

***Tabel***

**Tabel II-1.4.1 Rencana Tata Ruang Wilayah (RTRW)**

| No.                    | S P A T I A L P L A N ( <i>RENCANA TATA RUANG WILAYAH, RTRW</i> )  |  |   |
|------------------------|--|--|---|
|                        | NATIONAL LEVEL   | PROVINCIAL LEVEL   | DISTRICT LEVEL  |
| <b>COVERAGE</b>        | Strategic and recommended policy of the national spatial utilization that consist of:<br>a. national objectives of spatial utilization for improving community welfare and security defense.<br>b. Structure and pattern of national spatial utilization<br>c. Criteria and pattern of the management of protected zone, cultivation zone and specific zone. | Spelling out of the strategic and recommended policy of the national spatial utilization into structure and strategy of provincial spatial utilization that consist of:<br>a. Provincial objectives of spatial utilization for improving community welfare and security defense.<br>b. Structure and pattern of provincial spatial utilization<br>c. Guidance for provincial spatial utilization control   | Spelling out of the provincial spatial utilization into the implementation strategy of provincial spatial utilization that consist of:<br>a. District objectives of spatial utilization for improving community welfare and security defense.<br>b. Structure and pattern of district spatial utilization plan<br>c. General plan and spatial plan of district<br>d. Guidance for controlling district spatial utilization  |
| <b>CONTENT</b>         | a. National protection zone, cultivation zone, and specific zone<br>b. Condition and criteria of spatial utilization<br>c. Guidance for spatial utilization control  | a. Recommendation of the management of protection and cultivation zone,<br>b. Recommendation of the management of rural zone, urban zone, and specific zone.<br>e. Recommendation of zone development for settlements, forestry, agriculture, mining, industry, tourism and others.<br>f. Recommendation of central system development for rural and urban settlements<br>g. Recommendation of regional infrastructure systems: transportation, telecommunication, energy water resources, and environment management,<br>h. Recommendation of the priority zone,<br>i. Recommendation policies of land use plan, water use plan, space use plan, other natural resources use plan, and pay attention for the integrity of human and artificial resources. | a. The management of protection zone and cultivation zone<br>b. The management of rural zone, urban zone, and specific zone,<br>c. Systems of development activities and rural and urban settlements<br>d. Infrastructure systems of transportation, telecommunication, energy, water resources, and environment management<br>e. Land use plan, water use plan, space use plan, other natural resources use plan, and pay attention for the integrity of human and artificial resources. |
| <b>GUIDELINES FOR</b>  | a. Formulation of integrity, interrelatedness, and balance of inter-region development and inter-sector harmony<br>b. Creating integrity, interrelatedness, and balance of inter-region development and inter-sector harmony<br>c. Recommendation of investment place<br>d. Provincial and district planning   | a. formulation of main provincial spatial plan policies<br>b. Creating integrity, interrelatedness, and balance of inter-provincial development and inter-sector harmony<br>c. Recommendation of investment place<br>d. District spatial planning which is a basis for controlling the permission of development location  | a. formulation of main district spatial plan policies<br>b. Creating integrity, interrelatedness, and balance of inter-district development and inter-sector harmony<br>c. Determining location of investment<br>d. Formulating detailed district spatial plan<br>e. Using land/space for development activities  |
| <b>PERIOD</b>          | 25 years   | 15 years   | 10 years  |
| <b>REGULATION</b>      | Government regulation ( <i>peraturan pemerintah</i> )  | Regional regulation ( <i>peraturan daerah</i> )  | Regional regulation ( <i>peraturan daerah</i> )   |
| <b>SCALE/INTENSITY</b> | Minimum 1 : 1.000.000  | Minimum 1 : 250.000  | Minimum 1 : 100.000   |

**Tabel II-1.4.2 Perencanaan dan Pembagian Pemanfaatan Tata Ruang di DAS Tondano (1/2)**

| No       | ZONES  | Location according to   |  |  |
|----------|--|---|--|--|
|          |  | Provincial Spatial Plan ( <i>RTRW Propinsi</i> ) by <i>BAPPEDA PROPINSI</i> | District Spatial Plan ( <i>RTRW Kabupaten</i> ) by <i>BAPPEDA Minahasa</i>   | Zonation of TWS by <i>PU Pengairan</i>   |
| <b>A</b> | <b>RECOMMENDATION OF STABILIZING PROTECTED ZONE</b>  |   |  |  |
| A.1      | ZONE FOR PROTECTING ITS LOWER AREA<br>1. PROTECTED FOREST ZONE<br><br>2. WATER ABSORPTION ZONE   | Mt.Klabat, Mt.Manimporok<br><br>Protected forest and Tondano watershed      | Mt. Klabat, Mt. Lembean, Mt. Mahawu, Mt. Masarang, Mt. Tampusu, Mt. Lengkoan, Mt. Kawatak, Mt. Soputan<br><br>Protected forest and Mt. Manimporok  | Districts of Tompaso, Langowan, Kakas, Remboken, Eris, Tondano, Tomohon, Pineleng, Kauditan, Airmadidi<br>-----same as above-----<br>-----   |
| A.2      | IN-SITU PROTECTION ZONE<br>1. RIVER BANK ZONE<br>2. SURROUNDING LAKE ZONE<br><br>3. SURROUNDING WATER SPRING ZONE  | River Tondano<br>Lake Tondano<br><br>Not yet indicated                      | River Tondano (100 m of left-right side), River Tikala (50m of left-right side)<br>Lake Tondano (50 – 100 m surrounding lake),<br>Lake Sendow (50 m surrounding lake)<br>Not yet indicated   | River Tondano and River Tikala<br>Lake Tondano<br><br>All water spring in the catchment (in radius of 200 m)   |
| A.3.     | NATURAL AND CULTURAL RESERVE ZONE<br>1. NATURAL RESERVE ZONE<br><br>2. CULTURE RESERVE ZONE  | Not indicated<br><br>Not indicated  | Not indicated<br><br>Ancient Tomb in Sawangan-Airmadidi  | Tomohon and around the lake (ecotourism park)<br>Not indicated   |
| A.4.     | SENSITIVE NATURAL DISASTER ZONE<br>1. VOLCANOES ERUPTION<br>2. MASS MOVEMENT/LANDSLIDE<br>3. FLOODING  | Mt.Mahawu, Mt.Soputan<br>Not indicated<br>Not indicated                     | Mt. Mahawu, Mt.Soputan<br>Telap – Tasuka<br>Not indicated  | Not indicated<br>Not indicated<br>Cities of Manado and Tondano   |
| <b>B</b> | <b>RECOMMENDATION OF DEVELOPMENT OF CULTIVATION ZONE</b>   |   |  |  |
| B.1      | PRODUCTION FOREST ZONE   | -   | -  |  |
| B.2      | AGRICULTURE ZONE<br>1. WETLAND CEREAL CROPS ZONE<br><br>2. ESTATE AND CEREAL DRYLAND FARMING ZONE<br><br>3. ANIMAL HUSBANDRY ZONE<br><br>4. FISHERY ZONE |   | Tondano, Kakas, Remboken, Langowan<br><br>Clove cultivation: Kombi, Eris, Kakas, Tomohon, Tondano, Pineleng;<br>Coconut cultivation: Airmadidi, Pineleng, Dimembe;<br>Coffee cultivation: Tomohon, Langowan, Tompaso, Kakas, Kawangkoan; Nutmeg cultivation: Kauditan, Airmadidi;<br>Cinnamon cultivation: Langowan<br>Fruit trees: Dimembe ( <i>Nephelium</i> , <i>Durian</i> );<br>Vegetables: Tomohon, Remboken, Kawangkoan; Floriculture: Remboken<br><br>Poultry commodity (Ducks): Remboken, Kakas, Tondano<br>Livestock: Langowan (Goat)<br>Animal Husbandry: Langowan, Tomp[aso, Tondano (Sapi, Kuda)<br><br>Freshwater fish: Kakas, Eris, Tondano (around lake Tondano) | Tompaso, Kakas, Tondano, Eris, Airmadidi, Langowan<br><u>Cereal dryland farming</u> : Tompaso, Langowan, Eris, Remboken, Tondano, Airmadidi<br><u>Estates Crops</u> : Langowan, Eris, Remboken, Tondano, Airmadidi, Mapanget, Kauditan, Tomohon, Pineleng<br><br><u>Animal Husbandary</u> : Tondano, Langowan, Remboken, and Tomohon<br><br>Lake Tondano, Airmadidi, River Tondano |
| B.3      | ZONE OF MINING   | Not indicated   | Digging ( <i>Galian C</i> ): Maumbi, Noongan, Districts of Langowan, Dimembe (Klabat) have to be monitored periodically  | -  |

**Tabel II-1.4.2 Perencanaan dan Pembagian Pemanfaatan Tata Ruang di DAS Tondano (2/2)**

| No        | ZONES  | Location according to   |  |   |
|-----------|--|---|--|---|
|           |  | Provincial Spatial Plan ( <i>RTRW Propinsi</i> ) by <i>BAPPEDA PROPINSI</i> | District Spatial Plan ( <i>RTRW Kabupaten</i> ) by <i>BAPPEDA Minahasa</i>   | Zonation of TWS by <i>PU Pengairan</i>                            |
| B.4.      | ZONE OF INDUSTRY   | Not indicated   | Tourism industry (mountain, lake tourism) and agroindustry: Districts of Tomohon, Langowan, Kakas, Eris, Tondano, and Remboken   |   |
| B.5.      | ZONE OF TOURISM  |   | Main tourism zone of Tomohon – Tondano and its surrounding: Water tourism, ecotourism (agritourism)  | Langowan, Tompasso, Remboken, Tondano, Tomohon, Airmadidi, Manado |
| B.6.      | ZONE OF SETTLEMENTS  |   | Development of planned housing: Airmadidi, Pineleng, Tondano, Kauditan,<br><br>Remboken, Langowan,<br><br>Kawangkoan;<br>Resting places: Tondano, Remboken, Kakas;<br>Labor housing: Kauditan, Airmadidi | All kecamatan   |
| <b>C.</b> | <b>RECOMMENDATION OF DEVELOPING RURAL ZONE</b>   |   |  |   |
| <b>D.</b> | <b>RECOMMENDATION OF DEVELOPING URBAN ZONE</b>   |   |  |   |
| <b>E.</b> | <b>RECOMMENDATION OF SPECIFIC ZONE</b>   |   |  |   |
| E.1.      | INTEGRATED ECONOMIC DEVELOPMENT ZONE ( <i>KAPET</i> ) MANADO - BITUNG                            |   | Manado – Bitung corridor (core zone of <i>KAPET</i> industry)  |   |
| <b>F.</b> | <b>RECOMMENDATION OF DEVELOPING AND MANAGING PRIORITY ZONE</b>                                   |   |  |   |
| F.1.      | DEVELOPING STRATEGIC ZONE<br>1. WATER TOURISM: LAKE TONDANOT                                     |   | Integrated with other tourism activities as like <i>FESBUDATON</i> (in Paleloan village), Pottery handicraft industry (Pulutan village)  |   |
| F.2.      | DEVELOPING GROWTH REGIONAL TRIGGER ZONE  |   | -  |   |
| F.3.      | DEVELOPING FAST GROWTH AREA<br>1. CORRIDOR OF MANADO – BITUNG<br>2. CORRIDOR OF MANADO – TOMOHON |   | Along corridor Manado – Bitung<br>Along corridor Manado – Tomohon  |   |
| <b>G.</b> | <b>DEVELOPING SPECIAL ZONE</b>   |   |  |   |
|           | 1. MANADO – BITUNG HIGHWAY<br>2. TONDANO RIVER DAM   |   | Along the planned highway<br>Not yet indicated   |   |

Sources :

1. Review of Spatial/Land Use Plan of North Sulawesi (Review *Rencana Tata Ruang Wilayah Propinsi Sulawesi Utara*). 2000. Regional Government of Province of North Sulawesi. Manado.
2. Review of Spatial/Land Use Plan of District of Minahasa (Review *Rencana Tata Ruang Wilayah Kabupaten Minahasa*). 1997. Regional Government of District of Minahasa. Tondano
3. Zonation of Tondano Watershed (*Pekerjaan Penataan Kawasan DAS Tondano*). 1997. Dinas Pekerjaan Umum Propinsi Sulawesi Utara. Manado.

**Tabel II-1.4.3 Skor untuk menentukan Penggunaan Lahan yang dianjurkan**

1. Classification of Intensity of Daily Rainfall and its Score

| No | Intensity of daily rainfall (mm/day) | Class     | Score |
|----|--------------------------------------|-----------|-------|
| 1. | < 13.60                              | very low  | 10    |
| 2. | 13.6 – 20.7                          | low       | 20    |
| 3. | 20.7 – 27.7                          | moderate  | 30    |
| 4. | 27.7 – 34.8                          | high      | 40    |
| 5. | > 34.8                               | very high | 50    |

2. Classification Soil Type and its Score

| No | Soil Type (Center for Soil Research, Bogor)                                       | Classification       | Score |
|----|---|----------------------|-------|
| 1. | Aluvial, Gley Planosol, Hidromorf Kelabu, Laterik Air                             | Not sensitive        | 15    |
| 2. | Tanah   | Low sensitive        | 30    |
| 3. | Latosol   | Moderately sensitive | 45    |
| 4. | Brown Forest Soil, Non Calcic Brown, Mediteran                                    | Sensitive            | 60    |
| 5. | Andosol, Laterit, Grumusol, Podsol, Podsolik Regosol, Litosol, Organosol, Renzina | Very sensitive       | 75    |

3. Classification of Slope and its Score

| No | Slope gradient (%) | Classification | Score |
|----|--------------------|----------------|-------|
| 1. | 00 - 08            | Flat           | 20    |
| 2. | 08 – 15            | Gentle         | 40    |
| 3. | 15 – 25            | Moderate       | 60    |
| 4. | 25 – 40            | Steep          | 80    |
| 5. | > 40               | very steep     | 100   |

**Tabel II-1.4.4 Konsep dari Rencana Kerja Konservasi DAS Tondano**

| No. | Main activities  | Description   | Executing agency  |
|-----|--|---|---|
| 1.  | Protecting sedimentation   | Reforestation/Planting:<br>1. Nursery/sedling:<br>a. Reforestation<br>b. Planting<br>2. Rearing<br>3. Construction of check dam<br>4. Maintaining of the dam  | Kanwil Forestry & Estates Crops<br>Dinas Kehutanan Propinsi<br><br>Dinas Kehutanan Kabupaten<br>Dinas PU (Pengairan)  |
| 2.  | Water Use  | Water use retribution   | Reg. Govn. Propinsi & Kabupaten,<br>Dipenda, DPRD   |
| 3.  | Water lake pollution   | 1. Garbage management and weeds control<br>2. Hadycraft industry (Eceng gondok)<br>3. Controlling of Liquid garbage, fertilizer, pesticide, detergent, etc<br>(extension service for floating net fishery)  | Dinas PU (pengairan)<br>Kanwil industry and commerce<br>BAPEDALDA<br><br>Dinas Perikanan Propinsi   |
| 4.  | Sempadan Danau dan sungai (surrounding lake and river bank zone) | 1. delimiting boundary of zone<br>2. Extension and sosialisasi  | BAPPEDA Minahasa<br>BAPPEDA Minahasa  |
| 5.  | Spatial Plan of the Watershed                                    | 1. Detailed spatial plan<br>Second year: legalization and sosialisasi<br>2. Definiting forest boundary  | UNSRAT, BAPPEDA, PU (cipta karya)<br><br>Dinas Kehutanan Propinsi   |
| 6.  | Demography/ pressure on the watershed                            | 1. Resettlement<br>2. application of appropriate technology for conserving land (training)<br>3. Diversification and supplement livelihood (seeds assistance)<br>4. Research in demography and ecosystem.<br>The activities:<br>1 <sup>st</sup> year : preliminary study on community perception<br>2 <sup>nd</sup> year experimental study (pilot project)<br>3 <sup>rd</sup> – 4 <sup>th</sup> year : implementation<br>5. improving community awareness and attitude changing<br>1 <sup>st</sup> year: extension/training<br>2 <sup>nd</sup> year:developing environmental human resources<br>3 <sup>rd</sup> year: improving capability and participation of NGOs<br>4 <sup>th</sup> year: giving appreciation<br>5 <sup>th</sup> year: evaluation<br>6. Training on environmental aspects<br>7. Funds assistance for farmers | Regional government (Prop. & Kab.)<br>Politeknik, Kanwil Pertanian<br><br>Kanwil industry & commerce<br><br>UNSRAT<br><br>BAPEDALDA<br><br>BAPEDALDA<br>BAPEDALDA |
| 7.  | Watershed Management Institution                                 | 1. Formulating the Management Board<br>2. Formulating and revising the regulation<br>3. Extension services for stakeholders<br>4. Formulating integrated watershed management<br>5. Obtaining environmental geology data/information<br>6. Supervising/ law enforcement<br>7. Evaluation  | BAPPEDA,<br>LAW BUREAU OF REGIONAL GOVNT.<br>NGOs<br>Related agency<br><br>Kanwil Pertambangan (mining office)<br><br>Police Department<br>BAPPEDA                |

**Tabel II-1.5.1 Distribusi dari Penghutanan kembali di dalam dan di sekitar  
DAS Tondano pada tahun 1976 – 1999**

| Fiscal Year | Location                                | Area (ha) | Failure |       |                 |       | Success | Grown species  |
|-------------|---|-----------|---------|-------|-----------------|-------|---------|----------------|
|             |   |           | Fired   | Fail  | Cleared<br>Away | Total |         |                |
| 1976/1977   | Mt. Potong<br>Noongan                   | 71        | 71      | 0     | 0               | 0     | 0       | Pine, etc      |
|             |   | 529       | 0       | 297   | 0               | 297   | 232     | Pine, etc      |
| 1977/1978   | Mt. Soputan<br>Kayuwatu                 | 2.400     | 0       | 1.786 | 614             | 2.400 | 0       | Pine, etc      |
|             |   | 200       | 0       | 0     | 200             | 200   | 0       | Pine, etc      |
| 1980/1981   | Mt. Masarang<br>Mt. Mahawu              | 175       | 175     | 0     | 0               | 175   | 0       | Pine, etc      |
|             |   | 200       | 65      | 135   | 0               | 200   | 0       | Pine, etc      |
| 1981/1982   | Mt. Mahawu                              | 170       | 78      | 92    | 0               | 170   | 0       | Pine, etc      |
| 1983/1984   | Mt. Soputan                             | 100       | 100     | 0     | 0               | 100   | 0       | Pine, etc      |
| 1984/1985   | Mt. Soputan<br>Mt. Kawatak<br>Tumaratas | 500       | 115     | 0     | 0               | 115   | 385     | Pine, Nantu    |
|             |   | 100       | 0       | 0     | 35              | 35    | 65      | Pine, Nantu    |
|             |   | 100       | 0       | 25    | 0               | 25    | 75      | Pine, Nantu    |
| 1985/1986   | Makalonsow<br>Mt. Lembean               | 200       | 0       | 30    | 0               | 30    | 170     | Pine, Nantu    |
|             |   | 100       | 100     | 0     | 0               | 100   | 0       | Pine, Nantu    |
| 1986/1987   | Mt. Lembean                             | 300       | 0       | 0     | 0               | 0     | 300     | Pine, Nantu    |
| 1988/1989   | Makalonsow                              | 100       | 0       | 0     | 0               | 0     | 100     | Nantu, etc     |
| 1991/1992   | Ranolambot                              | 150       | 0       | 50    | 0               | 50    | 100     | Nantu, etc.    |
| 1992/1993   | Mt. Soputan                             | 150       | 0       | 0     | 0               | 0     | 150     | Nantu, etc.    |
| 1993/1994   | Ranolambot<br>Noongan                   | 100       | 0       | 0     | 0               | 0     | 100     | Nantu, etc.    |
|             |   | 200       | 0       | 0     | 0               | 0     | 200     | Nantu, etc.    |
| 1994/1995   | Makalonsow                              | 200       | 200     | 0     | 0               | 200   | 0       | Gmelina, Nantu |
| 1995/1996   | Makalonsow                              | 400       | 0       | 0     | 0               | 0     | 400     | Gmelina, Nantu |
| 1996/1997   | Makalonsow                              | 600       | 0       | 0     | 0               | 0     | 600     | Gmelina, Nantu |
| 1998/1999   | Rerer                                   | 100       | 0       | 0     | 0               | 0     | 100     | Gmelina, MPTS  |

*Source: Statistics of Dinas Kehutanan Dati I Sulawesi Utara, 1999.  
Personal communication with Katuuk, 2000*

**Tabel II-1.5.2 Kegiatan Penghijauan kembali di DAS Tondano pada tahun anggaran 1999/2000**

| No.         | Location                        | Activities              | Area/Unit |
|-------------|---------------------------------|-------------------------|-----------|
| <b>I.</b>   | <b>Tondano Sub-district</b>     |                         |           |
| 1           | Kelurahan' Rinegetan            | Private Forest / Estate | 50 ha     |
| 2           | Kelurahan' Sumalangka           | Private Forest / Estate | 50 ha     |
| 3           | Kelurahan' Wewelen              | Private Forest / Estate | 25 ha     |
| 4           | "Kelurahan' Tataaran II         | Private Forest / Estate | 25 ha     |
| 5           | Kelurahan' Tataaran II          | Private Forest / Estate | 50 ha     |
| 6           | Kelurahan' Paleloan             | Private Forest / Estate | 25 ha     |
| 7           | Kelurahan' Tuutu                | Private Forest / Estate | 50 ha     |
|             |                                 | KBD                     | 0,5 ha    |
| 8           | Kelurahan' Wawalintowan         | Private Forest / Estate | 50 ha     |
| <b>II.</b>  | <b>Toulimambot Sub-district</b> |                         |           |
| 1           | Kelurahan' Kiniar               | Private Forest / Estate | 50 ha     |
|             |                                 | UP-UPSA'                | 1 unit    |
| 2           | Kelurahan' Taler                | Private Forest / Estate | 50 ha     |
| <b>III</b>  | <b>Eris Sub-district</b>        |                         |           |
| 1           | Desa' Touliang Oki              | Private Forest / Estate | 50 ha     |
|             |                                 | UP-UPSA                 | 1 unit    |
| 2           | Desa' Tandengan                 | Private Forest / Estate | 50 ha     |
| 3           | Desa' Eris                      | Private Forest / Estate | 50 ha     |
| <b>IV</b>   | <b>Kakas Sub-district</b>       |                         |           |
| 1           | Desa' Simbel                    | Private Forest / Estate | 50 ha     |
| 2           | Desa' Toulimambei               | Private Forest / Estate | 50 ha     |
| 3           | Desa' Tounumomei                | Private Forest / Estate | 50 ha     |
| 4           | Desa' Kaweng                    | UP-UPSA                 | 1 unit    |
| <b>V</b>    | <b>Remboken Sub-district</b>    |                         |           |
| 1           | "Desa' Talikuran                | Private Forest / Estate | 50 ha     |
| 2           | Desa' Paslaten                  | Private Forest / Estate | 50 ha     |
| 3           | "Desa' Sionia                   | Private Forest / Estate | 50 ha     |
| 4           | Desa' Kaima                     | Private Forest / Estate | 50 ha     |
| <b>VI</b>   | <b>Tomohon Sub-district</b>     |                         |           |
| 1           | "Desa' Rurukan                  | Preventor / Check Dam   | 1 unit    |
| <b>VII</b>  | <b>Langowan Sub-district</b>    |                         |           |
| 1           | Desa' Teep                      | Private Forest / Estate | 50 ha     |
| 2           | Desa' Touneiei                  | Private Forest / Estate | 50 ha     |
| 3           | Desa' Manembo                   | Private Forest / Estate | 50 ha     |
| 4           | Desa' Winebetan                 | Private Forest / Estate | 50 ha     |
| 5           | Desa' Kaayuran Atas             | Private Forest / Estate | 50 ha     |
|             |                                 | KBD                     | 1 unit    |
| 6           | Desa' Waleure                   | KBD                     | 0,5 unit  |
| 7           | Desa' Temboan                   | Private Forest / Estate | 25 ha     |
| 8           | Desa' Noongan                   | KBD                     | 0,5 ha    |
| <b>VIII</b> | <b>Tompaso Sub-district</b>     |                         |           |
| 1           | Desa' Toure                     | Private Forest / Estate | 50 ha     |
| 2           | Desa' Tonsewer                  | Private Forest / Estate | 50 ha     |
| <b>IX</b>   | <b>Pineleng Sub-district</b>    |                         |           |
| 1           | Desa' Sawangan                  | Private Forest / Estate | 50 ha     |
|             |                                 | Preventor / Check Dam   | 1 unit    |
| 2           | Desa' Ramangia                  | Private Forest / Estate | 50 ha     |
|             |                                 | KBD                     | 1 unit    |
| 3           | Desa' Tombuluan                 | Private Forest / Estate | 50 ha     |
| 4           | Desa' Kembes                    | Private Forest / Estate | 50 ha     |
| 5           | Desa' Koka                      | Private Forest / Estate | 25 ha     |
| <b>X</b>    | <b>Airmadidi Sub-district</b>   |                         |           |
| 1           | Kelurahan' Sukur                | Private Forest / Estate | 50 ha     |
| 2           | Kelurahan' Sarongsong I         | Preventor / Check Dam   | 1 unit    |
| 3           | Desa' Tanggari                  | Private Forest / Estate | 50 ha     |
|             |                                 | KBD                     | 1 unit    |
| 4           | Desa' Rumengkor                 | Private Forest / Estate | 25 ha     |
| 5           | Desa' Kembuan                   | Private Forest / Estate | 50 ha     |
| 6           | Desa' Kolongan                  | Private Forest / Estate | 50 ha     |
| <b>XI</b>   | <b>Dimembe Sub-district</b>     |                         |           |
| 1           | Desa' Paniki Atas               | Private Forest / Estate | 50 ha     |
|             |                                 | Preventor / Check Dam   | 1 unit    |
| 2           | Desa' Matungkas                 | Private Forest / Estate | 50 ha     |
|             |                                 | Preventor / Check Dam   | 1 unit    |

Notes: \* KBD = Kebun Bibit Desa (Village Nursery)

\*\* UP-UPSA (Unit Percontohan Usaha Pelestarian Sumber Daya Alam) = Demonstration Plot for Conservation of Natural Resources

**Tabel II-1.6.1 Produksi dari Hasil Panen Utama**

| (1) Harvested Area of Food Crops in the Study Area (1998) |               |              |               |           |               |             |             |           |               | unit: ha |
|---|---------------|--------------|---------------|-----------|---------------|-------------|-------------|-----------|---------------|----------|
| Sub-district  | Lowland paddy | Upland paddy | Maize         | Cassava   | Swee potatoes | Ground nuts | Green grams | Soybeans  | Total         |          |
| Longowan  | 1,400         | 0            | 870           | 2         | 3             | 12          | 0           | 0         | 2,287         |          |
| Kakas   | 2,070         | 40           | 874           | 0         | 12            | 0           | 0           | 0         | 2,996         |          |
| Tompaso   | 1,028         | 0            | 2,201         | 2         | 4             | 21          | 0           | 0         | 3,256         |          |
| Remboken  | 604           | 0            | 1,483         | 39        | 13            | 62          | 0           | 0         | 2,201         |          |
| Eris  | 344           | 0            | 282           | 3         | 0             | 0           | 0           | 0         | 629           |          |
| Tondano   | 1,926         | 0            | 2,764         | 8         | 6             | 55          | 0           | 0         | 4,759         |          |
| Toul imambot  | 2,310         | 0            | 2,787         | 3         | 0             | 36          | 0           | 5         | 5,141         |          |
| Tomohon   | 49            | 0            | 89            | 6         | 6             | 7           | 0           | 0         | 157           |          |
| Kauditan  | 454           | 0            | 245           | 19        | 0             | 4           | 0           | 0         | 722           |          |
| Airmadidi   | 329           | 35           | 1,080         | 0         | 0             | 20          | 0           | 8         | 1,472         |          |
| Pineleng  | 56            | 18           | 958           | 6         | 8             | 4           | 0           | 0         | 1,050         |          |
| <b>Study Area</b>   | <b>10,514</b> | <b>75</b>    | <b>12,675</b> | <b>82</b> | <b>44</b>     | <b>217</b>  | <b>0</b>    | <b>13</b> | <b>23,620</b> |          |

  

| (2) Production of Food Crops in the Study Area (1998) |               |              |               |              |               |             |             |           |               | unit: tons |
|---|---------------|--------------|---------------|--------------|---------------|-------------|-------------|-----------|---------------|------------|
| Sub-district  | Lowland paddy | Upland paddy | Maize         | Cassava      | Swee potatoes | Ground nuts | Green grams | Soybeans  | Total         |            |
| Longowan  | 7,840         | 0            | 2,696         | 54           | 30            | 15          | 0           | 0         | 10,635        |            |
| Kakas   | 9,936         | 84           | 2,526         | 0            | 0             | 1           | 0           | 0         | 12,547        |            |
| Tompaso   | 6,029         | 0            | 6,709         | 26           | 100           | 24          | 0           | 0         | 12,888        |            |
| Remboken  | 2,947         | 0            | 5,339         | 585          | 65            | 59          | 0           | 0         | 8,995         |            |
| Eris  | 1,664         | 0            | 1,008         | 39           | 0             | 0           | 0           | 0         | 2,711         |            |
| Tondano   | 8,628         | 0            | 9,508         | 134          | 23            | 65          | 0           | 0         | 18,358        |            |
| Toul imambot  | 9,471         | 0            | 5,379         | 49           | 0             | 39          | 0           | 5         | 14,934        |            |
| Tomohon   | 239           | 0            | 196           | 66           | 83            | 8           | 0           | 0         | 526           |            |
| Kauditan  | 2,146         | 0            | 649           | 273          | 0             | 4           | 1           | 0         | 3,073         |            |
| Airmadidi   | 1,582         | 74           | 2,268         | 0            | 0             | 20          | 0           | 8         | 4,152         |            |
| Pineleng  | 224           | 33           | 3,399         | 71           | 37            | 5           | 0           | 0         | 4,079         |            |
| <b>Study Area</b>                                     | <b>50,482</b> | <b>158</b>   | <b>36,278</b> | <b>1,226</b> | <b>301</b>    | <b>235</b>  | <b>1</b>    | <b>13</b> | <b>88,633</b> |            |

  

| (3) Yield of Food Crops in the Study Area (1998) |               |              |              |               |               |              |              |              |               | unit: kg/ha |
|--|---------------|--------------|--------------|---------------|---------------|--------------|--------------|--------------|---------------|-------------|
| Sub-district                                     | Lowland paddy | Upland paddy | Maize        | Cassava       | Swee potatoes | Ground nuts  | Green grams  | Soybeans     | Total         |             |
| Longowan   | 5.600         |              | 3.099        | 27.000        | 10.000        | 1.250        |              |              | 47.949        |             |
| Kakas  | 4.800         | 2.100        | 2.890        |               | 0.000         |              |              |              | 9.790         |             |
| Tompaso  | 5.865         |              | 3.048        | 13.000        | 25.000        | 1.143        |              |              | 47.056        |             |
| Remboken   | 4.879         |              | 3.600        | 15.000        | 5.000         | 0.952        |              |              | 29.431        |             |
| Eris   | 4.837         |              | 3.574        | 13.000        |               |              |              |              | 31.411        |             |
| Tondano  | 4.480         |              | 3.440        | 16.750        | 3.833         | 1.182        |              |              | 39.685        |             |
| Toul imambot                                     | 4.100         |              | 1.930        | 16.333        |               | 1.083        |              | 1.000        | 33.446        |             |
| Tomohon  | 4.878         |              | 2.202        | 11.000        | 13.833        | 1.143        |              |              | 33.056        |             |
| Kauditan   | 4.727         |              | 2.649        | 14.368        |               | 1.000        |              |              | 32.744        |             |
| Airmadidi  | 4.809         | 2.114        | 2.100        |               |               | 1.000        |              | 1.000        | 10.023        |             |
| Pineleng   | 4.000         | 1.833        | 3.548        | 11.833        | 4.625         | 1.250        |              |              | 27.189        |             |
| <b>Study Area</b>                                | <b>4.801</b>  | <b>2.107</b> | <b>2.862</b> | <b>14.951</b> | <b>6.841</b>  | <b>1.083</b> | <b>1.824</b> | <b>1.058</b> | <b>38.927</b> |             |

Source: Laporan Tahunan, Dinas Pertanian Tanaman Pangan Kab. Minahasa

**Tabel II-1.6.2 Produksi dari Hasil Perkebunan Utama**

| (1) Sub-District   | Area of Estate Crops in the Study Area (1998) |               |              |              |            |              | Unit:ha        |
|--------------------|---|---------------|--------------|--------------|------------|--------------|----------------|
|                    | Coconut                                       | Clove         | Coffee       | Vanilla      | Nutmeg     | Cocoa        | Total          |
| Langowan           | 256   | 265           | 8            | 44           | 2          | 6            | 581            |
| Kakas              | 215   | 609           | 18           | 29           | 2          | 17           | 890            |
| Tompaso            | 78  | 72            | 52           | 4            | 5          | 0            | 211            |
| Remboken           | 20  | 80            | 118          | 15           | 0          | 2            | 235            |
| Eris               | 13  | 342           | 13           | 10           | 0          | 4            | 382            |
| Tondano            | 12  | 60            | 266          | 55           | 0          | 0            | 393            |
| Toulimambc         | 14  | 605           | 36           | 19           | 0          | 0            | 674            |
| Tomohon            | 25  | 56            | 8            | 5            | 0          | 0            | 94             |
| Kauditan           | 1,760   | 195           | 12           | 28           | 122        | 21           | 2,138          |
| Airmaditi          | 8,698   | 998           | 38           | 76           | 24         | 49           | 9,883          |
| Pineleng           | 3,179   | 899           | 7            | 37           | 3          | 8            | 4,133          |
| <b>Study total</b> | <b>11,091</b>                                 | <b>3,282</b>  | <b>569</b>   | <b>285</b>   | <b>155</b> | <b>99</b>    | <b>15,481</b>  |
| <b>Minahasa</b>    | <b>130,755</b>                                | <b>35,540</b> | <b>2,378</b> | <b>2,936</b> | <b>885</b> | <b>2,451</b> | <b>174,945</b> |

| (2) Sub-District  | Number of Trees of Estate Crops in the Study Area (1998) |                  |                  |                  |                |                  |
|-------------------|--|------------------|------------------|------------------|----------------|------------------|
|                   | Coconut  | Clove            | Coffee           | Vanilla          | Nutmeg         | Cocoa            |
| Langowan          | 28,813   | 66,454           | 9,176            | 105,874          | 494            | 5,717            |
| Kakas             | 26,313   | 189,908          | 18,494           | 71,531           | 3,536          | 17,094           |
| Tompaso           | 5,401  | 5,906            | 52,429           | 11,644           | 431            | 0                |
| Remboken          | 2,200  | 16,010           | 117,988          | 37,250           | 0              | 2,000            |
| Eris              | 1,083  | 65,529           | 12,960           | 21,242           | 0              | 4,050            |
| Tondano           | 1,232  | 12,137           | 265,000          | 72,670           | 0              | 0                |
| Toulimambc        | 1,584  | 121,800          | 39,142           | 47,000           | 0              | 0                |
| Tomohon           | 3,026  | 13,010           | 8,219            | 4,866            | 58             | 627              |
| Kauditan          | 244,267  | 38,922           | 7,966            | 51,189           | 22,650         | 21,173           |
| Airmaditi         | 1,128,947  | 199,600          | 43,699           | 150,000          | 4,800          | 50,430           |
| Pineleng          | 476,567  | 127,719          | 7,112            | 76,930           | 0              | 8,292            |
| <b>Study Area</b> | <b>1,442,866</b>   | <b>729,276</b>   | <b>575,073</b>   | <b>573,266</b>   | <b>31,969</b>  | <b>101,091</b>   |
| <b>Minahasa</b>   | <b>16,348,456</b>  | <b>7,766,672</b> | <b>2,399,458</b> | <b>6,486,902</b> | <b>162,244</b> | <b>2,322,235</b> |

| (3) Sub-District  | Number of Productive Trees of Estate Crops in the Study Area (1998) |                  |                  |                  |                |                  |
|-------------------|---|------------------|------------------|------------------|----------------|------------------|
|                   | Coconut   | Clove            | Coffee           | Vanilla          | Nutmeg         | Cocoa            |
| Langowan          | 22,637  | 66,454           | 8,117            | 105,873          | 494            | 5,717            |
| Kakas             | 26,313  | 185,136          | 16,862           | 68,811           | 0              | 16,999           |
| Tompaso           | 4,855   | 4,519            | 44,100           | 10,306           | 991            | 0                |
| Remboken          | 2,200   | 16,000           | 113,002          | 37,250           | 0              | 2,000            |
| Eris              | 357   | 64,800           | 12,234           | 21,121           | 243            | 4,050            |
| Tondano           | 931   | 10,230           | 250,000          | 59,970           | 400            | 0                |
| Toulimambc        | 1,213   | 118,427          | 35,000           | 29,600           | 0              | 0                |
| Tomohon           | 2,970   | 10,400           | 7,888            | 3,373            | 58             | 406              |
| Kauditan          | 232,408   | 37,147           | 7,036            | 51,189           | 21,345         | 17,549           |
| Airmaditi         | 1,119,955   | 199,600          | 27,699           | 150,000          | 3,200          | 30,630           |
| Pineleng          | 468,221   | 126,900          | 3,515            | 47,263           | 409            | 4,576            |
| <b>Study Area</b> | <b>1,413,839</b>  | <b>712,713</b>   | <b>521,938</b>   | <b>537,493</b>   | <b>26,731</b>  | <b>77,351</b>    |
| <b>Minahasa</b>   | <b>14,848,794</b>   | <b>7,379,128</b> | <b>2,149,944</b> | <b>5,691,897</b> | <b>150,188</b> | <b>2,004,462</b> |

| (4) Sub-District  | Production of Estate Crops in the Study Area (1998) |              |              |            |           |            | Unit:tons |
|-------------------|---|--------------|--------------|------------|-----------|------------|-----------|
|                   | Coconut   | Clove        | Coffee       | Vanilla    | Nutmeg    | Cocoa      |           |
| Langowan          | 198   | 46           | 9            | 17         | na        | 2          |           |
| Kakas             | 231   | 131          | 15           | 11         | na        | 5          |           |
| Tompaso           | 42  | 3            | 48           | 2          | na        | 0          |           |
| Remboken          | 19  | 11           | 125          | 5          | na        | 0          |           |
| Eris              | 3   | 49           | 15           | 4          | na        | 2          |           |
| Tondano           | 8   | 6            | 255          | 63         | na        | 0          |           |
| Toulimambc        | 10  | 82           | 37           | 3          | na        | 0          |           |
| Tomohon           | 26  | 7            | 5            | 3          | na        | 0          |           |
| Kauditan          | 2,220   | 26           | 7            | 9          | na        | 5          |           |
| Airmaditi         | 9,823   | 139          | 28           | 26         | na        | 10         |           |
| Pineleng          | 4,107   | 92           | 4            | 23         | na        | 1          |           |
| <b>Study Area</b> | <b>12,580</b>                                       | <b>500</b>   | <b>544</b>   | <b>143</b> | <b>na</b> | <b>24</b>  |           |
| <b>Minahasa</b>   | <b>130,246</b>                                      | <b>5,132</b> | <b>2,200</b> | <b>456</b> | <b>na</b> | <b>624</b> |           |

Source: Laporan Tahunan, Dinas Perkebunan Kab. Minahasa

## Tabel II-1.6.3 Populasi Hewan

### (1) Animal Population in Minahasa District

|                               | 1994      | 1995      | 1996      | 1997      | 1998      | Average   |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Cattle                        | 44,171    | 44,877    | 45,397    | 46,986    | 47,409    | 46,167    |
| Horse                         | 9,697     | 9,289     | 9,391     | 9,532     | 9,837     | 9,512     |
| Goat                          | 8,456     | 8,315     | 8,666     | 9,446     | 7,434     | 8,465     |
| Pig*                          | 397,075   | 357,246   | 82,945    | 102,851   | 119,307   | 165,587   |
| Local chicken                 | 1,271,697 | 1,275,507 | 1,328,877 | 1,354,126 | 1,150,736 | 1,277,312 |
| Duck                          | 151,818   | 169,257   | 163,546   | 141,141   | 42,634    | 129,145   |
| Chicken for egg               | 349,300   | 197,488   | 238,072   | 232,800   | 204,438   | 218,200   |
| Chicken for meat <sup>†</sup> | 145,175   | 145,175   | 194,785   | 217,359   | 232,987   | 197,577   |

\*: Pig population 1996 is decreased by pig cholera

\*\* : Production per month

Source: Laporan Tahunan, Dinas Peternakan, Tondano 1999

### (2) Animal Population in Related Sub-district (1999)

| Sub-district            | Cattle        | Horse        | Pig           | Goat         | Chicken        | Duck          |
|-------------------------|---------------|--------------|---------------|--------------|----------------|---------------|
| Longowan                | 1,548         | 794          | 3,649         | 901          | 82,965         | 8,703         |
| Kakas                   | 1,706         | 433          | 4,761         | 116          | 46,229         | 1,922         |
| Tompaso                 | 2,766         | 772          | 2,286         | 0            | 18,823         | 2,860         |
| Remboken                | 1,014         | 404          | 637           | 39           | 16,283         | 951           |
| Eris                    | 133           | 85           | 927           | 24           | 15,380         | 2,013         |
| Tondano                 | 2,392         | 1,225        | 1,264         | 151          | 54,304         | 4,296         |
| Toul imambot            | 2,861         | 1,201        | 726           | 391          | 38,455         | 3,375         |
| Tomohon                 | 3,162         | 1,464        | 11,733        | 129          | 87,353         | 1,969         |
| Kauditan                | 1,885         | 211          | 7,311         | 231          | 92,818         | 1,592         |
| Airmadidi               | 2,120         | 327          | 10,502        | 861          | 55,039         | 129           |
| Pineleng                | 1,374         | 154          | 13,109        | 488          | 63,638         | 1,281         |
| <b>Study Area total</b> | <b>20,961</b> | <b>7,070</b> | <b>56,905</b> | <b>3,331</b> | <b>571,287</b> | <b>29,091</b> |

Source: Laporan Tahunan, Dinas Peternakan, Tondano 1999

Tabel II-1.7.1 Jenis Sistem Pertanian Hutan di Wilayah Studi

| Type  | Woody perennials |              |       |         |             | Herbaceous crops | Major Area   |
|-------|------------------|--------------|-------|---------|-------------|------------------|--|
|       | Woody trees      | Estate crops |       |         | Fruit trees |                  |  |
|       |                  | Coconut      | Clove | Others+ |             |                  |  |
| I-1   | △                | ⊙            | △     | X       | △           | △                | Northern part of Airmadidi and Pineleng  |
| I-2   | △                | △            | ⊙     | X       | △           | △                | Tondano, Tompasso, Remboken, Touliambot, and southern part of Airmadidi and Pineleng |
| I-3   | ○                | ⊙            | ○     | X       | ○           | △                | Relatively steep slope area of Langowan, Kakas, Eris, Airmadidi and Pineleng         |
| I-4   | ○                | ○            | ⊙     | X       | X           | △                | Relatively steep slope area of Langowan, Kakas, Eris, Airmadidi and Pineleng         |
| I-5   | ○                | ○            | X     | ⊙       | X           | X                | Tondano, Tompasso, Remboken, Airmadidi and Pineleng                                  |
| I-6   | ○                | ○            | ○     | ○       | ○           | ○                | Housing area of all the Study Area and Airmadidi (along Bitung road)                 |
| II-1  | △                | ○            | △     | X       | △           | ⊙                | Southern and western part of the study area  |
| II-2  | △                | △            | ○     | X       | △           | ⊙                | Southern and western part of the study area  |
| III-1 | △                | ⊙            | X     | X       | △           | ⊙                | Flat area of Airmadidi, Pineleng, Tompasso and Remboken                              |
| III-2 | △                | X            | ⊙     | X       | X           | ⊙                | Flat area of Airmadidi, Pineleng, Tompasso, Remboken, Tondano and Toulimumbot        |

Note: \*; Others include coffee, cocoa and vanilla.

⊙: Pre-dominant ○: Dominant △: Frequent X: Negligible

▲: shows the limited area.

**Tabel II-1.7.2 Sistem Pertanian Hutan di Wilayah Studi**

| Sub-District  | Location                  | Flat (Less than 8%) |                 | Slope I (8% to 25%) |          | SlopeII (More than 25%) |          |
|---------------|---------------------------|---------------------|-----------------|---------------------|----------|-------------------------|----------|
|               |                           | Majority            | Minority        | Majority            | Minority | Majority                | Minority |
| 1 Langowan    | Tumaratas-Rarinis         | <b>II-1</b>         | III-2           | <b>III-1</b>        | III-2    | <b>I-11</b>             |          |
|               | Noogan                    | <b>I-1, II-1</b>    | III-2           | <b>I-1</b>          |          |                         |          |
| 2 Kakas       | Kawang                    |                     |                 | <b>III-1</b>        |          | <b>I-4</b>              |          |
|               | Totolan-Panasen-Kalawiran | <b>II-2</b>         |                 | <b>II-2</b>         |          | <b>I-4</b>              |          |
| 3 Tompaso     | Tempot                    | <b>II-2</b>         | I-2, -5, III-2  | <b>III-1, -2</b>    |          |                         |          |
|               | Tonsewer-Touure           | <b>III-1</b>        | III-1           | <b>III-1, -2</b>    |          |                         |          |
| 4 Remboken    | Palestan-Tampusu          | <b>III-2</b>        | III-2           | <b>III-2</b>        | I-3      |                         |          |
|               | Tampusu-Kasuratan         | <b>III-1,2</b>      |                 |                     |          | <b>I-3</b>              |          |
|               | Kasuratan                 | <b>I-2, II-2</b>    | I-5, III-2      |                     |          |                         |          |
|               | Kasuratan-Parepei         | <b>I-2, II-2</b>    | I-6, III-1      | <b>III-2</b>        | III-1    | <b>I-4</b>              |          |
|               | Parepei                   | <b>III-1,2</b>      |                 | <b>III-2</b>        | III-1    | <b>I-4</b>              |          |
|               | Parepei-Pulatan           | <b>II-2</b>         | I-2, II-1       |                     |          | <b>I-4</b>              |          |
| 5 Tomohon     | Pulatan                   | <b>III-1,2</b>      |                 |                     |          |                         |          |
|               | Rurukan-Temboan           | <b>II-1, -2</b>     |                 | <b>II-1</b>         |          | <b>II-1</b>             | I-4      |
|               | Kumelembau                | <b>II-1, -2</b>     |                 | <b>II-1</b>         |          | <b>II-1</b>             |          |
| 6 Tondano     | Ruaukan-Sumalangka        | <b>III-2</b>        | I-2, II-2       | <b>II-2</b>         | I-2      | <b>II-2</b>             |          |
|               | Sumalangka-sasaran-Suluan | <b>I-2, III-2</b>   | I-6             | <b>I-2, III-2</b>   |          | <b>I-3</b>              |          |
|               | Tataaran                  | <b>8, 11</b>        |                 | <b>III-1,2</b>      |          | <b>I-3</b>              |          |
|               | Tataaran-Palesten         | <b>III-1, -2</b>    |                 | <b>II-2</b>         | I-1, -5  | <b>I-3</b>              |          |
| 7 Toulimambot | Papakalan-Makalonsouw     | <b>III-2</b>        | III-1           | <b>I-2, III-2</b>   | III-2    | <b>I-4</b>              |          |
| 8 Eris        |                           |                     |                 | <b>I-4</b>          |          | <b>I-4</b>              |          |
| 9 Kauditan    |                           | <b>III-1</b>        | I-1             | <b>I-3</b>          |          | <b>I-4</b>              |          |
| 10 Airmadidi  | Suluan-Kembuan            | <b>I-1, -2, I-5</b> | III-1, -2       | <b>III-1, -2</b>    | I-3      | <b>I-3</b>              |          |
|               | Suluan-Rumengkor          | <b>I-2, I-5</b>     | I-1, II-1, -2   | <b>I-1,2</b>        | III-1    | <b>I-3</b>              | I-4      |
|               | Rumenkor                  | <b>I-1, I-3</b>     | III-1, -2       | <b>III-1, -2</b>    | I-1      | <b>I-4</b>              | I-1      |
|               | Airmadidi Atas-Maunbi     | <b>I-1, I-6</b>     | I-5, III-1      | <b>I-1</b>          |          | <b>I-4</b>              |          |
|               | Airmadidi Bawah-Tanggari  | <b>I-1</b>          | I-6, II-2       | <b>I-1, -3</b>      |          | <b>I-4</b>              |          |
|               | Tanggari-Tonsealama       | <b>I-2</b>          | II-2, III-2     | <b>I-4</b>          |          | <b>I-4</b>              |          |
| 11 Pineleng   | Rumengkor-Kembes          | <b>I-1</b>          | I-2, III-1, -2  | <b>I-3, III-1</b>   |          | <b>I-4</b>              |          |
|               | Kembes-Tombuluan          | <b>I-1, III-1</b>   | II-1, -2, III-2 | <b>I-3</b>          | I-1, -2  | <b>I-4</b>              |          |
|               | Tombuluan-Kumangata       | <b>I-1, III-1</b>   |                 | <b>I-3</b>          | I-1, -2  | <b>I-4</b>              |          |
|               | Kumangata-Sawangan        | <b>I-1</b>          | I-5, -6, II-1   | <b>I-1</b>          | III-1    | <b>I-4</b>              |          |
|               | Kembes-Koka               | <b>I-1, II-1</b>    | III-1           | <b>I-3</b>          | I-1, -2  | <b>I-4</b>              |          |

Source: Field reconnaissance by JICA Study Team

Note : Gothic letter shows predominant system in the Study Area.

**Tabel II-1.11.1 Tugas dan Fungsi Badan Pemerintah yang terkait**

| Agencies  | Duties   | Functions  |
|---|--|--|
| 1. Directorate General of Land Rehabilitation and Social Forestry | To implement the duties of the MOFEC (Ministry of Forestry and Estate Crops) in the sector of land rehabilitation and social forestry according to the policy as stipulated by MOFEC and based on the existing legislative regulation (Article 87 of the Decree of Ministry of Forestry and Estate Crops no.:002/Kpts-II/2000, dated on January 7,2000).   | (a). Formulation of technical policy in land rehabilitation and social forestry sector;<br>(b). Plan and program, as well as technical control, social forestry, forest product diversification development, and forest crops seedling; and;<br>(c). Development, which covers the training guidance, and standard preparation in the sector of land rehabilitation and conservation, social forestry, forest product diversification development and forest crops seedling.   |
| 2. Regional Office of Ministry of Forestry and Estate Crops       | To make and coordinate various plans on forestry activities.   | -  |
| 3. Office of Land Rehabilitation and Soil Conservation (BRLKT)    | Implement the compositions of micro-planning, monitoring, evaluation of watershed management, successful land rehabilitation and soil conservation;  | (a). Prepare the long term plan (pattern of land rehabilitation and soil conservation) and the medium term plan (field technical plan of land rehabilitation and soil conservation);<br>(b). Execute the monitoring and evaluation on watershed management;<br>(c). Execute the monitoring and evaluation on successful land rehabilitation and soil conservation;<br>(d). Examine the technical arrangement of land rehabilitation and soil conservation;<br>(e). Examine the technical plan of greening and reforestation; and<br>(f). Perform the administration matters.   |
| 4. Forestry Service Office of North Sulawesi Province             | (a). Lead and coordinate all forestry activities at provincial level;<br>(b). Execute the technical policies in forestry affairs in accordance with the guidelines and / or technical policies prepared by the central government;<br>(c). Prepare the plans on forestry affairs at provincial level in accordance with the national forestry development plan;<br>(d). Control the forest use including its protection and maintenance; and<br>(e). Perform other duties given by the central government, as the provincial leader. | To fulfil the whole exertions and activities for:<br>(a). Planning, preparing, processing, analyzing;<br>(b). Implementing the duties of Forestry Service Office in accordance with the applicable laws;<br>(c). General administration, civil service, and logistic and financial matters;<br>(d). Arranging and establishing some corporations, integrating and synchronizing whole organizational activities of the Forestry Service Office, including the implementation of technical coordination with other relevant agencies for smooth execution of the Office duties; and<br>(e). Implementing the technical security.  |
| 5. Estate Crops Office of North Sulawesi                          | Execute the household affairs at provincial level in the estate crops section;   | (a). Implement the general establishment in accordance with the policies prepared by the Ministry of Home Affairs;<br>(b). Execute the technical program in the estate crops;<br>(c). Provide the permit enterprise establishment;<br>(d). Execute the extension and enlightenment services;<br>(e). Execute the research ;<br>(f). Execute the technology examination in the framework of establishment of recommended technology;<br>(g). Perform the office administration matters;<br>(h). Carry out the management of Technical Implementation Unit.  |
| 6. Forestry Service Office of Minahasa District                   | To support the Governor for the household matters at district level on the forestry affairs, about ways of:<br>(a). Sale and distribution of forest products;<br>(b). Forest protection;<br>(c). Greening and conservation of soil and water;<br>(d). Sericulture;<br>(e). Apiculture;<br>(f). Community forest and private forest;<br>(g). Enlightenment of importance of forestry, which are supported by the central and regional governments.  | (a). Control the distribution and sale of forest products;<br>(b). Protect the forest damage;<br>(c). Prepare the program on monitoring, evaluation, and other administration matters;<br>(d). Support the communities and Self-Supporting Community Institutions in planting, and protection /maintenance of community forest and private forest;<br>(e). Execute the implementation and improvement of apiculture and sericulture;<br>(f). Implement the greening, soil, and water conservation;<br>(g). Execute the enlightenment activities and train the extension workers;<br>(h). Support the community and community organization in recovering and maintaining function of forest, soil, and water; and<br>(i). Provide technical guidance for Technical Implementation Unit.   |
| 7. Estate Crops Office of Minahasa District                       | (a). Examination and application of technology;<br>(b). Land resources utilization;<br>(c). Seedling preparation;<br>(d). Fertilizer supply;<br>(e). Pesticides supply;<br>(f). Establishment of Method of use for machinery equipment;<br>(g). Establishment of farm enterprise management;<br>(h). Products management;<br>(i). Establishment of marketing.  | (a). Perform the development by the approach to the natural resources, human resources, agri-business, and integrity concept of inter sector / sub sector;<br>(b). Implement the development pattern consisting of various patterns such as self-supporting / partial establishment, economic enterprise, and investor;<br>(c). Partnership / joint venture of economic enterprise and joint venture;<br>(d). Partnership / joint venture of investor and economic enterprise;<br>(e). BOT (built, operate, transfer);<br>(f). BTN (the estate is made / constructed by the investor / entrepreneur, which the payment is made by the farmers in installments);<br>(g). Execute the main cultivation activities consisting of intensification, extensification, rehabilitation / replanting, diversification, and land conservation;<br>(h). Implement agriculture commodity development; and<br>(i). Application of the commodity policies on various estate crops such as cocoa, clove, nutmeg, coffee, cacao, vanilla, cashew, cassiavera, candlenut, cardamom, and ginger. |

**Tabel II-3.4.1 Komponen-komponen untuk menentukan Sistem Pertanian Hutan yang direkomendasikan**

| Slope  | Access | Soil erodibility | Herbaceous cultivation* | Erosion            | Required Resistact to erosion | Applicable system                | Required Hedge crops* | Required Ridge* | Application of new practice* | Inter cropping* | Recommendable system     |
|--------|--------|------------------|-------------------------|--------------------|-------------------------------|----------------------------------|-----------------------|-----------------|------------------------------|-----------------|--------------------------|
| 0--8   | good   | low              | easy                    | strongly resistant | medium                        | All the system                   | slightly              | slightly        | easy                         | easy            | I-5,6, II-1,2, III-1,2   |
|        |        | medium           | easy                    | strongly resistant | medium                        | All the system                   | slightly              | slightly        | easy                         | easy            | I-5,6, II-1,2, III-1,2   |
|        | poor   | low              | easy                    | strongly resistant | medium                        | All the system                   | slightly              | slightly        | easy                         | easy            | I-5,6, II-1,2, III-1,2   |
|        |        | medium           | easy                    | strongly resistant | medium                        | All the system                   | slightly              | slightly        | easy                         | easy            | I-5,6, II-1,2, III-1,2   |
| 8--15  | good   | low              | easy                    | resistant          | medium                        | All the system                   | slightly              | medium          | easy                         | easy            | I-5,6, II-1,2, III-1,2   |
|        |        | medium           | easy                    | medium             | medium-resistant              | I-1,2,3,4,5,6, (II-1,2), III-1,2 | slightly              | medium          | easy                         | easy            | I-5,6, (II-1,2), III-1,2 |
|        | poor   | low              | easy                    | resistant          | medium                        | All the system                   | slightly              | medium          | easy                         | easy            | I-5,6, II-1,2,3, III-1,2 |
|        |        | medium           | easy                    | medium             | medium-resistant              | I-1,2,3,4,5,6, (II-1,2), III-1,2 | slightly              | medium          | easy                         | easy            | I-5,6, (II-1,2), III-1,2 |
| 15--25 | good   | low              | medium                  | medium             | resistant                     | I-1,2,3,4, III-1,2               | medium                | strongly        | medium                       | medium          | I-1,2, I-5, (III-1,2)    |
|        |        | medium           | medium                  | susceptible        | Strongly resistant            | I-1,2,3,4, (III-1,2)             | medium                | strongly        | medium                       | medium          | I-1,2,3,4, (III-3)       |
|        | poor   | low              | medium                  | medium             | resistant                     | I-1,2,3,4, III-1,2               | medium                | strongly        | medium                       | medium          | I-1,2, (II-3), (III-1,2) |
|        |        | medium           | medium                  | susceptible        | Strongly resistant            | I-1,2,3,4, (III-1,2)             | medium                | strongly        | medium                       | medium          | I-1,2,3,4, (III-1,2)     |
| 25--40 | good   | low              | difficult               | susceptible        | Strongly resistant            | I-1,2,3,4                        | strongly              | strongly        | difficult                    | difficult       | I-1,2,3,4                |
|        |        | medium           | difficult               | susceptible        | Very strongly resistant       | I-3,4, (I-1,2)                   | strongly              | strongly        | difficult                    | difficult       | I-3,4, (I-1,2)           |
|        | poor   | low              | difficult               | susceptible        | Strongly resistant            | I-1,2,3,4                        | strongly              | strongly        | difficult                    | difficult       | I-1,2,3,4                |
|        |        | medium           | difficult               | susceptible        | Very strongly resistant       | I-3,4, (I-1,2)                   | strongly              | strongly        | difficult                    | difficult       | I-3,4, (I-1,2)           |
| 40<    | good   | low              | very difficult          | very susceptible   |                               | Permanent tree complex           | strongly              | strongly        | very difficult               | very difficult  | Permanent tree complex   |
|        |        | medium           | very difficult          | very susceptible   |                               | Permanent tree complex           | strongly              | strongly        | very difficult               | very difficult  | Permanent tree complex   |
|        | poor   | low              | very difficult          | very susceptible   |                               | Permanent tree complex           | strongly              | strongly        | very difficult               | very difficult  | Permanent tree complex   |
|        |        | medium           | very difficult          | very susceptible   |                               | Permanent tree complex           | strongly              | strongly        | very difficult               | very difficult  | Permanent tree complex   |

Numerals in parenthesis shows optionally applicable or recommendable.

Erosion: Relative value

Soil: Andsols; medium. Other soil; less

\* : Determined by field inspection.

Access: Distance from the village. Good : less than 1 km, Poor; more than 1km

In case that farming activities are excuted at more than 40% sloped area, it is proposed to employ hedgerow cropping by considering soil erosion.

For recommendation of agroforestry system, it is necessary to pay regard to farmers opinion and requirement.

| Type  | Woody perennials |              |       |        | Herbaceous crops |   |
|-------|------------------|--------------|-------|--------|------------------|---|
|       | Woody trees      | Estate crops |       |        | Fruit trees      |   |
|       |                  | Coconut      | Clove | Others |                  |   |
| I-1   | △                | ⊙            | △     | X      | △                | △ |
| I-2   | △                | △            | ⊙     | X      | △                | △ |
| I-3   | ○                | ⊙            | ○     | X      | ○                | △ |
| I-4   | ○                | ○            | ⊙     | X      | X                | △ |
| I-5   | ○                | ○            | X     | ⊙      | X                | X |
| I-6   | ○                | ○            | ○     | ○      | ○                | ○ |
| II-1  | △                | ○            | △     | X      | △                | ⊙ |
| II-2  | △                | △            | ○     | X      | △                | ⊙ |
| III-1 | △                | ⊙            | X     | X      | △                | ⊙ |
| III-2 | △                | X            | ⊙     | X      | X                | ⊙ |

Note: \* : Others include coffee, cocoa and vanilla.

⊙ :Pre-dominant ○ : Dominant △ : Frequent X:Neglesible

Category I is tree crop dominant, Category II is herbaceous crop dominant, Category III is non dominant.

II-3:Hedge cropping applied to type II-1 and II-2

**Tabel II-3.4.2 Karakteristik dari Masing-masing Jenis Sistem Pertanian Hutan**

| Type  | Productivity |          |            |            | Evaluation | Resistance to<br>Soil erosion | Application of<br>new practice |
|-------|--------------|----------|------------|------------|------------|-------------------------------|--------------------------------|
|       | Trees        | Estate C | Fruit      | Herbaceous |            |                               |                                |
| I-1   | neglesible   | high     | neglesible | neglesible | medium     | resistant                     | relatively difficult           |
| I-2   |              | high     | neglesible | neglesible | medium     | resistant                     | relatively difficult           |
| I-3   | Low          | medium   | neglesible | neglesible | Low        | very resistant                | difficult                      |
| I-4   | Low          | medium   | neglesible | neglesible | Low        | very resistant                | difficult                      |
| I-5   | medium       | high     |            |            | high       | very resistant                | easy                           |
| I-6   | medium       | medium   | medium     | medium     | high       | very resistant                | relatively easy                |
| II-1  | neglesible   | low      | neglesible | high       | high       | resistant                     | easy                           |
| II-2  | neglesible   | low      | neglesible | high       | high       | resistant                     | easy                           |
| III-1 | neglesible   | high     | neglesible | medium     | high       | resistant                     | easy                           |
| III-2 | neglesible   | high     | neglesible | medium     | high       | resistant                     | easy                           |

Tabel II-3.4.3 Jenis Sistem Pertanian Hutan yang direkomendasikan di Wilayah Studi

| Type  | Woody perennials |              |       |        | Fruit trees | Herbaceous crops | Recommended area  |
|-------|------------------|--------------|-------|--------|-------------|------------------|---|
|       | Woody trees      | Estate crops |       |        |             |                  |   |
|       |                  | Coconut      | Clove | Others |             |                  |   |
| I-1   | △                | ⊙            | △     | X      | △           | △                | Gentle to relatively steep slope area of northern part of the Study Area                |
| I-2   | △                | △            | ⊙     | X      | △           | △                | Gentle to relatively steep slope area of southern part of the Study Area                |
| I-3   | ○                | ⊙            | ○     | X      | ○           | △                | Relative steep to steep slope area  |
| I-4   | ○                | ○            | ⊙     | X      | X           | △                | Relatively steep to steep slope area  |
| I-5   | ○                | ○            | X     | ⊙      | X           | X                | Gentle slope area where it located not far from settlement area                         |
| I-6   | ○                | ○            | ○     | ○      | ○           | ○                | Home garden, and fruit production area  |
| II-1  | △                | ○            | △     | X      | △           | ⊙                | Flat to gentle slope area of northern part of the Study Area, close to the housing area |
| II-2  | △                | △            | ○     | X      | △           | ⊙                | Flat to gentle slope area, close to the housing area                                    |
| II-3  | ○                | △            | ○     | X      | △           | ⊙                | Slopy area, close to the settlement area, trees used as hedgerow                        |
| III-1 | △                | ⊙            | X     | X      | △           | ⊙                | Flat to gentle slope area of northern part of the Study Area                            |
| III-2 | △                | X            | ⊙     | X      | X           | ⊙                | Flat to gentle slope area of southern part of the Study Area                            |

Note: \* : Others include coffee, cocoa and vanilla.

⊙ : Pre-dominant ○ : Dominant △ : Frequent X: Neglesible

Category I is tree crop dominant, Category II is herbaceous crop dominant, Category III is non dominant.

**Tabel II-3.4.4 Rencana Konservasi DAS**

| Zones   | Land Use                   | Slope Gradient (%) | Area (ha) | Recommended Conservation Measures  |   |   |
|---------|----------------------------|--------------------|-----------|--|---|---|
|         |                            |                    |           | Forest   | Agroforestry  | Protection Works  |
| P Zone  | Forest                     | > 40               | 4,361     | <ul style="list-style-type: none"> <li>⊙ Reforestation</li> <li>⊙ Prevention of reforestation</li> <li>⊙ Community forest</li> </ul> | -   | -   |
| Bw Zone | Farmlands, forest, wetland | —                  | 3,266     | <ul style="list-style-type: none"> <li>○ Green belt</li> </ul>   | <ul style="list-style-type: none"> <li>○ Tree dominate type</li> <li>○ Multistory tree garden</li> </ul>  | <ul style="list-style-type: none"> <li>○ Control of fishing in the lake,</li> <li>○ Erosion control measures (Vegetative measures, riverbed revetment, check dam)</li> </ul>  |
| Bm Zone | Estate                     | 25-40              | 4,030     | <ul style="list-style-type: none"> <li>⊙ Expansion of private forest</li> </ul>  | <ul style="list-style-type: none"> <li>⊙ Tree dominate type</li> <li>⊙ Multistory tree garden</li> </ul>  | <ul style="list-style-type: none"> <li>⊙ Erosion control measures (terracing, contour dikes, diversion ditches)</li> <li>○ Road improvement</li> <li>○ Erosion control farming (contour ridge cultivation, hedge cropping)</li> </ul>             |
|         |                            | 15-25              | 7,734     | <ul style="list-style-type: none"> <li>⊙ Expansion of private forest</li> </ul>  | <ul style="list-style-type: none"> <li>⊙ Tree dominate type</li> <li>⊙ Multistory tree garden</li> </ul>  | <ul style="list-style-type: none"> <li>⊙ Erosion control measures (diversion ditches, contour dikes, infiltration trenches)</li> <li>○ Road improvement</li> <li>○ Erosion control farming (contour ridge cultivation, hedge cropping)</li> </ul> |
|         | Arable upland              | 25-40              | 443       | <ul style="list-style-type: none"> <li>⊙ Expansion of private forest</li> </ul>  | <ul style="list-style-type: none"> <li>⊙ Tree dominate type</li> <li>⊙ Multistory tree garden</li> </ul>  | <ul style="list-style-type: none"> <li>⊙ Erosion control measures (terracing, contour dikes, diversion ditches)</li> <li>○ Road improvement</li> <li>○ Erosion control farming (contour ridge cultivation, hedge cropping)</li> </ul>             |
|         |                            | 15-25              | 3,825     | <ul style="list-style-type: none"> <li>⊙ Expansion of private forest</li> </ul>  | <ul style="list-style-type: none"> <li>○ Tree dominate type</li> <li>○ Multistory tree garden</li> </ul>  | <ul style="list-style-type: none"> <li>⊙ Erosion control measures (diversion ditches, contour dikes, infiltration trenches)</li> <li>○ Road improvement</li> <li>○ Erosion control farming (contour ridge cultivation, hedge cropping)</li> </ul> |
| F Zone  | Estate                     | 8-15               | 4,747     | <ul style="list-style-type: none"> <li>⊙ Expansion of private forest</li> </ul>  | <ul style="list-style-type: none"> <li>○ Non dominant crop type</li> <li>○ Multistory tree garden</li> <li>○ Multi-purpose tree</li> <li>○ Hedgerow cropping w/ leguminous trees</li> </ul> | <ul style="list-style-type: none"> <li>⊙ Erosion control measures (infiltration trenches, contour dikes, drains)</li> <li>○ Road improvement</li> <li>⊙ Erosion control farming (contour ridge cultivation, hedge cropping)</li> </ul>            |
|         |                            | <8                 | 5,647     | <ul style="list-style-type: none"> <li>⊙ Expansion of private forest</li> </ul>  | <ul style="list-style-type: none"> <li>Δ Non dominant crop type</li> <li>Δ Herbaceous dominant type</li> </ul>  | <ul style="list-style-type: none"> <li>Δ Erosion control measures (drains)</li> <li>Δ Road improvement</li> <li>⊙ Erosion control farming (contour ridge cultivation, hedge cropping)</li> </ul>  |
|         | Arable upland              | <8                 | 3,782     | <ul style="list-style-type: none"> <li>⊙ Expansion of private forest</li> </ul>  | <ul style="list-style-type: none"> <li>Δ Non dominant crop type</li> <li>Δ Herbaceous dominant type</li> </ul>  | <ul style="list-style-type: none"> <li>Δ Erosion control measures (drains)</li> <li>Δ Road improvement</li> <li>⊙ Erosion control farming (contour cropping)</li> </ul>   |

Note : Priority in implementation    ⊙ : High    ○ : Medium    Δ : Low  
Paddy field (6,007 ha) under F Zone is not included in the table.

**Tabel III-1.1.1 Profil Tanah pada umumnya (Kelompok Selatan) (1/3)**

| Horizon/Layer | Depth (cm) | Explanation   |
|---------------|------------|---|
| A             | 0-30       | Color: black (7.5yr 2/1), Structure: Crumb, Size: very fine to medium, Texture: sandy loam, Consistency: very friable to friable, Root condition: dense |
| C             | 30-49      | Buried horizon; Sandy fraction  |
| I             | 49-82      | Color: brownish black (10yr 2/2), Structure: Crumb, Size: very fine to fine, Texture: sandy loam, Consistency: friable, Root condition: lacked          |
| II            | 82-97      | Color: black (10yr 2/1), Structure: crumb, Size: very fine to fine, Consistency: friable  |
| III           | 97-100     | Color: black (10yr 2/1), Structure: Crumb to blocky, Size: fine to medium, Texture: sandy loam, Consistency: friable                                    |

**Tabel III-1.1.1 Profil Tanah pada umumnya (Kelompok Timur) (2/3)**

| Horizon/Layer | Depth (cm) | Explanation  |
|---------------|------------|--|
| A             | 0-15       | Color: very dark brown (7.5YR 2/3), Structure: blocky<br>Size: fine to medium, Texture: clay, Consistency: friable to firm, Root condition: dense            |
| B             | 15-77      | Color: brownish black (75YR 4/3-4/6), Structure: blocky<br>Size: medium-coarse, Texture: clay, Consistency: friable to firm, Root condition: lacked          |
| BC            | 77-115     | Color: brown (75YR 4/4-4/6), Structure: crumb to blocky<br>Size: fine to medium, Texture: clay, Consistency: friable to firm, sticky, Root condition: lacked |

**Tabel III-1.1.1 Profil Tanah pada umumnya (Kelompok Barat) (3/3)**

| Horizon/Layer | Depth (cm) | Explanation   |
|---------------|------------|---|
| Ap            | 0-10       | Color: brownish black (7.5YR 3/2), Structure: Crumb to blocky, Size: fine to medium, Texture: clay loam, Consistency: friable, Root condition: dense                  |
| BA            | 10-31      | Color: dark brown (7.5YR 3/3), Structure: crumb to blocky, Size: medium, Texture: clay, Consistency: friable to firm, sticky, Root condition: lack                    |
| B             | 31-86      | Color: brownish black to dark brown (10YR 3/2), Structure: crumb to blocky, Size: medium to coarse, Texture: clay, Consistency: friable to firm, Root condition: lack |
| BC            | 86-102     | Color: dark brown (7.5YR 3/4), Structure: blocky, Size: fine to medium, Consistency: firm and sticky, Root condition: lack  |

**Tabel III-1.3.1 Wilayah dari masing-masing Penggunaan Lahan di Tiga Wilayah**

Upper: Area (ha)  
Lower: Ratio (%)

| No. | Legend                              | East Area | South Area | West Area | Intensive Area |
|-----|-------------------------------------|-----------|------------|-----------|----------------|
| 1   | Natural/Semi/natural forest         | 327       | 735        | 66        | 1,128          |
|     |                                     | 9.8       | 21.6       | 1.3       | 9.5            |
| 2   | Secondary forest                    | 70        | 478        | 52        | 600            |
|     |                                     | 2.1       | 14.1       | 1.0       | 5.0            |
| 3   | Planted forest (Timber)             | 11        | 12         | 1         | 24             |
|     |                                     | 0.3       | 0.4        | 0.0       | 0.2            |
| 4   | Planted forest (Firewood)           | 83        | 6          | 359       | 448            |
|     |                                     | 2.5       | 0.2        | 7.0       | 3.8            |
| 5   | Bush                                | 120       | 48         | 74        | 242            |
|     |                                     | 3.6       | 1.4        | 1.4       | 2.0            |
| 6   | Estate (Clove)                      | 731       | 19         | 200       | 950            |
|     |                                     | 22.0      | 0.6        | 3.9       | 8.0            |
| 7   | Estate (Others)                     | 684       | 269        | 1,491     | 2,444          |
|     |                                     | 20.5      | 7.9        | 29.0      | 20.6           |
| 8   | Mixture of estate and arable upland | 461       | 742        | 618       | 1,821          |
|     |                                     | 13.8      | 21.7       | 12.0      | 15.3           |
| 9   | Arable upland                       | 368       | 859        | 1,895     | 3,122          |
|     |                                     | 11.0      | 25.2       | 36.8      | 26.3           |
| 10  | Pasture                             | 0         | 0          | 36        | 36             |
|     |                                     | 0.0       | 0.0        | 0.7       | 0.3            |
| 11  | Paddy field                         | 388       | 125        | 125       | 638            |
|     |                                     | 11.6      | 3.7        | 2.4       | 5.4            |
| 12  | Swamp                               | 10        | 2          | 8         | 20             |
|     |                                     | 0.3       | 0.1        | 0.2       | 0.2            |
| 13  | Water body                          | 1         | 0          | 5         | 6              |
|     |                                     | 0         | 0          | 0.1       | 0.0            |
| 14  | Settlement and others               | 85        | 105        | 216       | 406            |
|     |                                     | 2.5       | 3.1        | 4.2       | 3.4            |
|     | Total (ha)                          | 3,339     | 3,400      | 5,146     | 11,885         |
|     | Total (%)                           | 100.0     | 100.0      | 100.0     | 100.0          |

**Tabel III-1.4.1 Batas Hutan Lindung di Wilayah Studi**

| No. | Registration No. | Location                   | Decrees (No., Date)  | Area (ha) | Structuring |                      | Year of Restructuring | Map Scale |
|-----|------------------|----------------------------|--|-----------|-------------|----------------------|-----------------------|-----------|
|     |                  |                            |  |           | Year        | Boundary code        |                       |           |
| 1   | 42               | Mt. Sopotan                | GB.No.8; July 5, 1930  | 13,440    | 1932        | G.1 - G.333          | -                     | 1:20,000  |
| 2   | 46               | Mt. Lengkoan               | GB.No.3; Nov. 22, 1932   | 56        | 1935        | G.1 - G.11           | -                     | 1:5,000   |
| 3   | 47               | Mt. Tampusu                | GB.No.17; July 15, 1933  | 29        | 1938        | B.1 - B.29, G.1-G.10 | 1985/1986             | 1:2,500   |
| 4   | 48               | Mt. Kawatak                | GB.No.3; July 5, 1930  | 980       | 1934        | G.1-G.12             | -                     | 1:20,000  |
| 5   | 50               | Mt. Mahawu                 | GB.No.17; July 15, 1933  | 550       | 1939        | G.1-G86              | 1986/1987             | 1:10,000  |
| 6   | 52               | Mt. Lembean                | GB.No.3; Jan. 5, 1932  | 2,700     | Not Clear   | B.1-B.130            | 1977/1978             | 1:20,000  |
| 7   | 54               | Mt. Klabat<br>Mt. Masarang | GB.No.38; April 2, 1932  | 5,670     | Not Clear   | B.1-B.183            | 1996/1997             | 1:20,000  |
| 8   |                  | Mt. Kaweng                 | Decision of Forestry Minister,<br>No.250/Kpts-II/UM/1984; Feb. 20,<br>1984 | 146.97    | 1996        | Not Clear            | -                     | 1:50,000  |
| 9   |                  |                            | Decision of Forestry Minister,<br>No.250/Kpts-II/UM/1984; Feb. 20,<br>1984 | 417.86    | 1996        | Not Clear            | -                     | 1:25,000  |

GB: *Gouvernementsbesluit (Governor's decision)*

Source: *Bub BIPHUT Manado, 2000*