold. If this waste water gets into the waters body, then the bio-degradation process will occur at public waters (river), so it will emerge a bad sanitation, a bad smell and the decrease of aquatic biota's life. Since these rivers are used for MCK by some of the population then a waste water treatment plant shall absolutely needed until it reaches the defined threshold value.

4) Land fire potential

The results of analysis on rainfall it is obtained a picture that the deficit of water may occur in August, where in this month it is estimated that a land fire might occur due to several factors, among others the burning of nomad dry field activity's remaining felled down, cigarette butts, and the opening of oil palm land.

A spreading land fire will be able to kill the people's dry field that might cause restlessness. The double consequence of this land fire also emerges due to a smoke disturbance that results in respiratory tract disease and the disturbance to transportation network.

5) Fresh water for daily use

The source of population's fresh water used to be utilized for bathing, washing and defecating (MCK) if its polluted by PKS waste shall also capable of becoming the trigger of community's complaints and restlessness. If it is left as such it shall result in a prolonged social conflict

4. IMPACT ON COMMUNITY'S HEALTH

The source of impact from an oil palm plantation and processing plant construction activity on community's health is estimated to come from:

(a) Local environmental condition. Where this area is still prone to the attack and spread of malaria disease, so the land opening activity will give a chance to this disease's vector to spread to the settlements area

(b) A possibility of dermatitis and diarrhea due to the presence of factory's liquid waste, if the waste produced by PKS is not processed well
(c) The increase to ISPA disease due to the increasing degree of dust by the increasing volume of TBS transportation vehicle passing through the settlements area

The results of recording on diseases at community's settlements around the study area it is obtained a picture that the prevalence of ISPA disease is still high (second rank after malaria), so it can be concluded that the environmental condition will have an impact on the activity, particularly ISPA disease against the company's workers and employees.

Further, during operation phase (production / exploitation phase), the oil palm processing plant will produce liquid waste, if it is not processed well it might pollute the waters environment (particularly Bian river and Fly river) used by some of the population for MCK.

In a degraded condition of waters sanitation, if PKS waste is not processed well, then the possible impact that emerges on community's health is the increase in dermatitis and diarrhea patients. To overcome this impact, PKS will be equipped with a Waste water Treatment Plant (IPAL), by which the environmental waters sanitation of both rivers can be maintained better. In detail, the description on Waste water Treatment Plant (IPAL) is presented in the Environmental Management Plan (RKL) document.
By the presence of this activity, it is possible to facilitate the community members to get a better health service. Indirectly, this system will change the community's view to a better one towards health, if compared to that before the activity is present.
Based on the above description it can be concluded that whether an impact is important due to the company's activity is presented shortly in Table IV-1. Further, Figure IV-1 gives a direction on the flow-chart of impact expected to use for the management of impact right from its primary source of impact.

VII EVALUATION ON SIGNIFICANT AND IMPORTANT IMPACT

The results of impact identification and prediction described in Chapter-VI, give a direction that the construction activity of oil palm plantation and processing plant will have several important impacts that need to conduct a continuous management and monitoring upon, because if on those impacts it is not done a good management it will cause a potentially detrimental impact and reduce the environmental carrying capacity.

Evaluation on significant and important impact is done through a holistic review as a basis of management that covers a review on impact behavior and interrelation between those impacts. As a basis of review on impact behavior it is described the cause and efffect relationship between the activity plan and important impact, characteristics of important impact, impact suffering community groups, impact's intensity and time-length of occurrence, the accumulative and reversible nature of impact, other environmental components going to be affected by impact as well as the width of impact spread. Evaluation on important impact is done by using such criteria in Guidance on the Criteria of Important impact according to the Decision of the Head of BAPEDAL No. Kep-056/1994 and the Governmental Regulation Number 27 of 1999, concerning Criteria of Important impact.

The significant and important impacts estimated to occur and need to conduct a management on the presence of said activity plan, are among others:

(1) The degradation of River's water quality (Bian river and Fly river) (-)
(2) The increase of soil erosion rate (-)
(3) The disturbance of protected Flora and Fauna (-)
(4) Social restlessness / Community's perception (-)
(5) Community's health (-)

A. RIVER'S WATER QUALITY

1. Characteristics of impact

The impact of this oil palm processing plant (PKS) operation plan is the emergence of liquid waste having negative characteristics of impact. The quantity of waste water is deemed as voluminous enough (capacity 120 tons of TBS/hour = 1,152 m3/day) spreading at three locations and also having a high pollutant concentration. The parameters which exceed their threshold are the degree of BOD5, COD, suspended solid (TSS), oil and grease, ammonia, and pH.

From the results of analysis and calculation on pollution rate (BPA & BPM) it is obtained results that the pollution load of waste water before being processed at IPAL exceeds the permitted threshold.

Such a condition will add to the pollution load on waste receiving water body, i.e. Bian river's branch that has its estuary at Bian river. This river by some of the population is still used for MCK and fishing activity.

2. THE AREA OF IMPACT SPREAD

The determination of PKS site plan is deemed as optimum enough from the aspect of location from waste receiving settlements area, i.e. with the spread of impact is PKS liquid waste (120 tons of TBS/hour) upon having been processed at IPAL will be flown to Bian river's branch to subsequently disembogue to Bian river. The distance between IPAL and Bian river through this Bian river's branch is about 15 km. The downstream portion of this Bian river is far from a people's settlement (> 25 km from PKS).
In view of the number of human affected by the impact, it is estimated as relatively small, since the downstream of said river (Bian river) is far from people's settlement.

3. IMPACT'S INTENSITY AND DURATION OF OCCURRENCE

The impact of waste water pollution on said river will occur continuously anytime (hour, day), starting from the PKS operation date up to the end of activity (25 years).
This impact will occur as long as the waste water management effort at IPAL and in-house keeping activity does not run well so the effluent from IPAL does not reach the target quality standard of an oil palm factory's liquid waste according to SK MENLH No.

Kep-51/MENLH/10/1995. If IPAL runs well, then the intensity of impact shall occur during an emergency situation only.

4. OTHER ENVIRONMENTAL COMPONENTS AFFECTED BY THE IMPACT

The environmental components going to be affected by subsequent impact from this possible presence of PKS waste pollution at Bian and Fly rivers are among others the degradation of aquatic biota covering the degradation of diversity, uniformity and dominance of species which in turn will disturb the ecosystem equilibrium at the waters.
The other environmental component estimated to be affected by impact is the population using Fly river's water, who are located at the distance of approx. 10 km from PKS, so the impact is deemed as relatively small.

5. CUMULATIVE NATURE OF IMPACT

The characteristics of PKS liquid waste is a multiple organic waste with the characteristic of biodegradable in waters and may suffer a purification (natural purification) in a certain scale of time, which will be decomposed into simpler compounds. By the presence of a good IPAL, the cumulative nature of impact can be reduced.
If PKS liquid waste is not processed well at IPAL and this waste water gets into the river then this biodegradation process will occur at the waste water receiving body. For this PKS (120 tons of TBS/hour) its cumulative nature of impact is relatively small since this Bian river's branch does not suffer any tidal so the purification process will run well, also by considering that this Bian river's branch has a very large debit > 100 m3/second.

The volume of waste water going to be produced and gets into the river's water body at its peak capacity is estimated to reach 1,152 m3/day.

6. WHETHER THE IMPACT IS REVERSIBLE OR NOT

The impact of liquid waste on this body of Bian river's branch is deemed as reversible in term that said organic waste will be decomposed in the waters body, where each waters body basically has a self purification capability. However, if there should occur an

emergency situation, for example IPAL is broken down or collapses then the action needs to take is reducing PKS work hours or applying a temporary stoppage of PKS operation until PKS repair completed.

B. SOIL EROSION RATE

1. CHARACTERISTICS OF IMPACT

The impact of oil palm plantation construction plan on soil erosion rate is deemed as both negative and positive impacts. Negative impact occurs at the beginning of land opening phase, the opening of secondary forest land at the slope of 8-15% and the opening of land for emplacement, in which the erosion rate will tend to increase.

As for on flat land of 0-8% slope with the current type of land use in the form of reeds and bushes, the erosion rate with oil palm planting treatment will tend to suffer a decrease by a better management factor, so it shall have a positive impact.

2. THE AREA OF IMPACT SPREAD

The area of erosion impact spread is as follows:

* Erosion impact (positive)	: land with the slope of 0-8%	: 30.000 ha	
* Erosion impact (negative)	: land with the slope of 8-15%	: 6.000 ha	
	Land for emplacement and road	: 1.817 ha	
	The beginning of land opening	: 37.817 ha	

3. IMPACT'S INTENSITY AND DURATION OF OCCURRENCE

This erosion impact will occur temporarily, i.e. at the beginning of land opening until LCC crops cover soil perfectly, for approx. 6-8 months. While on emplacement and road land, this erosion process usually takes place longer, i.e. until the conservation act is implemented such as the planting of grasses and garden at the emplacement as well as road hardening.

4. OTHER ENVIRONMENTAL COMPONENTS AFFECTED BY THE IMPACT

Those environmental components going to be affected by subsequent impact due to the erosion are river's turbidity, the siltation of basin and river that continues to the degradation of aquatic biota.

5. CUMULATIVE NATURE OF IMPACT

Erosion will carry soil particles to basin area and river with a cumulative nature of impact, in term that it will become sediment on the waters' base. Water turbidity will decrease by the better rate of erosion occurring on oil palm land.

6. WHETHER THE IMPACT IS REVERSIBLE OR NOT

The nature of erosion impact is reversible by LCC crops' covering oil palm land better. Even there is a tendency that the impact of erosion on oil palm land will become lower compared to the land previously having reeds or bushes vegetation.

C. NATURE'S FLORA / VEGETATION

1. CHARACTERISTICS OF IMPACT

The impact of oil palm plantation construction plan on nature's vegetation constitutes a primary impact where by total felling down system, the floristic composition in the existing land will be replaced with monoculture vegetation system. Further, since the previous existing vegetation constituted a habitat of various wild animals (protected and non-protected ones), then this impact is classified as an important impact.

2. THE AREA OF IMPACT SPREAD

The area of impact spread going to occur by the presence of this plantation activity is the change from original vegetation into oil palm land with the detailed area as follows:

- secondary forest : 13,315 ha
- bushes : 26,438 ha

- open land : 147 ha

3. IMPACT'S INTENSITY AND DURATION OF OCCURRENCE

The duration of impact on vegetation change will occur continuously and of permanent nature, in which natural vegetation will be replaced with oil palm mono-cultural nurtured vegetation.

4. OTHER ENVIRONMENTAL COMPONENTS AFFECTED BY THE IMPACT

This vegetation changing impact constitutes a primary impact that could continue to become secondary and tertiary impacts. The real impact is the decreasing function of animals' habitat which continues to the change of animals' behavior, i.e. the occurrence of wild animals relocation and migration both those protected and non-protected.
The migration of boar and rat animals existing at the study area is potential to become pest of plants (oil palm) and interfere with the surrounding community's agricultural business. The loss of this vegetation will give a contribution to the erosion process on that open land.

5. CUMULATIVE NATURE OF IMPACT

The cumulative nature of this vegetation impact will be permanent (especially impact on floristic composition) where it will have an effect to the existence of sperm plasma.

6. WHETHER THE IMPACT IS REVERSIBLE OR NOT

The nature of this change to vegetation impact is irreversible, but the management needs to do is among others by doing the re-vegetation on open lands (emplacement) with crops of economic and ecological value, both as animals feed and as conservation crops.

D. PROTECTED FAUNA / WILD ANIMALS

1. CHARACTERISTICS OF IMPACT

The nature of this wild animals relocation and migration impact constitutes a secondary impact due a change to the animals' habitat function due to a change to secondary forest's vegetation to become an open area and monoculture crops.
The subsequent impact is the migration of those animals to another area or the decrease of protected animals population in said area covering:?

- Protected animal species : cuscus (Phalanger gymnotis), tree kangaroo (Dendrologus ursinus), and deer (Cervus timorensis).
- Protected aves species: cassowary (casuarius casuarius), fish eagle (Pandion haliaetus), big beak parakeet (tanygnathus megalorinchos), blue chest Cendrawasih (Ptiloris magnificus), and yellow crest cockatoo (cacatua galerite)
- Protected reptile species: fresh water crocodile (Crocodilus novaeguineae), Irian turtle (Carettachelys coraceae) and lizard (Varanus gouldi).

The decrease of wild animal population may occur due to the possible illegal hunting by community or outsider workers considering that the meat of these wild animals constitutes a free source of protein. For exotic and unique species of aves, the community's tendency to catch, trap and raise them is quite high, since the economic value of these species of aves is quite high.

2. THE AREA OF IMPACT SPREAD

the area of impact spread from the change to this animals' habitat is 36.000 ha, i.e. the area of land going to open for the construction of PT Bio Inti Agrindo's oil palm plantation and processing plant. The migration pattern of these wild animals is estimated to move to the south of study area which is still covered by forest.

3. IMPACT'S INTENSITY AND DURATION OF OCCURRENCE

The intensity and duration of the relocation and migration of protected wild animals' impact is continuous and permanent. Wild animals (except aves and rat) will migrate out of the area and shall not be back to the working area.
the impact of this boar and rat migration which are potential to become pest of plants will take place during the construction and operation period (4-6 years), then by the hunting of boar and other acts it is estimated that in the 7^{th} year, the disturbance by these wild animals will reduce.

For species of aves having mobile characteristic, particularly species of aves eating insect, grains, and meat eaters, the oil palm land is in general a good place to find feed for those species of aves, due to the availability of insect, grains from LCC crops and grass grains as well as the easiness for eagle to catch rats in this more open area.

4. OTHER ENVIRONMENTAL COMPONENTS AFFECTED BY THE IMPACT

Other environmental component going to be affected by the migration of these wild animals is the emergence of boar and rat pests attacking food crops and oil palms, which impacts on those crops being damaged which subsequently impacts on the decrease of income from food crops sector undertaken by local community.

5. CUMULATIVE NATURE OF IMPACT

The impact of this wild animals migration particularly boar is not cumulative considering that by the improvement of management effort, through mass hunting the impact will decrease in term of its attack.

6. WHETHER THE IMPACT IS REVERSIBLE OR NOT

The migration of protected wild animals for mammalian species cuscus (Phalanger gymnotis), tree kangaroo (Dendrologus ursinus), and deer (Cervus timorensis) is permanent and irreversible.

For species of aves having mobile characteristic, particularly species of aves eating insect, grains, and meat eaters it is estimated as reversible. This is because an oil palm land is in general a good place to find feed for those species of aves, due to the availability of insect, grains from LCC crops and grass grains as well as the easiness for eagle to catch rats in this more open area. In addition, the re-vegetation act on emplacement area shall constitute a new habitat for the species of aves.

For boar and rat pest, in the 7^{th} year, in general their level of attack will reduce by the increasingly number of population and also the act of mass hunting.

E. SOCIAL RESTLESNESS / COMMUNITY'S PERCEPTION

1. CHARACTERISTICS OF IMPACT

Community's perception (complaints and restlessness) due to the construction activity of oil palm plantation and processing plant is estimated to occur due to the following possibilities:

- The use of local people's communal right on land for oil palm plantation
- The upgrade of dust's degree by the increasing flow of TBS transportation
- The degradation of water quality (fresh water for daily need) due to PKS waste or for domestic activity's need
- The increase of boar and rat pest
- The damage of road due to loads that exceed the road's capacity

The characteristic of impact above can be distinguished as primary impact and secondary impact. Secondary impact pertains to the upgrade of dust's degree, the quality of PKS waste water, and the increase of boar and rat pest, so when the primary impact can be overcome then the community's perception impact shall not happen. While the primary impact is in the form of the use of communal right on land.

2. THE AREA OF IMPACT SPREAD

The area of community's perception primary impact spread is as follows:

- The use of local people's communal right on land : 11 kampong areas
- The upgrade of dust's degree \
- The degradation of water quality due to PKS waste : Bian and Fly rivers
- The increase of boar and rat pest
- The damage of road due to excess load of CPO : 11 kampong areas

3. IMPACT'S INTENSITY AND DURATION OF OCCURRENCE

The impact's intensity and duration is as follows:

- The use of local people's communal right on land : temporary, during the commencement period of construction
- The upgrade of dust's degree : every day, during the activity period (25 years)
- The degradation of water quality due to PKS waste : every day, during the activity period (25 years)
- The increase of boar and rat pest: 5-6 years during the commencement period of construction
- The damage of road due to excess load of CPO : every day, during the activity period (25 years)

4. OTHER ENVIRONMENTAL COMPONENTS AFFECTED BY THE IMPACT

The environmental components going to be affected by the impact are summarized as follows:

- the use of local people's communal right of land : the decrease of land for dry field (local people's income decreases)
- the increase of dust degree : the increase of ISPA disease
- the degradation of water quality due to PKS waste : the increasing prevalence of dermatitis
- the increase of boar and rat pests : APATIS attitude and reluctant to undertake agricultural business (community's income decreases)
- the damage of road due to excess CPO load : the increase of dust's degree (pollution) and community's activity is disturbed

5. CUMULATIVE NATURE OF IMPACT

The nature of community's perception impact (complaints and restlessness) above if the source of impact is not managed well, it is estimated to occur a conflict and social anarchy.

6. WHETHER THE IMPACT IS REVERSIBLE OR NOT

All of these social impacts are reversible by the presence of impact treatment or by making a repair or improvement to its positive impact, so the community feels of being respected.

F. COMMUNITY'S HEALTH

1. CHARACTERISTICS OF IMPACT

The nature of impact of oil palm plantation and processing plant construction activity plan on community's health parameter is deemed as a negative impact. The oil palm plantation activity and the dumping of liquid waste into Bian and Fly rivers will have an impact on the health of those communities using the rivers for daily purpose. This will trigger the emergence of various diseases such as malaria, ISPA (acute respiratory tract infection) , and diarrhea.

The emergence of malaria disease is based on such considerations like among others the disturbance of mosquito habitat existing at the project site and the entry of occupants who are in general susceptible to malaria disease.

2. THE AREA OF IMPACT SPREAD

The real area of impact spread from this community's health parameter is particularly on the nearest kampongs to working area, i.e. 11 villages (Selil, Kindiki, Kumaaf, Nggayu, Kafyamke, Mandekman, Rawahayu, Belbelan, Kiraky, Kandrakay, and Baidub kampongs).

3. IMPACT'S INTENSITY AND DURATION OF OCCURRENCE

The intensity of impact will occur continuously until the end of activity

4. OTHER ENVIRONMENTAL COMPONENTS AFFECTED BY THE IMPACT

The other environmental component going to suffer the impact of this community's health is social restlessness (community's perception). By the degradation of community's health condition and the emergence of various diseases, it will result in social restlessness (community's perception that tends to be negative).

5. CUMULATIVE NATURE OF IMPACT

The nature of impact will accumulate to community's health parameter

6. WHETHER THE IMPACT IS REVERSIBLE OR NOT

This community's health impact is of reversible nature by the presence of impact treatment action or by making a repair or improvement to its positive impact such as adding medical facility and drugs, so the community will not be restless if there should occur malaria, ISPA, diarrhea and other diseases.

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NOTE TO MBAK KARTIKA:

Di sudut kiri lembar teks DP-2 halamannya terpotong dan tidak terbaca, jadi tidak saya buat mohon maklum