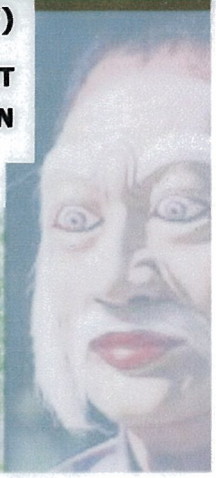
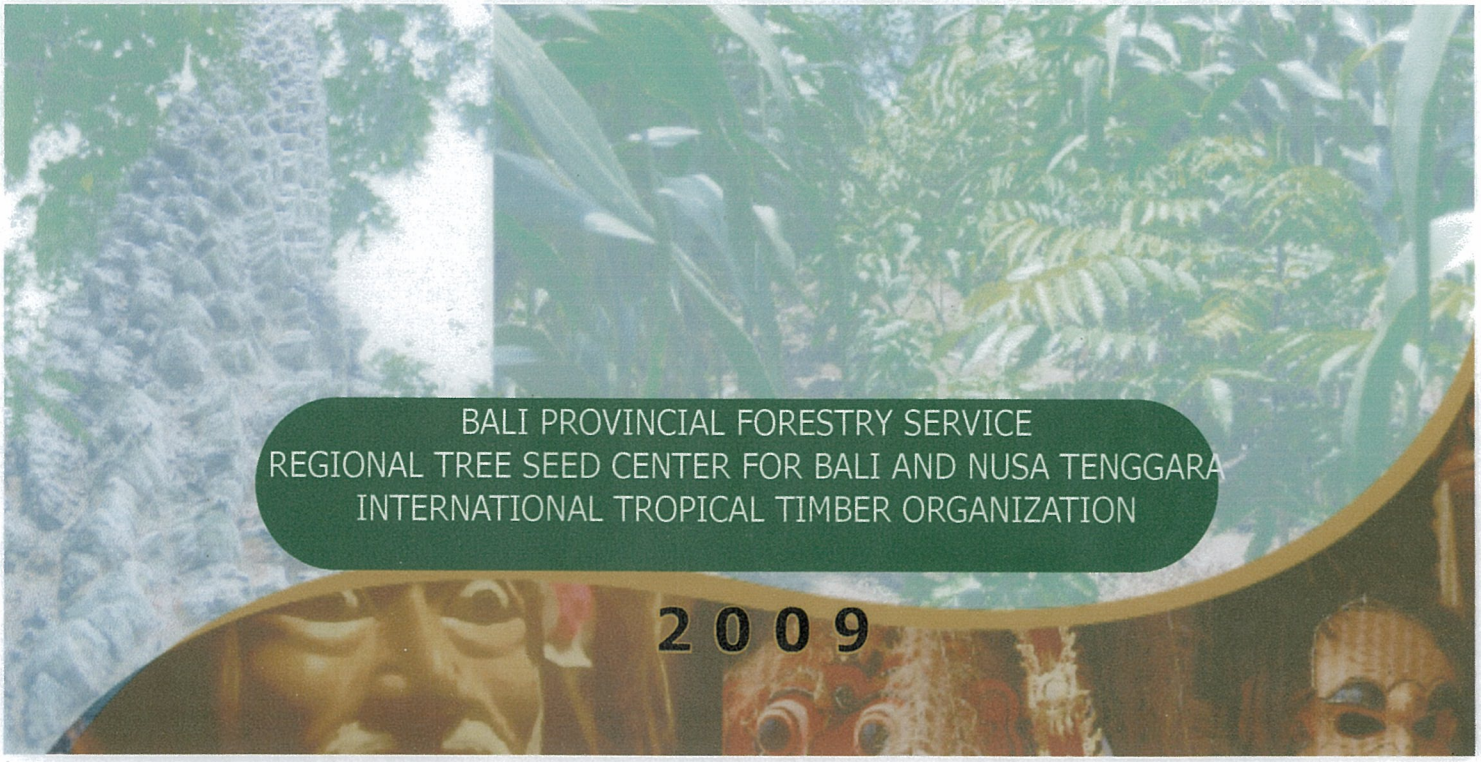
ITTO PD 386/05 Rev.1 (F)

TECHNOLOGICAL DEVELOPMENT FOR THE PRODUCTION OF PLANTING MATERIALS TO SUPPORT SUSTAINABLE PLANTATION OF BALI INDIGENOUS SPECIES THROUGH COMMUNITY PARTICIPATION



REPORTING ACTIVITY 4.1 DATA COLLECTION AND ANALYSIS OF SOCIAL ECONOMIC AND BIOPHYSICS

PREPARED BY:
PROJECT EXECUTING TEAM



BALI PROVINCIAL FORESTRY SERVICE
REGIONAL TREE SEED CENTER FOR BALI AND NUSA TENGGARA
INTERNATIONAL TROPICAL TIMBER ORGANIZATION

2009

Reporting
Activity 4.1. Data collection and analysis of social economic and biophysics

Project Executing Team ITTO PD 386/05 Rev.1(F)

Bali Provincial Forestry Service and
Regional Tree Seed Center for Bali and Nusa Tenggara and
International Tropical Timber Organization
2009

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SUMMARY

In order to support sustainable plantation of indigenous plant in Bali Province, a physical survey has been carried out in targeted area of 6 districts; Karangasem, Buleleng, Bangli, Klungkung, Tabanan and Jembrana. The aim of physical survey is to collect data on soil type, microclimate, topography, forest type, etc. The goal of this study is to gain information of the physical and chemical conditions of the targeted land. Furthermore an evaluation of land suitability classes of area in relation to plantation of 6 indigenous plants was also carried out in this survey.

Sixty soil samples were taken from 18 sub districts of targeted area. Physical and chemical properties of soil samples were analyzed in Laboratory of Soil Science, Udayana University. The samples were analyzed using normal and standard procedures as recommended Puslittanak, Bogor.

The results of physical survey found that, soil texture of targeted area is dominated by sandy loam then followed by loam, clay loam and silky loam with moderate C-organic. It was found that chemical characteristic of soil indicated that soil pH is slightly acid to neutral, while CEC is high to very high. In contrast however N – content was low to very low. Soil fertility status of targeted area is generally low, except in some parts of Buleleng and Klungkung district is high. The erosion hazard index of targeted area is generally low to severe. Therefore, a soil conservation practice needs to be done. All of indigenous plants that proposed in this project could be adapted in this area as far as the limiting factors such as rooting depth, and available of water could be managed.

Intention of ITTO PD 386 project is to prevent of extinction types original Bali crop that having high economic value as raw material sculpturing wood to support tourism activity in Bali. Therefore, before spreading and cultivation of seed started, require preparation from various aspect, one of them is from social economic aspect with conduct social economic survey toward farmers of candidate receiver of sculpturing woods seeds. Later result of this study can become guidance in conducting spreading sculpturing woods seeds and evaluation impact of the project of some years later.

From result of study activity of social economic aspect of social forest expected to be obtained output that is: (1) Data and information about social economic condition of farmer of candidate receiver of idol wood seeds of[is project of ITTO PD 386 (condition existing), as comparator of economic social condition after project finish; (2) Perception of farmer of candidate receiver of sculpturing woods seeds from ITTO PD 386 project, concerning ITTO project, sculpturing woods seeds that will distributed to them, preservation forest and natural resources, and equivalence of gender.

1. INTRODUCTION

1.1 BACK GROUND

As stated in the ITTO Objective 2000, ITTO is fully committed to achieving exports of tropical timber and timber products from sustainable managed sources. In line with the policy of Provincial Government of Bali and the ITTO objective 2000, the proposed project focuses on promoting the establishment of plantations of indigenous trees. Such a plantation would be greatly benefiting the local craftsman, as the end use of the indigenous timber would be for handicraft.

The kind of plant and condition have to match each other in order that the plant which planting growth well. To find out suitable condition that match with the kind of plant is needed physical survey of the target area. The physical survey will collect data on soil type, microclimate, topography, forest type, vegetation, etc. The goal of this work would be to have data and information of the physical conditions of the forest land in order to update forest land use.

The physical survey was carried out in 6 districts : Karangasem, Buleleng, Bangli, Klungkung, Tabanan and Jembrana. In this survey 60 soil samples was taken from 18 sub districts of targeted area. The soil samples were analyzed in Laboratory of Soil Science, Udayana University. Physical and chemical properties of soil were determined using a normal and standard procedures as recommended by Puslittanak, Bogor.

Beside the physical survey also conducted the social-economic survey. Objective of the survey is: (1) Analyzing the condition of social economic of farmer of candidate receiver of the seedlings from ITTO PD 386 project before project started (existing), (2) Knowing perception of farmer of candidate receiver of the seedlings from ITTO PD 386 project, concerning seedlings of indigenous species that would be distributed to them, preservation of forest and natural resources, and equivalence of gender. Research location is in six Regencies of Bali Province, that is Karangasem, Buleleng, Bangli, Klungkung, Tabanan, and Jembrana.

National expert, Prof. Merit and Dr. Antara, involved in the activities mentioned above. All of activities of the survey were under supervised by the experts.

1.2 MATERIAL AND METHOD

1.2.1 Physical Survey

In order to update the forest land use, a physical survey was done in each targeted area in Bali Province. This survey was initiated with the determination of land unit based on the critical land map of Bali Province and followed by a field survey. Six districts in Bali Province were determined as a targeted area for the plantation and development of Bali indigenous plants. The targeted areas are: Karangasem, Buleleng, Bangli, Klungkung, Tabanan and Jembrana. A field survey was done to ascertain the dominant and existing land uses in the area. A land use map of targeted area produced by the local government of Bali was used as base line map. The boundaries of each land use was delineated using an air photography topographic map (1: 25,000) and slope map where land units were identified. The geological map of Bali (Purbo-Hadiwidjojo, 1971) show that the geological structure of the targeted area is Palasari Formation which comprises of conglomerates, sandstone and reef limestone for Jembrana, Buleleng and Tabanan districts, while for Klungkung it was Selatan formation with lime stone (Nusa Penida) and Ulakan formation (Dawan), Karangasem is dominated by Seraya Volcan formation. Land unit was determined by overlaying of slope map, geomorphological map and land use map. From each land unit soil sample was taken for soil analyzed purposes. Total soil sample which was taken from targeted area were 60 samples. Primary data on climatic characteristics, land use, soil characteristics, topographyc features, slope pattern and status of erosion was obtained through direct observation, soil sampling and farmers interviews.

Soil sampling was done based on slope sequence, slope class and land status. The soils physical and chemical analyzed was done at the Laboratory of Soil Science in Udayana University, Bali. Soil physical properties such as: soil texture, soil structure, bulk density, soil water content, and permeability were determined using a normal procedure which released by Soil Research Institute, Bogor-Indonesia (Puslittanak Team, 1993). Soil texture was determined by pipet method, soil water content by gravimetric, while permeability was determined by De Booth method. Soil bulk density was determined by ring method.

Soil chemical properties such as: pH, C-organic, CEC, base saturated, N total, available P and K content was also determined in the laboratory and then the fertility status of the soil was evaluated. Soil pH was determined by pH-meter, soil organic matter by Walkley and Black, CEC with Amonium Acetat. Total nitrogen content of the soil was determined by Kjeldahl method, while P and K content were determined by Olsen method. The soil fertility status was determined based on physical and chemical analyzes. Land suitability classes was also determine for some indigenous plants such as panggal buaya, sawo kecik, bentawas, pule, majegau and kutat. These was done based on a standard method which was released by Soil Survey Staff Bogor.

Soil classification was also determined by combining the result of field observation and laboratory analyzed. Field observation was done on a minipit of soil profile. This was done followed by a procedure released by Soil Taxonomy System of Soil Survey Staff (1999).

The degree of erosion was evaluated using the Universal Soil Loss Equation (USLE) formulated by Wischmeier and Smith (1979) which state that :

$$A = R. K. LS. C. P$$

Where:

A = the computed soil loss (t/ha/yr)

R = the rainfall erosivity factor

K = the soil erodibility factor

L = the slope length factor

S = the slope steepness factor

C = the cover and management of crop factor, and

P = the conservation support factor

Each component of the USLE as applied to the research site was determined based on a certain equations such that the rainfall erosion index (R) was calculated based on Bol's equation (Bols, 1978). The value of K and LS factor was calculated based on the equation according to Wischmeier and Smith (1978). Value of C and P factor were based on the CP values published by Hammer (1980). The tolerable soil loss as computed by Hammer (1982) was compared to the magnitude of erosion from each land unit identified in the research site.

An evaluation of land suitability classes for the development of some forest trees such as *Zantoxylum rhetsa, Manikara kauki, Alstonia scholaris, Wrightia pubecens, Planchonia valida and Dysoxylum densiflorum* was also done. The analyses of land suitability was followed a frame work for land evaluation released by FAO (1976) which focused on land itself, land use, land characteristic and land quality. There were three land suitability classes: S1 (highly suitable), S2 (moderate suitable) and S3 (marginal suitable). The land suitability classes were divided into 2 categories: actual and potential classes. The limitations of each class was also determined, and some improvements need to be done was also suggested.

1.2.2. Social-economic Survey

Research location is in six regency of Bali Province, that is Karangasem, Buleleng, Bangli, Klungkung, Tabanan, and Jembrana. Determination of regency, district and villages is by purposive namely regency, district and villages estimated still enable to be planted and developed sculpturing woods in the farmer land's, and farmer ready receive sculpturing woods seedlings freely.

Since total amount of farmers who living in sampling villages more than thousand, the research population was using method of accidental sampling, that mean whosoever which is coincidence met in location, interviewed as research respondent. The total respondent that determined to the sample was 180 respondents which dispersed in six regencies across Bali.

Data collecting use some methods and instrument consist of: (1) Interview method used for the data collecting of primary having the character of quantitative and qualitative, what is each using instrument of structure questionnaire and guidance of interview that both of them have been prepared previously; (2) Observation method namely do direct observation to district and villages the research location, so that knowledge of this field very supporting in analyzing and discuses the result of research; and (3) Documentation method used for the data collecting of secondary having the character of quantitative and qualitative by doing record-keeping and study documents had governmental institution related.

Data analysis use method of statistic-descriptive, that is interpreting the data and information that presented in the form of lists, crossed tables, graphs, or data of verbal that collected of interview or dept interview, and is not at all there is element examination of statistic.

2. MAIN TEXT

2.1 Physical Survey

The result of field observation and laboratories analysis is combined to identify the characteristic of targeted area. The complete data of land characteristics was presented in Annex 1. A brief description of land characteristic of targeted area in each district, as follow:

2.1.1 District of Karangasem

In the district of Karangasem, 18 soil samples were taken in 4 sub districts consisted of 15 villages, that is: Pempatan, Besakih, Datah, Bunutan, Culik, Nawakerti, Selumbung, Antiga, Tenganan, West Seraya, East Seraya, and also Bukit. Some soil type that has been discovered is brown regosol, brown latosol and lithosol, also grey regosol. The altitude range is between 3 – 800 m from above sea level, annually temperature is between 26.3° C – 22.1° C, dry season last for 4 to 6 months with rain fall between 1555 to 2591 mm/year. Effective depth is range between 30 – 110 cm classified shallow to deep. Soil drainage is fairly with soil permeabilities range from moderate to very fast (Annex 1). This is due to the soil texture which is dominated by sandy loam. The sand was very dominant compared to silt and clay. This condition leads to a faster water penetration (Table 1). Cation Exchange Capacity (CEC) mostly classified as very low and only a few samples are indicated moderate and high. Soil pH is neutral with base saturation is very high to high. Most of the nitrogen content of soil is very low while the available potassium is very high. The available of C-organic and P was varied from low to high (Table 2). Based on C-organic, CEC, base saturation, P2O5 and K2O, the soil fertility status in the targeted area are classified high to moderate, and only 1 soil sample was found to be high (Table 3). Soil erosion hazard was classified low to very severe with the erosion prediction of about 1.530 ton/ha/year up to 663,835 ton/ha/year (Table 4). This is caused by slope which is varied from 2 to 45%. Based on the tolerable erosion (Edp), almost 50% of the targeted area samples need to be conserved.

Table 1. Physical characteristics of soil of targeted area

No. Lab.	Sample	Location	Sand (%)	Silt (%)	Clay (%)	Texsture	Structure	Permeabi-lity (cm/hr)	Bulk density (g/cm3)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	K1	Pempatan	84.93	11.95	3.12	Loamy sand	Coarse granular	68.88	0.848
2	K2	Besakih	66.77	27.52	5.71	Sandy loam	Coarse granular	14.39	0.901
3	K3	Nawakerti	60.79	23.63	15.58	Sandy loam	Fine granular	14.15	0.882
4	K4	Nawakerti	62.87	27.78	9.35	Sandy loam	Fine granular	7.46	0.993
5	K5	Datah	71.20	24.65	4.15	Sandy loam	Coarse granular	6.38	1.180
6	K6	Datah	79.23	14.28	6.49	Loamy sand	Coarse granular	58.65	1.210
7	K7	Culik	66.21	25.21	8.58	Sandy loam	Fine granular	17.41	1.057
8	K8	Culik	79.23	11.68	9.09	Loamy sand	Fine granular	70.46	1.182
9	K9	Bunutan	55.60	27.52	16.88	Sandy loam	Angular blocky	6.38	1.137
10	K10	Bunutan	75.90	20.73	3.37	Loamy sand	Fine granular	33.16	1.128
11	K11	Bukit	49.69	30.62	19.69	Loam	Sub angular blocky	13.26	1.136
12	K12	Seraya	39.80	25.35	34.85	Clay loam	Angular blocky	1.66	1.532
13	K13	Kecag balung	40.72	31.20	28.08	Clay loam	Angular blocky	3.95	1.265
14	K14	Tinyalas	43.67	38.94	17.39	Loam	Sub angular blocky	55.95	1.006
15	K15	Gili selang	56.08	23.39	20.53	Sandy clay loam	Angular blocky	7.26	1.199
16	K16	Tenganan	48.86	23.62	27.52	Sandy clay loam	Sub angular blocky	3.56	1.434
17	K17	Selumbung	46.24	37.92	15.84	Loam	Angular blocky	16.58	1.077
18	K18	Antiga	24.66	41.05	34.29	Clay loam	Sub angular blocky	14.40	0.994
19	BUL1	Pemuteran	53.26	37.91	8.83	Sandy loam	Coarse granular	33.07	1.082
20	BUL2	Pemuteran	28.50	40.04	31.46	Clay loam	Sub angular blocky	13.51	0.997
21	BUL3	Penyabangan	50.12	37.15	12.73	Loam	Sub angular blocky	6.88	1.119
22	BUL4	Penyabangan	56.63	37.76	5.61	Sandy loam	Coarse granular	15.50	1.181
23	BUL5	Musi	54.29	28.31	17.40	Sandy loam	Sub angular blocky	16.91	1.263
24	BUL6	Sangalangit	26.28	43.35	30.37	Clay loam	Sub angular blocky	4.05	1.186
25	BUL7	Sangalangit	38.64	41.08	20.28	Loam	Sub angular blocky	10.47	1.220
26	BUL8	Patas	61.81	27.80	10.39	Sandy loam	Sub angular blocky	14.24	1.179

No. Lab.	Sample	Location	Sand (%)	Silt (%)	Clay (%)	Texsture	Structure	Permeabi-lity (cm/hr)	Bulk density (g/cm3)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
27	BUL9	Patas	54.28	42.34	3.38	Sandy loam	Sub angular blocky	6.55	1.497
28	BUL10	Banjar asem	26.31	37.36	36.33	Clay loam	Coarse granular	3.91	1.452
29	BUL11	Pangkung paruk	51.19	38.68	10.13	Loam	Sub angular blocky	6.28	0.981
30	BUL12	Depaha	53.22	28.33	18.45	Sandy loam	Sub angular blocky	31.71	1.021
31	BUL13	Bulian	52.47	33.50	14.03	Sandy loam	Sub angular blocky	44.34	0.743
32	BUL14	Tunjung	21.83	46.23	31.94	Clay loam	Angular blocky	5.81	1.182
33	BUL15	Tunjung	39.26	25.70	35.04	Clay loam	Sub angular blocky	4.97	1.010
34	BUL16	Sembiran	46.78	33.75	19.47	Loam	Sub angular blocky	35.51	0.946
35	BUL17	Julah	53.29	31.14	15.57	Sandy loam	Coarse granular	11.03	0.910
36	BUL18	Sambirenteng	67.22	23.41	9.37	Sandy loam	Coarse granular	48.29	0.943
37	BL1	Yangapi	66.79	26.72	6.49	Sandy loam	Fine granular	71.17	1.003
38	BL2	Yangapi	52.94	41.86	5.20	Sandy loam	Coarse granular	18.82	0.720
39	BL3	Bantang	68.79	30.69	0.52	Sandy loam	Fine granular	15.22	1.000
40	BL4	Satra	51.89	43.70	4.41	Silty clay	Coarse granular	9.95	0.756
41	BL5	Kutuh	48.31	34.81	16.88	Loam	Coarse granular	1.91	1.219
42	BL6	Belandingan	65.72	25.19	9.09	Sandy loam	Fine granular	6.05	0.989
43	BL7	Subaya	47.34	45.14	7.52	Loam	Fine granular	10.53	0.762
44	KL1	Kutampi	48.06	48.56	3.38	Sandy loam	Angular blocky	11.66	1.225
45	KL2	Batununggul	46.55	43.07	10.38	Loam	Angular blocky	17.66	1.072
46	KL3	Pesinggahan	37.66	51.17	11.17	Silty clay	Coarse granular	16.58	0.961
47	KL4	Besan	11.11	79.27	9.62	Silty clay	Sub angular blocky	25.49	1.153
48	KL5	Besan kelod	34.82	51.16	14.02	Silty clay	Angular blocky	6.22	1.248
49	T1	Lalanglinggah	12.16	44.44	43.40	Silty clay	Angular blocky	3.32	0.940
50	T2	Suraberata	24.93	50.91	24.16	Silty loam	Angular blocky	29.01	0.947
51	T3	Jatiluwih	53.27	38.42	8.31	Sandy loam	Coarse granular	17.93	0.717
52	T4	Senganan	54.26	25.61	20.13	Sandy clay loam	Coarse granular	19.89	0.714
53	T5	Angsri	60.76	33.00	6.24	Sandy loam	Coarse granular	18.24	0.709
54	T6	Antapan	42.35	40.77	16.88	Loam	Coarse granular	22.37	0.854

No. Lab.	Sample	Location	Sand (%)	Silt (%)	Clay (%)	Texsture	Structure	Permeabi-lity (cm/hr)	Bulk density (g/cm3)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
55	J1	Ekasari	11.46	31.68	56.86	Clay	Angular blocky	0.47	1.159
56	J2	Tukadaya	11.01	44.37	44.62	Silty clay	Angular blocky	2.24	1.060
57	J3	Brangbang	19.68	41.85	38.47	Silty clay loam	Angular blocky	0.55	1.038
58	J4	Batuagung	21.80	46.50	31.70	Clay loam	Angular blocky	5.91	1.050
59	J5	Penyaringan	25.26	45.67	29.07	Clay loam	Angular blocky	2.28	0.787
60	J6	Yeh Embang Kangin	31.43	23.53	45.04	Clay	Angular blocky	0.71	1.014

Table 2. Soil chemical characteristics of targeted area

No. Lab	Sample	Location	pH (H_2O)	C-organic (%)	CEC (meq/ 100g)	Base Satura-tion (%)	N-total (%)	Available-P (ppm)	Available-K (ppm)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	K1	Pempatan	6.43 SA	0.37 VL	8.72 L	97.56 VH	0.28 M	2.55 VL	94.29 L
2	K2	Besakih	6.10 SA	3.08 H	10.63L	73.47 VH	0.11 L	2.15 VL	123.15 L
3	K3	Nawakerti	6.72 N	3.05 H	15.87L	60.27 H	0.08 VL	35.70 VH	329.73 H
4	K4	Nawakerti	6.60 N	3.08 H	17.14 M	66.67 H	0.05 VL	7.22 VL	400.13 VH
5	K5	Datah	6.12 SA	2.52 M	8.64 L	60.00 H	0.07 VL	33.21 H	467.58 VH
6	K6	Datah	6.58 N	0.83 VL	9.20 L	83.72 VH	0.04 VL	9.70 VL	499.89 VH
7	K7	Culik	6.84 N	2.11 M	11.24 L	100.00 VH	0.05 VL	34.58 H	430.72 VH
8	K8	Culik	7.05 N	1.25 L	11.14 L	92.31 VH	0.05 VL	199.93 VH	950.49 VH
9	K9	Bunutan	6.94 N	2.52 M	17.31 M	43.38 M	0.06 VL	1.69 VL	882.45 VH
10	K10	Bunutan	7.06 N	1.62 L	22.46 M	107.41 VH	0.04VL	38.92 VH	629.34 VH
11	K11	Bukit	7.07 N	2.48 M	24.58 H	86.21 VH	0.06 VL	38.33 VH	1304.83 VH
12	K12	Seraya	6.78 N	3.06 H	39.73 H	53.48 H	0.06 VL	6.98 VL	679.42 VH
13	K13	Kecag balung	7.33 N	1.25 L	324.78 H	82.76 VH	0.13 L	25.66 H	947.65 VH
14	K14	Tinyalas	6.96 N	3.02 H	20.33 M	77.55 VH	0.07 VL	13.20 L	806.10 VH

No. Lab	Sample	Location	pH (H_2O)	C-organic (%)	CEC (meq/ 100g)	Base Satura-tion (%)	N-total (%)	Available-P (ppm)	Available-K (ppm)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
15	K15	Gili selang	6.70 N	2.92 M	18.07 M	78.16 VH	0.10 VL	7.49 VL	556.80 VH
16	K16	Tenganan	6.85 N	3.06 H	26.54 H	105.60 VH	0.10 VL	4.76 VL	678.91 VH
17	K17	Selumbung	6.95 N	2.98 M	22.59 M	77.78 VH	0.03 VL	11.67 L	741.07 VH
18	K18	Antiga	7.06 N	2.14 M	42.36 VH	35.27 M	0.06 VL	2.18 VL	248.51 H
19	BUL1	Pemuteran	6.85 N	2.48 M	19.94 M	91.67 VH	0.05 VL	36.40 H	921.38 VH
20	BUL2	Pemuteran	6.84 N	2.98 M	37.59 H	53.49 H	0.05 VL	2.17 VL	1345.60 VH
21	BUL3	Penyabangan	7.26 N	0.42 VL	48.63 VH	63.44 H	0.06 VL	48.12 VH	279.42 H
22	BUL4	Penyabangan	6.90 N	2.48 M	27.82 H	45.80 M	0.06 VL	101.26 VH	605.94 VH
23	BUL5	Musi	7.05 N	3.07 H	35.19 H	50.91 H	0.07 VL	67.02 VH	682.03 VH
24	BUL6	Sangalangit	6.66 N	2.09 M	34.82 H	74.07 VH	0.08 VL	2.13 VL	465.41 VH
25	BUL7	Sangalangit	7.01 N	2.49 M	41.31 VH	57.73 H	0.05 VL	87.71 VH	944.52 VH
26	BUL8	Patas	6.96 N	2.90 M	37.58 H	29.38 L	0.05 VL	62.74 VH	642.43 VH
27	BUL9	Patas	6.98 N	2.05 M	23.37 M	97.30 VH	0.06 VL	41.14 VH	419.52 VH
28	BUL10	Banjar asem	6.87 N	2.96 M	36.21 H	71.86 VH	0.05 VL	4.86 VL	730.66 VH
29	BUL11	Pangkung paruk	6.78 N	1.64 L	30.15 H	69.93 H	0.05 VL	51.69 VH	456.49 VH
30	BUL12	Depaha	6.47 SA	3.11 H	24.49 H	59.13 H	0.05 VL	2.56 VL	314.45 H
31	BUL13	Bulian	6.75 N	2.56 M	40.74 VH	95.45 VH	0.04 VL	51.89 VH	461.33 VH
32	BUL14	Tunjung	7.02 N	2.14 M	40.96 VH	96.70 VH	0.04 VL	8.15 VL	603.55 VH
33	BUL15	Tunjung	7.25 N	2.90 M	33.55 H	60.76 H	0.06 VL	16.27 M	605.88 VH
34	BUL16	Sembiran	6.60 N	2.89 M	30.26 H	44.76 M	0.07 VL	4.31 VL	239.59 H
35	BUL17	Julah	7.05 N	2.02 M	18.69 M	93.33 VH	0.04 VL	11.59 L	306.65 H
36	BUL18	Sambirenteng	7.02 N	0.80 VL	14.04 L	100.00 VH	0.04 VL	3.34 VL	430.42 H
37	BL1	Yangapi	6.25 SA	1.88 L	9.88 L	102.13 VH	0.15 L	25.31 H	129.43 L
38	BL2	Yangapi	6.53 N	2.50 M	24.24 H	49.52 M	0.08 VL	7.01 VL	102.42 L
39	BL3	Bantang	7.30 N	2.82 M	13.01 L	101.59 VH	0.06 VL	15.40 M	340.45 H
40	BL4	Satra	6.57 N	2.63 M	34.19 H	42.11 M	0.10 L	13.02 L	758.10 VH
41	BL5	Kutuh	6.47 SA	2.48 M	28.67 H	41.48 M	0.06 VL	63.65 VH	679.20 VH
42	BL6	Belandingan	7.50 N	2.81 M	14.85 L	77.78 VH	0.07 VL	13.65 L	268.99 H
43	BL7	Subaya	6.36 SA	2.65 M	38.27 H	80.47 VH	0.10 L	15.47 M	724.19 VH

No. Lab	Sample	Location	pH (H_2O)	C-organic (%)	CEC (meq/ 100g)	Base Satura-tion (%)	N-total (%)	Available-P (ppm)	Available-K (ppm)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
44	KL1	Kutampi	7.51 SL	1.66 L	22.14 M	100.00 VH	0.06 VL	7.88 VL	141.07 H
45	KL2	Batununggul	7.32 N	2.05 M	25.27 H	66.67 H	0.04 VL	11.75 L	347.16 H
46	KL3	Pesinggahan	6.90 N	2.50 M	50.14 VH	57.40 H	0. 34 M	415.99 VH	718.98 VH
47	KL4	Besan	7.25 N	2.72 M	42.31 VH	35.05 M	0.08 VL	74.00 VH	547.31 VH
48	KL5	Besan kelod	7.02 N	2.17 M	31.19 H	77.14 VH	0.06 VL	48.66 VH	482.42 VH
49	T1	Lalanglinggah	6.04 SA	2.20 M	44.43 VH	67.61 H	0.05 VL	7.41 VL	216.52 M
50	T2	Suraberata	6.48 SA	2.14 M	40.66 VH	51.89 H	0.07 VL	7.68 VL	475.85 VH
51	T3	Jatiluwih	6.11 SA	2.14 M	30.10 H	23.36 L	0.19 L	9.05 VL	286.61 H
52	T4	Senganan	6.61 N	2.11 M	28.20 H	36.92 M	0.18 L	14.36 L	133.55 L
53	T5	Angsri	6.85 N	2.99 M	25.86 H	54.24 H	0.12 L	9.48 VL	97.21 L
54	T6	Antapan	6.56 N	2.72 M	27.46 H	46.88 M	0.11 L	7.94 VL	279.81 H
55	J1	Ekasari	6.48 SA	2.25 M	49.65 VH	44.65 M	0.04 VL	2.29 VL	619.22 VH
56	J2	Tukadaya	6.50 SA	2.82 M	55.59 VH	40.34 M	0.08 VL	7.19 VL	385.11 H
57	J3	Brangbang	6.57 N	1.77 L	24.98 H	76.36 VH	0.06 VL	6.99 VL	1007.49 VH
58	J4	Batuagung	6.56 N	2.17 M	45.45 VH	49.02 M	0.06 VL	5.93 VL	226.44 H
59	J5	Penyaringan	6.02 SA	2.64 M	37.71 H	71.17 VH	0.07 VL	12.58 L	157.58 M
60	J6	Yeh Embang Kangin	6.60 N	1.80 L	33.89 H	73.47 VH	0.07 VL	7.58 VL	157.58 M

Notes : SA = Slightly Acid, N= Neutral, SL = Slightly Alkali
VL = Very low L = Low M = Moderate H = High VH = Very High

2.1.2 District of Buleleng

Eighteen samples were taken from 4 sub district (Seririt, Kubutambahan and Tejakula), which consisted of 12 villages, they are : Penyambangan, Gerokgak, Musi, Pemuteran, Banjarasem, Seririt, Bulian, Depaha, tunjung, Sambirenteng, Julah, and Sembirran. The soil type found in this area are brown latosol dan Lithosol, grey brown alluvial, and brown regosol. The altitude range between 10 to 560 m from above sea level, with yearly temperature from 26.2 to 22.9 °C, dry season between 7 and 8 months with rainfalls range between 1051 to 1435 mm/year. Effective depth of soil is 30-120 cm which is classified shallow to deep with a good drainage (Annex 1). Soil permeabilities is moderate to very fast. This might be due to the soil texture which is sandy loam to clay loam. Soil structure is sub angular blocky and bulk density range from 0,743 – 1,497 gr/cm^2 (Table 1). Cation exchange capacity, based saturation and available pottasium is high to very high with neutral pH. Most of soil sample having a moderate C organic while soil nitrogen content is very low. The P available was low to high (Table 2). Soil fertility status as indicated by C organic, CEC, based saturation, P_2O_5 and K_2O was classified from moderate to high (Table 3). The index of erosion hazard varied from low to very severe with predicted erosion was about 2.228 ton/ha/year up to 516.839 ton/ha/year (Table 4). This high level of erosion is caused by slope which is more than 40%. Almost 50% of the soil samples from the targeted area need to be conserved.

2.1.3 District of Bangli

Only 7 soil samples were taken from the district of Bangli, especially from Kintamani and Tembuku Sub Districts, which consisted of 6 villages : Kutuh, Blandingan, Satra, Subaya, Bantang and Yangapi. In those areas, soil type was dominated by brown Regosol. The altitude range from 678-1630m above sea level. The temperature range from 16.5 – 22.2^{0}C. The dry season last for 6 months with rain falls from 2020-2067 mm/year. Soil depth varied from 65-120cm which is classified to moderate to deep with fairly soil drainage (Annex 1). On the other hand, soil permeabilities is very fast due to soil texture which dominated by sandy loam to salty loam. Soil structure is fine granular with bulk density of 0,720-1,219gr/cm2 (Table 1). Cation exchange capacity is low with the soil reaction (pH) is slightly acid. Soil organic contents was low while soil

nitrogen content is very low. The available P is from very low up to high. Base saturation and the available of potassium was varied from moderate up to very high (Table 2). Based on the C-organic contents, CEC, base saturation, P_2O_5 and K_2O, the soil fertility status is low to moderate (Table 3). The erosion hazard index was range from low to severe where the predicted erosion was about 5.339 ton/ha/year up to 875.617 ton/ha/year (Table 4).

Table 3. Soil fertility status of targeted area

No. Lab	Sam-ple	Location	CEC (me/100 g of soil)	Base satura-tion (%)	C-organic (%)	P (ppm)	K (ppm)	Soil fertility status
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	K1	Pempatan	8.72 L	97.56 VH	0.37 VL	2.55 VL	94.29 L	L
2	K2	Besakih	10.63L	73.47 VH	3.08 H	2.15 VL	123.15 L	L
3	K3	Nawakerti	15.87L	60.27 H	3.05 H	35.70 VH	329.73 H	M
4	K4	Nawakerti	17.14 M	66.67 H	3.08 H	7.22 VL	400.13 VH	L
5	K5	Datah	8.64 L	60.00 H	2.52 M	33.21 H	467.58 VH	M
6	K6	Datah	9.20 L	83.72 VH	0.83 VL	9.70 VL	499.89 VH	L
7	K7	Culik	11.24 L	100.00 VH	2.11 M	34.58 H	430.72 VH	M
8	K8	Culik	11.14 L	92.31 VH	1.25 L	199.93 VH	950.49 VH	L
9	K9	Bunutan	17.31 M	43.38 M	2.52 M	1.69 VL	882.45 VH	L
10	K10	Bunutan	22.46 M	107.41 VH	1.62 L	38.92 VH	629.34 VH	L
11	K11	Bukit	24.58 H	86.21 VH	2.48 M	38.33 VH	1304.83 VH	H
12	K12	Seraya	39.73 H	53.48 H	3.06 H	6.98 VL	679.42 VH	M
13	K13	Kecag balung	324.78 H	82.76 VH	1.25 L	25.66 H	947.65 VH	M
14	K14	Tinyalas	20.33 M	77.55 VH	3.02 H	13.20 L	806.10 VH	L
15	K15	Gili selang	18.07 M	78.16 VH	2.92 M	7.49 VL	556.80 VH	L
16	K16	Tenganan	26.54 H	105.60 VH	3.06 H	4.76 VL	678.91 VH	M
17	K17	Selumbung	22.59 M	77.78 VH	2.98 M	11.67 L	741.07 VH	L
18	K18	Antiga	42.36 VH	35.27 M	2.14 M	2.18 VL	248.51 H	L
19	BUL1	Pemuteran	19.94 M	91.67 VH	2.48 M	36.40 H	921.38 VH	M
20	BUL2	Pemuteran	37.59 H	53.49 H	2.98 M	2.17 VL	1345.60 VH	M
21	BUL3	Penyabang an	48.63 VH	63.44 H	0.42 VL	48.12 VH	279.42 H	M
22	BUL4	Penyabang an	27.82 H	45.80 M	2.48 M	101.26 VH	605.94 VH	H

No. Lab	Sam-ple	Location	CEC (me/100 g of soil)	Base satura-tion (%)	C-organic (%)	P (ppm)	K (ppm)	Soil fertility status
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
23	BUL5	Musi	35.19 H	50.91 H	3.07 H	67.02 VH	682.03 VH	H
24	BUL6	Sangalangit	34.82 H	74.07 VH	2.09 M	2.13 VL	465.41 VH	M
25	BUL7	Sangalangit	41.31 VH	57.73 H	2.49 M	87.71 VH	944.52 VH	H
26	BUL8	Patas	37.58 H	29.38 L	2.90 M	62.74 VH	642.43 VH	M
27	BUL9	Patas	23.37 M	97.30 VH	2.05 M	41.14 VH	419.52 VH	H
28	BUL10	Banjar asem	36.21 H	71.86 VH	2.96 M	4.86 VL	730.66 VH	M
29	BUL11	Pangkung paruk	30.15 H	69.93 H	1.64 L	51.69 VH	456.49 VH	M
30	BUL12	Depaha	24.49 H	59.13 H	3.11 H	2.56 VL	314.45 H	M
31	BUL13	Bulian	40.74 VH	95.45 VH	2.56 M	51.89 VH	461.33 VH	H
32	BUL14	Tunjung	40.96 VH	96.70 VH	2.14 M	8.15 VL	603.55 VH	M
33	BUL15	Tunjung	33.55 H	60.76 H	2.90 M	16.27 M	605.88 VH	H
34	BUL16	Sembiran	30.26 H	44.76 M	2.89 M	4.31 VL	239.59 H	M
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
35	BUL17	Julah	18.69 M	93.33 VH	2.02 M	11.59 L	306.65 H	M
36	BUL18	Sambi-renteng	14.04 L	100.00 VH	0.80 VL	3.34 VL	430.42 H	L
37	BL1	Yangapi	9.88 L	102.13 VH	1.88 L	25.31 H	129.43 L	L
38	BL2	Yangapi	24.24 H	49.52 M	2.50 M	7.01 VL	102.42 L	L
39	BL3	Bantang	13.01 L	101.59 VH	2.82 M	15.40 M	340.45 H	M
40	BL4	Satra	34.19 H	42.11 M	2.63 M	13.02 L	758.10 VH	L
41	BL5	Kutuh	28.67 H	41.48 M	2.48 M	63.65 VH	679.20 VH	M
42	BL6	Belandingan	14.85 L	77.78 VH	2.81 M	13.65 L	268.99 H	L
43	BL7	Subaya	38.27 H	80.47 VH	2.65 M	15.47 M	724.19 VH	H
44	KL1	Kutampi	22.14 M	100.00 VH	1.66 L	7.88 VL	141.07 H	L
45	KL2	Batu-nunggul	25.27 H	66.67 H	2.05 M	11.75 L	347.16 H	M
46	KL3	Pesinggahan	50.14 VH	57.40 H	2.50 M	415.99 VH	718.98 VH	H
47	KL4	Besan	42.31 VH	35.05 M	2.72 M	74.00 VH	547.31 VH	H
48	KL5	Besan kelod	31.19 H	77.14 VH	2.17 M	48.66 VH	482.42 VH	H
49	T1	Lalang-linggah	44.43 VH	67.61 H	2.20 M	7.41 VL	216.52 M	M
50	T2	Suraberata	40.66 VH	51.89 H	2.14 M	7.68 VL	475.85 VH	M
51	T3	Jatiluwih	30.10 H	23.36 L	2.14 M	9.05 VL	286.61 H	L
52	T4	Senganan	28.20 H	36.92 M	2.11 M	14.36 L	133.55 L	L
53	T5	Angsri	25.86 H	54.24 H	2.99 M	9.48 VL	97.21 L	M
54	T6	Antapan	27.46 H	46.88 M	2.72 M	7.94 VL	279.81 H	L
55	J1	Ekasari	49.65 VH	44.65 M	2.25 M	2.29 VL	619.22 VH	L
56	J2	Tukadaya	55.59 VH	40.34 M	2.82 M	7.19 VL	385.11 H	L

No. Lab	Sam-ple	Location	CEC (me/100 g of soil)	Base satura-tion (%)	C-organic (%)	P (ppm)	K (ppm)	Soil fertility status
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
57	J3	Brangbang	24.98 H	76.36 VH	1.77 L	6.99 VL	1007.49 VH	M
58	J4	Batuagung	45.45 VH	49.02 M	2.17 M	5.93 VL	226.44 H	L
59	J5	Penyaringan	37.71 H	71.17 VH	2.64 M	12.58 L	157.58 M	M
60	J6	Yeh Embang Kangin	33.89 H	73.47 VH	1.80 L	7.58 VL	157.58 M	M

Notes :

VL = Very Low
L = Low
M = Moderate
H = High
VH = Very High

Picture 1. The activity of soil identifies

Table 4. Erosion prediction (A), index erosion hazard (TBE) and tolerable erosion (EDP)

No. Lab	Sam-ple	Location	R	K	LS	CP	A (ton/ha /th)	TBE	EDP (ton/ha /th)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	K1	Pempatan	1574	0.107	1.414	0.28	66.681	S	19.787
2	K2	Besakih	1574	0.133	0.900	0.028	5.260	L	27.030
3	K3	Nawakerti	1334	0.151	0.600	0.028	3.377	M	11.760
4	K4	Nawakerti	1334	0.140	1.184	0.028	6.183	M	9.930
5	K5	Datah	1334	0.218	1.323	0.028	10.798	L	29.500
6	K6	Datah	1334	0.220	1.291	0.028	10.595	L	28.233
7	K7	Culik	1334	0.129	0.717	0.028	3.443	M	12.332
8	K8	Culik	1334	0.095	0.406	0.16	8.222	M	11.820
9	K9	Bunutan	1334	0.230	1.164	0.16	57.132	S	11.370
10	K10	Bunutan	1334	0.117	0.351	0.028	1.530	L	22.560
11	K11	Bukit	1119	0.199	1.102	0.028	6.857	L	28.400
12	K12	Seraya	1119	0.215	1.014	0.16	39.088	S	25.533
13	K13	Kecag balung	1119	0.220	16.451	0.16	647.694	VS	16.867
14	K14	Tinyalas	1119	0.230	8.082	0.16	332.885	VS	16.767
15	K15	Gili selang	1119	0.141	13.649	0.16	344.824	VS	39.967
16	K16	Tenganan	1096	0.192	28.494	0.1	599.511	VS	47.800
17	K17	Selumbung	1096	0.234	1.014	0.1	26.057	L	39.490
18	K18	Antiga	1096	0.209	27.528	0.2	663.835	VS	23.193
19	BUL1	Pemuteran	866.7	0.243	0.231	0.2	9.718	M	12.984
20	BUL2	Pemuteran	866.7	0.186	0.520	0.2	16.751	L	29.910
21	BUL3	Penyabang-an	866.7	0.426	0.497	0.16	29.323	L	40.284
22	BUL4	Penyabang-an	866.7	0.247	0.711	0.16	24.319	M	22.321
23	BUL5	Musi	866.7	0.278	0.581	0.16	22.426	M	22.734
24	BUL6	Sangalangit	866.7	0.342	3.402	0.16	161.374	VS	12.453
25	BUL7	Sangalangit	866.7	0.391	0.450	0.2	30.531	L	36.600
26	BUL8	Patas	866.7	0.253	4.839	0.16	169.500	S	26.528
27	BUL9	Patas	866.7	0.472	0.805	0.16	52.616	L	44.910
28	BUL10	Banjar asem	903	0.217	0.406	0.028	2.228	SL	43.560
29	BUL11	Pangkung paruk	903	0.492	11.429	0.028	142.256	VS	8.829
30	BUL12	Depaha	1043	0.166	18.736	0.028	90.990	S	27.567
31	BUL13	Bulian	1043	0.222	0.569	0.028	3.684	SL	26.748
32	BUL14	Tunjung	1043	0.314	9.861	0.16	516.839	VS	31.914
33	BUL15	Tunjung	1043	0.186	3.749	0.028	20.410	L	36.360
34	BUL16	Sembiran	1033	0.191	16.000	0.08	253.102	VS	8.514
35	BUL17	Julah	1033	0.269	1.999	0.028	15.566	L	32.760
36	BUL18	Sambi-renteng	1033	0.243	4.266	0.16	171.572	S	23.764

No. Lab	Sam-ple	Location	R	K	LS	CP	A (ton/ha /th)	TBE	EDP (ton/ha /th)
1	2	3	4	5	6	7	8	9	10
37	BL1	Yangapi	1312	0.147	0.986	0.028	5.339	SL	32.096
38	BL2	Yangapi	1312	0.281	7.638	0.028	78.909	M	22.080
39	BL3	Bantang	1457	0.234	11.186	0.16	608.988	VS	25.000
40	BL4	Satra	1457	0.296	1.414	0.16	97.614	M	30.240
41	BL5	Kutuh	1457	0.284	13.216	0.16	875.617	VS	28.443
42	BL6	Belandingan	1457	0.187	18.736	0.16	818.415	VS	29.670
43	BL7	Subaya	1457	0.256	2.651	0.16	158.195	S	14.343
44	KL1	Kutampi	799.8	0.534	2.081	0.16	142.138	S	20.417
45	KL2	Batu-nunggul	799.8	0.334	3.807	0.16	162.847	S	17.867
46	KL3	Pesinggahan	1080	0.297	14.531	0.2	932.533	VS	13.220
47	KL4	Besan	1080	0.598	17.388	0.028	314.252	VS	23.060
48	KL5	Besan kelod	1080	0.421	12.208	0.1	555.488	VS	45.760
49	T1	Lalang-linggah	1387.6	0.205	4.049	0.1	115.287	M	37.600
50	T2	Suraberata	1387.6	0.317	9.898	0.1	435.927	S	47.350
51	T3	Jatiluwih	2170.2	0.347	3.749	0.028	79.050	M	28.680
52	T4	Senganan	2170.2	0.159	10.222	0.028	99.014	M	28.560
53	T5	Angsri	1622.3	0.202	2.420	0.028	22.204	L	28.360
54	T6	Antapan	1622.3	0.205	5.111	0.028	47.687	L	31.313
55	J1	Ekasari	1217.2	0.138	2.213	0.028	10.384	SL	46.360
56	J2	Tukadaya	1217.2	0.166	1.825	0.1	36.853	L	53.000
57	J3	Brangbang	1300.3	0.218	6.189	0.1	175.686	S	29.410
58	J4	Batuagung	1300.3	0.260	7.181	0.1	242.435	VS	17.500
59	J5	Penyaringan	1126.7	0.239	6.503	0.1	175.075	S	18.363
60	J6	Yeh Embang Kangin	1126.7	0.121	2.581	0.1	35.103	M	21.970

Keterangan :

SR = Slightly Low
L = Low
M = Moderate
S = Severe
VS = Very severe

TBE = Erosion hazard
EDP = Tolerable erosion

2.1.4 District of Klungkung

In the district of Klungkung, 5 soil samples were taken in 2 sub districts (Nusa Penida and Dawan) consisted of 4 villages, that is : Kutampi, Batununggul, Pesinggahan and Besan. Soil type that was found are : red brown mediteran, red brown Latosol and

Lithosol. The range of altitude is 5 – 160 m from above sea level, yearly temperature between 26.3 to 25.3 °C; 6 dry months with rainfall between 901 to 1515 mm/year. The soil effective depth is 50 –110 cm which is classified as moderate to deep with good soil drainage (Annex 1). Further more, soil permeabilities is slightly fast to very fast. This is due to the soil texture of silt loam to sandy loam. In this case, soil structure is mostly angular blocky with bulk density of 0.9610 to 1.248 gr/cm^3 (Table 1). Most of the soil samples of this area have a cation exchange capacity and base saturation is high to very high, while soil pH is neutral to moderately alkali. C-organic of all soil sample is moderate while soil nitrogen content is very low. The available P is varied from low to very high. Moreover, the available K is classified to high (Table 2). The soil fertility status of this area is classified to high as indicated by C-organic, CEC, base saturation, P_2O_5 and K_2O. The index of erosion hazard is severe to very severe with the predicted erosion of about 142.138 ton/ha/year to 932.533 ton/ha/year (Table 4). Based on the tolerable erosion, most of this area need to be conserved.

2.1.5 District of Tabanan

In the district of Tabanan, 6 samples have been taken from 3 sub districts (Baturiti, Penebel and Selemadeg) with consisted of 6 villages : Angsri, Antapan, Jatiluwih, Senganan, Lalanglinggah, and Surabrata. Soil type in this area is classified in to yellowish brown latosol which is equivalent to Inceptisol. The altitude ranges from 40 – 850 m above sea level with yearly temperature around 26.1 – 21.2 °C, with 5 months dry season, which annually rainfall of about 2185 – 3389 mm/year. Soil depth is around 110 to 150 cm with a good drainage (Annex 1). Soil permeabilities is fast caused by soil texture which is mostly dominated by sandy loam to loam. Soil structure is crumb with bulk density around 0.709 – 0.947 gram/cm^3 (Table 1). Most of this area having soil pH is neutral to slightly acid, with cation exchange capacity is high to very high. The nitrogen content of this soil is very low while C-organic is moderate. The available P is also very low. Base saturation varied from low to high and also the available of K (Table 2). The soil fertility status in this area is absolutely low as indicated by C-organic, CEC, base saturation, P_2O_5 and K_2O contents (Table 3). The predicted erosion was around

22.204 ton/ha/year to 435.927 ton/ha/year (Table 4). Even though the soil erosion hazard index is low, most of this area needs to be conserved.

2.1.6 District of Jembrana

Six soil samples were taken from 3 sub districts: Melaya , Negara, and Mendoyo, with 6 villages, that is : Yeh Embang Kangin, Penyaringan, Batuagung, Brambang, Ekasari, and Tukad Aya. Most of soil type is belonging to brown mediteran to brown latosol (Inceptisol). The range of altitude is 30 – 202 m above sea level with annually temperature is around 26.1 – 25.1 °C. the annually rainfall is 1.617 – 1.995 mm/year with 4 – 5 dry months. Soil depth is classified to deep (50 – 150 cm) with good soil drainage (Annex1). In contrast however, soil permeabilities is very low. This is caused by the soil texture which is dominated by clay loam. The soil structure is angular blocky, having a bulk density of 0.787 – 1.159 gr/cm^3 (Table 1). Most of this area having a cation exchange capacity of high to very high, while soil pH is neutral to slightly acid. The specific chemical characteristic of this soil is that the nitrogen content is very low. Based on the C-organic, CEC, base saturation, P_2O_5 and K_2O, the fertility status of this soil is classified from low to moderate (Table 3). The predicted erosion ranges from 10,384 ton/ha/year to 242,435 ton/ha/year (Table 4). This might be due to the effect of slope of this area which is varied from 9 – 20 %. Like the other areas, soil conservation practice need to be done.

2.1.7 Land Suitability Classes

In order to match the land suitability with the growth of the plant, analysis of land suitability evaluation need to be done. In this case, a frame work for land evaluation (FAO, 1976) is adopted. The land suitability evaluation is a form of the land capability for each land use. Base on the FAO 1976 frame work, the structure of land evaluation is divided into 4 categories such as :

a. Orde, is indicated as the general suitability. In this case, land suitability divided in to 2 categories: Suitable (S) and not suitable (N).
b. Class, indicated a most specific land suitability in which suitable land (S) divided in to very suitable (S1), moderate suitable (S2), and marginal suitable (S3). While not

suitable land (N) divide in 2 categories that is: not suitable for the moments (N1) and permanent not suitable (N2).

c. Sub class, indicated some constraints or some improvements need to be done.
d. Unit indicated the differences between sub classes in order to manage this land.

Land suitability will be discussed below for each species of plant that needs to be developed.

2.1.7.1 Land Suitability Classes for Panggal Buaya (*Fagara rhetsa* synonym *Zantoxylum rhetsa)*

According to the matching results between the quality data/land characteristic (Annex 1) with the class criteria of land suitability for forest plants which is in the CSR/FAO (1976) in Pullitanak (1993), therefore these land in the research area, actually (A) most of it are moderate suitable (S2) to marginal suitable (S3), with limiting factors are erosion hazard (e), slope (s), and rooting depth (r) (Table 5). Potentially, most of the land is classified into moderate suitable (S2) for pang gal bunya with the limiting factors are: rooting depth (r), and nutrient retention (f). The rooting depth component which is the effective depth less than 50 – 100 cm and the soil texture is coarse (loamy sand and sandy loam). In the other hand, the nutrient retention component that is CEC value is low. Only a small part of this area is suitable (S1), especially for the area of fine texture (loam to clay) with the soil depth more than 100 cm.

2.1.7.2 Land Suitability Classes for Sawo Kecik *(Manilkara kauki)*

Actual land suitability for sawo kecik is classified into moderate (S2) to marginal suitable (S3), with limiting factors of rooting depth (r), available of water (w), erosion hazard (e), and nutrient retention (f) (Table 5). Moreover, potentially suitability of this area is classified into moderate suitable (S2) to marginal suitable (S3) with the limiting factors of the available of water (w) and rooting depth (r). The component of water supply as a limiting factor is due to long dry months between 4 – 8 months and rainfall less than 1000 mm/year and more than 2000 mm/year. Further more, the rooting depth range between 75 – 100 cm with coarse texture.

2.1.7.3 Land Suitability Classes for Bentawas *(Wrightia pubescens)*

The land suitability classes for bentawas in the targeted area actually classified to moderate suitable (S2) to marginal suitable (S3) with erosion hazard (e), slope (s), and rooting depth (f) as the limiting factors (Table 5). However, the land in this targeted area, is potentially moderate suitable for bentawas, with rooting depth and nutrient retention as a limiting factors. In this case, the effective depth of soil is less than 50 – 100 cm with coarse texture. The nutrient retention becomes a limiting factor because the CEC of soil is very low. Only a small parts of this area, is suitable for the bentawas, especially the area with fine texture and the effective depth more than 100 cm.

2.1.7.4 Land Suitability Classes for Pulai *(Alstonia scholaris)*

Actual land suitability classes for Pulai are most of the area classified into moderate suitable (S2) up to marginal suitable (S3). In this case, the limiting factors are soil erosion, slope, and rooting depth. However, potentially, land suitability classes of this area is moderate suitable (S2), with some limiting factors such as rooting depth, erosion hazard, temperature, terrain, and nutrient retention. Similar with the other areas, rooting depth becomes a serious factor because of soil depth is less than 50 cm and the soil texture is moderate coarse. Further more, it was found that soil CEC is very low. Only a small part of this area belongs to S1, especially the area with fine texture and the soil effective depth more than 100 cm.

2.1.7.5 Land Suitability Classes for Majegau *(Dysoxylum densiflorum)*

Land suitability for Majegau is moderate suitable (S2) up to marginal suitable (S3). The soil constraints in this area are available of water (w), erosion hazard (e), slope (s), and rooting depth (r) (Table 5). Potentially, most of this area is moderate suitable (S2) up to marginal suitable (S3) for the development of Majegau. Some soil constraints such as available water, rooting depth and temperature. The available water becomes a limiting factor because the rain fall is less than 1000 mm/year with 4 – 8 dry months. Furthermore temperature becomes limited because the temperature of some areas is less than 20 °C.

Only a few areas is classified into suitable (S1), especially the area dominated by fine texture and soil depth more than 100 cm.

2.1.7.6 Land Suitability Classes for Putat *(Planchonia valida)*

Actually, most of the area is classified into moderate suitable (S2) up to marginal suitable (S3) for the development of Putat. It was found that the available water, erosion hazard, slope, nutrient retention, and rooting depth become serious limiting factors. Potentially, most of this area is classified into moderate suitable (S2), up to marginal suitable (S3) for the development of Putat which some constraints such as: available of water, rooting depth, and temperature. The available water becomes a limiting factor because the average of rainfall is less than 1000 mm/year, with 4 – 8 dry months. It was found that nutrient retention also becomes a limiting factor because the CEC of soil is very low.

Table 5. Land suitability classes for some indigenous plants in Bali

No.	Sample	Location	Panggal Buaya		Sawo Kecik		Bentawas	
			A	P	A	P	A	P
1	2	3	4	5	6	7	8	9
1.	K1	Pempatan	S3e	S2rf	S3e	S2wrf	S3e	S2rf
2.	K2	Besakih	S2rf	S2r	S2wrf	S2wr	S2rf	S2r
3.	K3	Nawakerti	S2rfe	S2r	S2wrfe	S2wr	S2rfe	S2r
4.	K4	Nawakerti	S2re	S2r	S2wre	S2wr	S2re	S2r
5.	K5	Datah	S2r	S2r	S2wr	S2wr	S2r	S2r
6.	K6	Datah	S2r	S2r	S2wr	S2wr	S2r	S2r
7.	K7	Culik	S2rfe	S2r	S2rwfe	S2wr	S2rfe	S2r
8.	K8	Culik	S2rfe	S2r	S2wrfe	S2wr	S2rfe	S2r
9.	K9	Bunutan	S3e	S2r	S3e	S2wr	S3e	S2r
10.	K10	Bunutan	S2r	S2r	S2wr	S2wr	S2r	S2r
11.	K11	Bukit	S2r	S1	S2r	S1	S2r	S1
12.	K12	Seraya	S3se	S2r	S3se	S2r	S3se	S2r
13.	K13	Kecag balung	S3e	S2r	S3e	S2r	S3e	S2r
14.	K14	Tinyalas	S3e	S2r	S3e	S2r	S3e	S2r
15.	K15	Gili selang	S3se	S1	S3se	S1	S3se	S1
16.	K16	Tenganan	S3se	S1	S3se	S1	S3se	S1
17.	K17	Selumbung	S1	S1	S1	S1	S1	S1
18.	K18	Antiga	S3se	S2r	S3se	S2r	S3se	S2r
19.	BUL1	Pemuteran	S3r	S2re	S3r	S2re	S3r	S2re
20.	BUL2	Pemuteran	S1	S1	S1	S1	S1	S1
21.	BUL3	Penyabangan	S1	S1	S1	S1	S1	S1

No.	Sample	Location	Panggal Buaya		Sawo Kecik		Bentawas	
			A	P	A	P	A	P
1	2	3	4	5	6	7	8	9
22.	BUL4	Penyabangan	S2re	S2r	S2re	S2r	S2re	S2r
23.	BUL5	Musi	S2re	S2r	S2re	S2r	S2re	S2r
24.	BUL6	Sangalangit	S3re	S2r	S3re	S2r	S3re	S2r
25.	BUL7	Sangalangit	S1	S1	S1	S1	S1	S1
26.	BUL8	Patas	S3e	S2r	S3e	S2r	S3e	S2r
27.	BUL9	Patas	S2r	S2r	S2r	S2r	S2r	S2r
28.	BUL10	Banjarasem	S1	S1	S1	S1	S1	S1
29.	BUL11	Pangkungparuk	S3re	S3r	S3re	S2r	S3re	S3r
30.	BUL12	Depeha	S3se	S2r	S3se	S2r	S3se	S2r
31.	BUL13	Bulian	S2r	S2r	S2r	S2r	S2r	S2r
32.	BUL14	Tunjung	S3e	S2rs	S3e	S2rs	S3e	S2rs
33.	BUL15	Tunjung	S1	S1	S1	S1	S1	S1
34	BUL16	Sembiran	S3rse	S2r	S3rse	S2r	S3rse	S2r
35	BUL17	Julah	S2r	S2r	S2r	S2r	S2r	S2r
36	BUL18	Sambirenteng	S3e	S2rfs	S3e	S2rfs	S3e	S2rfs
37	BL1	Yangapi	S2sr	S2r	S2wrs	S2wr	S2sr	S2r
38	BL2	Yangapi	S3e	S2rfs	S3e	S2wrfs	S3e	S2rfs
39	BL3	Bantang	S3se	S2trf	S3se	S2wtrf	S3se	S2trf
40	BL4	Satra	S2trse	S2t	S2twrse	S2tw	S2trse	S2t
41	BL5	Kutuh	S3se	S2r	S3se	S2wr	S3se	S2r
42	BL6	Belandingan	S3se	S2trf	S3se	S2twrf	S3se	S2trf
43	BL7	Subaya	S3e	S2rs	S3e	S2wrs	S3e	S2rs
44	KL1	Kutampi	S3e	S2rs	S3e	S2wrs	S3e	S2rs
45	KL2	Batununggul	S3e	S2rs	S3e	S2wrs	S3e	S2rs
46	KL3	Pesingahan	S3se	S2r	S3se	S2r	S3se	S2r
47	KL4	Besan	S3se	S2r	S3se	S2r	S3se	S2r
48	KL5	Besan Klod	S3se	S1	S3se	S1	S3se	S1
49	T1	Lalanglinggah	S2se	S1	S2twse	S2tw	S2se	S1
50	T2	Surabrata	S3se	S1	S3se	S2tw	S3se	S1
51	T3	Jatiluwih	S2rse	S2r	S3w	S3w	S2rse	S2r
52	T4	Senganan	S2se	S1	S3w	S3w	S2se	S1
53	T5	Angsri	S2rs	S2r	S2wrs	S2wr	S2rs	S2r
54	T6	Antapan	S2se	S1	S2wse	S2w	S2se	S1
55	J1	Ekasari	S1	S1	S2t	S2t	S1	S1
56	J2	Tukadaya	S1	S1	S2t	S2t	S1	S1
57	J3	Brangbang	S3se	S2r	S3se	S2r	S3se	S2r
58	J4	Batuagung	S3e	S2rs	S3e	S2rs	S3e	S2rs
59	J5	Penyaringan	S3e	S2rs	S3e	S2rs	S3e	S2rs
60	J6	Yeh embang kangin	S2re	S2r	S2re	S2r	S2re	S2r

Table 5. (continued)

No.	No. Sampel	Lokasi	Majegau		Kutat		Pulai	
			A	P	A	P	A	P
1	2	3	4	5	6	7	8	9
1.	K1	Pempatan	S3e	S2rf	S3e	S2rf	S3e	S2rf
2.	K2	Besakih	S2rf	S2r	S2rf	S2r	S2rf	S2r
3.	K3	Nawakerti	S2rfe	S2r	S2rfe	S2r	S2rfe	S2r
4.	K4	Nawakerti	S2re	S2r	S2re	S2r	S2re	S2r
5.	K5	Datah	S2r	S2r	S2r	S2r	S2r	S2r
6.	K6	Datah	S2r	S2r	S2r	S2r	S2r	S2r
7.	K7	Culik	S2rfe	S2r	S2rfe	S2r	S2rfe	S2r
8.	K8	Culik	S2rfe	S2r	S2rfe	S2r	S2rfe	S2r
9.	K9	Bunutan	S3e	S2r	S3e	S2r	S3e	S2r
10.	K10	Bunutan	S2r	S2r	S2r	S2r	S2r	S2r
11.	K11	Bukit	S2wr	S2w	S2r	S2r	S2wr	S2w
12.	K12	Seraya	S3se	S2wr	S3se	S2r	S3se	S2wr
13.	K13	Kecag balung	S3e	S2wr	S3e	S2r	S3e	S2wr
14.	K14	Tinyalas	S3e	S2wr	S3e	S2r	S3e	S2wr
15.	K15	Gili selang	S3se	S2w	S3se	S1	S3se	S2w
16.	K16	Tenganan	S3se	S2w	S3se	S1	S3se	S2w
17.	K17	Selumbung	S2w	S2w	S1	S1	S2w	S2w
18.	K18	Antiga	S3se	S2wr	S3se	S2r	S3se	S2r
19.	BUL1	Pemuteran	S3wr	S3wr	S3r	S2re	S3wr	S3wr
20.	BUL2	Pemuteran	S3w	S3w	S1	S1	S3w	S3w
21.	BUL3	Penyabangan	S3w	S3w	S1	S1	S3w	S3w
22.	BUL4	Penyabangan	S3w	S3w	S2re	S2r	S3w	S3w
23.	BUL5	Musi	S3w	S3w	S2re	S2r	S3w	S3w
24.	BUL6	Sangalangit	S3wr	S3wr	S3re	S2r	S3wr	S3wr
25.	BUL7	Sangalangit	S3w	S3w	S1	S1	S3w	S3w
26.	BUL8	Patas	S3w	S3w	S3e	S2r	S3w	S3w
27.	BUL9	Patas	S3w	S3w	S2r	S2r	S3w	S3w
28.	BUL10	Banjarasem	S3w	S3w	S1	S1	S3w	S3w
29.	BUL11	Pangkungparuk	S3wr	S3wr	S3re	S3r	S3wr	S3wr
30.	BUL12	Depeha	S3se	S2wr	S3se	S2r	S3wse	S3w
31.	BUL13	Bulian	S2wr	S2wr	S2r	S2r	S3w	S3w
32.	BUL14	Tunjung	S3e	S2wrs	S3e	S2rs	S3we	S3w
33.	BUL15	Tunjung	S2w	S2w	S1	S1	S3w	S3w
34	BUL16	Sembiran	S3rse	S2wr	S3rse	S2r	S3wrse	S3wr
35	BUL17	Julah	S2wr	S2wr	S2r	S2r	S3w	S3w
36	BUL18	Sambirenteng	S3e	S2wrfs	S3e	S2rfs	S3we	S3w
37	BL1	Yangapi	S2sr	S2r	S2rs	S2r	S2sr	S2r
38	BL2	Yangapi	S3e	S2rfs	S3e	S2rfs	S3e	S2rfs
39	BL3	Bantang	S3se	S2trf	S3se	S2trf	S3se	S2trf
40	BL4	Satra	S2trse	S2t	S2twrse	S2tw	S2trse	S2t
41	BL5	Kutuh	S3se	S2r	S3se	S2r	S3se	S2r
42	BL6	Belandingan	S3se	S2trf	S3se	S2trf	S3se	S2trf
43	BL7	Subaya	S3e	S2rs	S3e	S2wrs	S3e	S2rs

1	2	3	4	5	6	7	8	9
44	KL1	Kutampi	S3we	S3w	S3e	S2wrs	S3we	S3w
45	KL2	Batununggul	S3we	S3w	S3e	S2rs	S3we	S3w
46	KL3	Pesingahan	S3se	S2wr	S3se	S2r	S3se	S2wr
47	KL4	Besan	S3se	S2wr	S3se	S2r	S3se	S2wr
48	KL5	Besan Klod	S3se	S2w	S3se	S1	S3se	S2w
49	T1	Lalanglinggah	S2se	S1	S2se	S1	S2se	S1
50	T2	Surabrata	S3se	S1	S3se	S1	S3se	S1
51	T3	Jatiluwih	S2rse	S2r	S2rse	S2r	S2rse	S2r
52	T4	Senganan	S2se	S1	S2se	S1	S2se	S1
53	T5	Angsri	S2rs	S2r	S2rs	S2r	S2rs	S2r
54	T6	Antapan	S2se	S1	S2se	S1	S2se	S1
55	J1	Ekasari	S2w	S2w	S1	S1	S2w	S2w
56	J2	Tukadaya	S2w	S2w	S1	S1	S2w	S2w
57	J3	Brangbang	S3se	S2wr	S3se	S2r	S3se	S2wr
58	J4	Batuagung	S3e	S2wrs	S3e	S2rs	S3e	S2wrs
59	J5	Penyaringan	S3e	S2wrs	S3e	S2rs	S3e	S2wrs
60	J6	Yeh embang kangin	S2wre	S2wr	S2re	S2r	S2wre	S2wr

Keterangan :

A : Actual
P : Potential
S1 : very suitable
S2 :moderate suitable
S3 :marginal suitable
w : available of water
r : root zone
s : terrain
e : erosion hazard
f : nutrient retention
t : temperature

2.2 Social-economic Survey

Results of the survey that conducted by Dr. Antara, National expert for social economic, and team show as follows (detail report in Report of Social-Economic Survey that prepared by Dr. Made Antara):

1. Respondent in survey area have own land with mean 88,19 *acre*, that consist of 5,61 *acre* is rice field, 4,63 *acre* is yard land, and 77,95 *acre* is dry land, and most of their land is categorized in dry land.
2. Plant that planted by farmer are paddy, corn, and fruits such as *rambutan*, mango, banana, and orange. They planted in agroforestry system or *tumpangsari*, that consist of food crop i.e corn, peanut, sweet potato, banana, and the trees are coconut, clove,

coffee, avocado, jackfruit, mango, *rambutan* fruit, cashew, durian, orange, and *salak.* They also planted *Fagara rhetsa,* mahogany, *albizia, gempinis*, teak, *Gmelina arborea, lamtoro, intaran, , sonokeling, cempaka*, etc.

3. **a.** Earnings of respondent mean in six regency of Bali Province becoming research location equal to Rp 19.141.256 per family per year or Rp 4.785.314 per capita per year, stemming from crop farm 32,03%, livestock farm 33,15%, and off-farm 34,82%.

   b. Using three type measurement of poverty line of each Prof. Sajogyo poverty line rice equivalent (is not poor if earnings per capita per year > 480 kg rice equivalent), World Bank poverty line that is one dollar one day or Rp 3,6 million per capita per year with rate assumption 1$=Rp10.000), and poverty line BPS with earning Rp 141.179 per capita per month, obtained result of same measurement, that is respondent of candidate receiver of sculpturing woods seedlings from ITTO PD 386 project staying in condition is not poor.

4. Respondent expenditure in research area equal to Rp 11.701.624 per family per year, utilized for food 46,109%, clothing 2,319%, board 27,144%, lighting 4,056, education 8,242, health 1,823, ceremony 6,712%, contribution 1,272%, equipments 0,817% and expenditure of others 1,505. This expenditure still lower than earnings equal to Rp 19.141.256 per farmer family per year, so that the rest about Rp 7.439.910 per family per year become saving. If related to macro economic formula, Y = C + S, hence Rp 19.141.256 = Rp 11.700.813 + Rp 7.440.443. So the farmer in research region still have rational behavior, its meaning their style of consumption not exceed earning which they get or with other expression they do not demonstration effect.

5. Ownership of motion and non motion asset by respondent that valuable and assessed in the form of money, mean equal to Rp 40.812.417 per family. Total of biggest asset is house building equal to 75,912%, mean transportation 19,762%, house wares of household 4,281% and smallest is mean of produce asset 0,045% from asset total.

6. Perception of Respondent:

   a. All respondent confess that dry land is location for doing various activity of farm crop and livestock farm, so those represent the source of earnings. Seems this dry land become cultivation target of sculpturing woods seedlings of ITTO PD 386 project.

   b. In relation to model of agroforestry, counted 85% from 180 respondents tell never heard model of agroforestry and only 15% telling ever heard and read.

   c. In relation cultivation of woods crop in dry land, counted 61% (109 respondent) telling ever, and counted 39% (71 respondent) telling never planted woods crop. This indication that more respondent owning caring toward preservation of land and water.

   d. In framework to recover forest function outside forest area, most respondent (82,11%) express to ready and very readying to work along with government, 8,89% seeing to hesitate and only 8,89% expressing not ready to. This fact depicts respondent support widely to success of distribution and cultivation of sculpturing woods seeds.

   e. Readiness of respondent accept aid, counted 83% (150 respondent) expressing to ready for, and only 17% (30 respondent) expressing not ready to accept sculpturing woods seeds aid from government.

   f. Respondent motivation plant sculpturing woods seeds, most economic motive, future, to preserve environment, adding production, successful of governmental program, free seed, etc.

   g. Respondent preference toward six type of sculpturing woods seeds which provided by government, most chose *Majegau* (*Dysoxylum densiflorum*) (123 respondent), *Sawo Kecik (Manilkara kauki)* (52 respondent), *Panggal Buaya (Fagara rhetsa)* (29 respondent), *Bentawas (Wrightia pubescens)* (22 respondent), *Putat (Planchonia valida)* (16 respondent) and a littlest is *Pulai (Alstonia scholaris)* only by 4 respondent.

h. Knowledge of respondent about punish sanction effect of clear away the state forest, counted 43% (78 respondent) telling very know, and counted 64% (97 respondent) telling know, and there no respondent telling not know law sanction.

i. If gender equivalence measured from involvement intensity of wife and daughter in work of farm in dry land, in survey regions have happened equivalence of gender, indicated by 79% of wife and daughter involved in work of farm in dry land in effort assist working of husband and father.

j. Gender equivalence in enterprising of forest crop in dry land, counted 87% (157 respondents) daughter and wife involved, and counted 13% (23 respondents) confessing their wife and child keep off in work labor forest crop in dry land.

Picture 2. The activity of social-economic survey

3. CLOSING

Based on physical soil analysis, soil texture of targeted area is dominated by sandy loam followed by loam, clay loam and salty loam. These soil textures are very good and furthermore the C-organic is moderate. These will lead to good physical properties of soils, such as soil structure, bulk density, permeability, aeration and drainage of soil and infiltration rate. Most of the targeted area has a bulk density of 0.848 g/cm3 up to 1.497 g/cm3. This value is very evaporable for the growth of most of plants. Foth (1989) said that most of agriculture plants (food crops) will grow well in a bulk density of 0.80 to 1.60 g/cm3. Furthermore, Kohnke (1989) added, that soil with moderate to coarse texture with enough C-organic, soil tillage did not exist because soil textures already had a good physical properties and without restricting root growth.

Based on the analysis of soil fraction, the dominant soil fraction was sand (Table 1). This will lead to a low of soil water holding capacity (WHC). However, this problem could be minimized by adding some organic manure to the soil. The other problem which is arised from sand texture is that soil permeability will very past. Due to the fact, that on sandy soil, a macro pore will be formed and allow the water run away with very past.

The result of soil chemical analysis showed that soil pH is slightly acid to neutral. This condition is actually very vapourable for the growth of most agriculture plants (food crops), because in this situation, available of plant nutrients become optimum. Nutrient exchange and nutrient availability of targeted area is very good as indicated by a high to very high of CEC. In contrast however, the available of P and nitrogen content of soil is low to a very low. This problem could be overcome by putting some fertilizer and organic manures to soil.

Generally, the soil fertility status of targeted area is classified as moderate to low, except in some parts of Buleleng and Klungkung districts is high. In fact, this status is more concern to agricultural food crops, while forest plant supposed to be more adapted with a low of soil fertility status. Sanchez (l993) said that forest plants have a more ability to adapt and develop compare to food crops.

The erosion hazard of most targeted area is classified into low up to very high. This might be depending on the effect of physiographic factors such as the width and length of

slope. Arsyad (1989) said that the length and width of slope has a significant effect on soil erosion. The wider and length of slope will lead to a greater soil erosion. This is due to the effect of rain energy which will destroy soil aggregate and than followed by a heavy run-off. In order to reduce this negative effect of run-off, it was suggested to protect soil surface using cover crops or terracing soil surface.

Based on land evaluation capability (Table 5 & 6), all of indigenous plants which is supposed to be developed in targeted area could be grown well even there are some soil constraints. For example, in Jembrana district, sawo kecik is moderate suitable (S2) with limiting factors of w, r and s. The optimum land productivity could be gained with a good soil management such as: soil terrace, rooting depth and by adding of organic manures. On the other hand, however, it is need to improve soil fertility using organic fertilizers (NPK), especially at early stage of plant growth.

Due to the fact that lot of limiting factors affect land suitability of targeted area, it was suggested to do some actions to increase suitability classes of land from marginal suitable (S3) to moderate suitable (S2) or even more to a very suitable (S1). It was suggested that forest plants such as: panggal buaya, sawo kecik, bentawas, pule, majegau and putat will grow well in those area.

Some actions need to be done as follows:

1. In order to reduce erosion hazard, some land improvement need to be done such as: terracing soil, increasing plant density and using cover crops.
2. Improving the root zone with a deeper hole for planting plants, and improving water holding capacity of soil and CEC with organic manure.
3. In area where available water become limited due to a long of dry period, it is suggested do delay of planting until the beginning of rainy season.

Some conclusions could be drawn from physical survey:

1. Soil texture of targeted area is dominated by sandy loam then followed by loam, clay loam and salty loam with moderate C-organic.

2. It was found that chemical characteristic of soil indicated that soil pH is slightly acid to neutral while CEC is high to very high. In contrast however N – content was low to very low.
3. Soil fertility status of targeted area is generally low except in some parts of Buleleng and Klungkung district is high.
4. The erosion hazard index of targeted area is generally low to severe. Therefore, a soil conservation practice needs to be done.
5. All of indigenous plants that proposed in this project could be adapted in this area as far as the limiting factors could be managed.

Based on social-economic survey could be formulated the recommendation as follows:

1. In effort preserve the natural resources of land and water in Bali, do not only relying on Bali natural forest which only remaining 23,20% from totalizing wide of Bali Island, but need also intensify social forest (agro-forestry), and this matter have been done by ITTO PD 386 project and Provincial Forestry Service of Bali.
2. The socialization of this activity more intensive to society in general and to farmer of candidate receiver of sculpturing woods seedlings especially, concerning understanding and benefit of social forest (agro-forestry) to preservation of natural resources land and water.
3. Socialization more intensive to farmer of candidate receiver of sculpturing woods seedlings require to be done concerning is technical cultivation, usefulness, rights and obligations of farmer when cut away and market prospect from the six indigenous species, so that the farmers understand
4. Farmer of respondent in six regency of Bali Province Bali require to optimal utilizing their dry land which narrow relative by cultivating sculpturing woods, so that can give maximal earnings.
5. In effort to recover forest function outside natural forest area, Bali Government via Forestry Institution in Bali Province requires to utilize society support in the

form of readiness work along with government in success of ITTO PD 386 project.

6. In order to improving role of woman to equivalence of gender in separate region and cultivation of idol wood species, require to be formulated the strategy that enable role for woman according to condition of social, specific or local cultural and economic as per location each.
7. Communities that ready for receiving seedlings from the project suggest: (i) Dropping of seedling according to respondent preference; (ii) Time of dropping at early of rainy season; (iii) Technical assistance have to conduct after dropping, as counseling about rights and obligations the farmer who receive the seedlings; (iv) There is monitoring and evaluation toward journey of project, so that the farmers become clearly of direction and target wishing to be reached.
8. Require to evaluate in final of project, meant to know impact of project, doing well by recovering of natural resources of forest, land and water, as well as toward increasing farmer income by planting of sculpturing woods.
9. Research of continuation require to be done by concerning recognition of three strata technology in dry land property of farmer, so that efficacy of this technology can provide food livestock sustainability to farmer and the end result will be able to improve farmer earnings.