BIBLIOGRAPHY

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ABSTRACT

The study was conducted at Cabanao, La Trinidad, Benguet from January 2005 to June 2005 to characterize the 16 selected rice landraces collected from Benguet Province based on vegetative characters. Correlation analysis was also done in the different vegetative characters measured.

There were 16 rice landraces of Benguet field evaluated namely; Bongkitan, Butalga, Diket, Diset, Kabal, Kintoman, Lalay, Longgot, Makamining, Maximu, Monay, Nawal, Oplan, Red diket, Saba and Walay. The landraces were characterized before the seeds were sown and differences in grain characters were observed.

Significant differences were observed in number of days from transplanting to tillering, leaf angle, leaf area, initial height, height at 130 DAT, stem diameter, and number of tillers per hill. Leaf length and number of nodes per plant showed significant differences among the landraces.

In the correlation analysis, there was significant positive correlation between number of days from transplanting to tillering and number of tillers, leaf length, leaf area and height at 130 DAT, stem diameter and number of nodes. However, negative

significant correlation was obtained between number of tillers to leaf length and stem diameter. The findings revealed that almost all the characters are correlated, thus, such characters could be used as selection indices during the vegetative stage of rice landraces.

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INTRODUCTION

Rice *(Oryza sativa* L.*)* is a well-known cereal plant cultivated in warm and cool areas. It provides 25 - 80% calories of the daily diet of over 2.7 billion people and a good source of protein, minerals and vitamins (White, 1994). It provides employment and income to the largest sector of the rural population in most Asian countries. In the Philippines, rice plays an important role in the stabilization of the Philippine economy. Filipinos are highly and entirely dependent on rice as their staple food and hence the lifeblood of the nation. It comprises the whole of their diet. Nearly all their agricultural endeavor revolves as well as much of their hope is inclined to it (IRRI, 1971).

Furthermore, rice throughout the country is consumed primarily in plain boiled form and in other various preparations. In areas where rice is the staple food, it is processed in many, varied and often novel products such that it appears in breakfast cereals, soup and baby food and in a wide array of traditional rice products "kakanin" mostly in the form of snacks or desserts (Bean *et al*, 1983). In industry, rice hulls are used as insulation materials and ingredient in the liquid chemical furfural. Dried stalks in Asia are used to hatch roofs, weave sandals, baskets and hats (Teason, 1994).

Although many studies had been conducted in research stations to increase rice productions still large number of people face widespread hunger, malnutrition and poverty. Hence, increasing rice production should be of top priority. One way to increase rice production is through the use of High Yielding Varieties (HYV's). However, HYV's potential is achieved by applying more inputs such are fertilizers and pesticides, thus, there is an additional cost with effects to both humans and environment (Dalrymple, 1986). Another way of increasing rice production is expanding the area of cultivation, which would require more people to go into rice farming and perhaps mechanization of farm operations. However, vast rice lands had been converted to commercial establishments, residential areas and vegetable gardens, thus could not guarantee food security.

In the search for improving rice production, there is a need to identify potential varieties adaptable to specific conditions like those prevailing in the mountainous and cool areas of Cordillera region. Determining the characteristics of these varieties must be of significance. These characters maybe physiological and agro morphological in nature. Along this line, the study of traditional rice would be very useful.

Production of traditional rice is slow and decreasing due to the introduction of many high yielding rice varieties. However, here in Benguet and other provinces of the Cordillera region, native rice is still preferred by the people because of its aroma, good eating quality, minimum inputs and management, adaptability to the locality, stable yield and their use in traditional practices. The introduction of modem varieties is a growing disadvantage to the local rice germplasm pool as the traditional rice are fast vanishing. Before these traditional rices are lost, collection, characterization and stabilization should be done. Characterization is the first step in the evaluation of germplasm collection. It is done to establish the identity of each accession basing on the agro morphological characters of the plant. Standardized descriptions are used so that genetic resources are more accessible to researchers and plant breeders (Borromeo *et al*., 1994).

The study aimed to characterize selected rice landraces collection from the Province of Benguet and to correlate the vegetative characters measured during the vegetative stage.

The study was conducted at the Benguet State University experimental field at Cabanao, La Trinidad, Benguet from January 2005 to June 2005.

REVIEW OF LITERATURE

Importance of Varietal Characterization
And Varietal Improvement

Borromeo *et al*. (1994) stated that characterization is the first step in evaluation of germplasm collection. It is done to establish the identity of each accession basing on the agro morphological characters of the plant.

Ayfa (1998) cited that increased yields have been the ultimate goal of most plant breeders. Sometimes, it is accomplished by providing varieties basically more productive not because of specific improvements but as result of generally greater physiological efficiency.

Urbanes as cited by Salcedo (2002) stated that in low income countries, research managers give priority to genetic improvement of seeds to increase their yield potential. As economies progresses utmost priority is given to research for improving grain quality; increasing labor productivity, adding value to rice through post harvest operations and management practices. Additionally, Hirao (1990) reported that national programs have been studying ways to improve quality and shelf life of traditional and new rice products to generate income and employment in the rural areas.

The search for genetic variation is of great importance for rice breeding. Anonymous (1998) reported narrow genetic base of irrigated and upland rice cultivars. It was observed that 68% of the gene pool of irrigated rice analyzed was derived from only 10 ancestors and maybe even narrower as just 10 ancestors account 78% of the genes in upland rice. Nevertheless, Rangel (1996) suggested some alternatives for achieving a broader genetic base for rice breeding and one of them is the use of landraces (natives) in multiple crosses with inbreeds elite lines.

Genetic analysis using molecular markers was conduced in .wild species and landraces of rice. Buso (1998), studied genetic variability of four rice populations with isozyme and RAPD markers and found out that with both types of markers, a pattern of greater variation between than within populations indicated that large portion of the total genetic was attributable. Similarly, Glaszman (1988) studied the pattern of variation among native rices based on isozyme analysis and found that the geographic pattern of variation among varieties was largely related to the existence of varietal groups. Hence, isozyme polymorphism inhibit strong correlations with both environmental and macro geographic parameters.

The use of biotechnology in the exploitation of the countries biological resources that geared towards the development of High Yielding Varieties and creation of competitive products and services in a sustainable and environmental sustainable manner is recognized in both phases of plant breeding. Some of these techniques are utilization of molecular markers (molecular mapping of resistant genes), quantitative loci trait (QTL) for seeding vigor and yield, wide hybridization and genetic transformation technology or introduction of novel genes into rice, gene cloning and characterization (Obien *et al*., 1992). Additionally, the applicability of biotechnology to crop improvement involves non-conventional plant breeding technique but should mutually complement them by enhancing efficiency, trait transfer precision and recovery of useful value-added variation (Duncan, 1997).

Souza and Sorells (1989) reported that pedigree analysis of cultivars is useful for evaluating the effects of crop improvement and provides a basis for selection of cultivars use as parent in breeding programs. Likewise, pedigree evaluation could generate vital information to plant breeders, like the identity of the ancestral parents of crop varieties upon which the present day varieties are founded (Cuevas *et al*., 1992).

Characteristics of Landraces in the
Cordillera Region (CAR)

Several native rice varieties of red, dark red, violet and white colored are being grown in the Cordillera region (Cadatal, 1993). In Benguet Province, the varieties mostly planted by the farmers are Kintoman, Balatinao, Pinidua, Kayaring, Bassal, Talloy, Lagawe, Bayabas and Bongkitan. In Kalinga, the popular varieties that farmers preferred. are Unoy, Ujak, Pinuswoy, Waray and Intan red and white (Landacan, 1992).

Salcedo (2002) cited some characteristics of native rice grown in the Cordillera as low tillering, awned grains, tall stalks and late maturing.

Characteristics of traditional varieties are mostly tall (l60-200cm) with drooping and longer leaves, photoperiodic, low yielding late maturing and less responsive to nitrogen fertilizer (PhilRice, 1995). This can endure environmental conditions such as submerged regions and low soil fertility.

Maurya and Mall (1986) enumerated characteristics of traditional rice for waterlogged areas such that they have leafy and longer leaves because of faster growth, tall stems, profuse tillering and lodging susceptible that cause mutual shading. They have long growth duration and photoperiodic sensitivity. Peta, Intan and Bengawan which are native to the tropics belong to this type.

Functional Properties and Nutritional
Composition of Indigenous Rice

Juliano (1998) explained that protein content of milled rice is generally lower at 14% moisture level than unmilled rice. Despite its low protein content, rice is the primary source of dietary protein in tropical Asia. For nation- wide health status, iron deficiency, anemia and vitamin A is reportedly prevalent in Asia. In anticipation, low phytate rice mutant has been developed to be nutritionally important in improving iron (Fe) and zinc (Zn) availability in rice.

Gonzales (2001) stated that native rice grown in the Cordillera region contains much higher nutritive value than commercial rice. Accordingly, it contains 476% protein, 475% fiber, 346% calcium, 356% iron, 934% phosphorus, 322% food energy, 306% complex carbohydrates, 400% riboflavin, 1,306% niacin and 2,033% thiamin which are essential in human nutrition.

Brown or rough rice reduces blood cholesterol and decreases urinary calcium for people prone to kidney disorder (Javier, 2001). It contains vitamin B and dietary fibers that help prevents cancer and an effective laxative.

MATERIALS AND METHODS

Raising of Seedlings

There were 16 selected rice landraces collected from Province of Benguet used in this study; 8 were from Kibungan, 3 from Bakun municipality, two from Itogon, one from Kapangan municipality, one from Kabayan and one from municipality of Bokod. Seeds of each landrace was characterized before sowing. Sowing was done and prepared seedbeds through wet bed method. Necessary labels were placed in each seedbed for identification during pulling and transplanting.

Transplanting

An experimental area of $145m^2$ was thoroughly prepared, puddled and leveled for convenience during transplanting. The area was divided into 3 blocks and further subdivided into 48 beds. Each bed measured 1 m x 3 m. The study was laid out in the field using the randomized complete block design (RCBD) with two seedlings transplanted per hill following the straight row pattern with planting distance of 25 cm between hills and rows which were replicated 3 times. Processed chicken manure (PCM) was broadcasted an hour before during transplanting. Urea and 14-14-14 were broadcasted at 64 days after transplanting (DAT). Care and maintenance was done throughout the experimentation period.

Serving as treatments, the following were the landraces used:

	Landraces	Place of Collection
T_1	Bongkitan	Tinongdan,. Itogon, Benguet
T_2	Butalga	Poblacion, Kibungan, Benguet
T_3	Diket	Poblacion, Kibungan, Benguet

T_4	Diset	Poblacion, Kibungan, Benguet
T_5	Kabal	Poblacion Kibungan, Benguet
T_6	Kintoman	Poblacion, Kibungan, Benguet
T_7	Lalay	Poblacion, Kibungan, Benguet
T_8	Longgot	Poblacion, Kabayan, Benguet
T_9	Makamining	Poblacion, Kibungan, Benguet
T_{10}	Maximu	Gadang, Kapangan, Benguet
T_{11}	Monay	Poblacion, Bakun, Benguet
T_{12}	Nawal	Tinongdan, Itogon, Benguet
T_{13}	Oplan	Poblacion Kibungan, Benguet
T_{14}	Red Diket	Bila, Bokod, Benguet
T_{15}	Saba	Poblacion, Bakun, Benguet
T_{16}	Walay	Sinacbat, Bakun, Benguet

Data gathered:

The parameters collected were:

1. Meteorological data. Temperature, relative humidity, total brightness and rainfall during the conduct of the study were taken from the BSU- PAGASA station, Benguet State University, La Trinidad, Benguet.

2. Seed/Grain characteristics. This was taken by determining the seed characteristics of the 16 selected rice landraces before sowing in prepared seedbeds.

3. Number of days from transplanting to tillering. This was taken when 50% of the crops produced tillers.

4. Leaf Characters

a. Leaf length (cm). This was taken by measuring 10 sample leaves per treatment from the base of the leaf blade to the tip of the leaf at 90 DAT. The middle leaves were used as samples.

b. Leaf angle. This was taken by measuring the angle form between the leaf blade and stem using protractor.

c. Leaf area (cm^2). This was taken by measuring 10 fully expanded sample leaf per treatment during growth period using replica weight method:

$$\text{Leaf area } (cm^2) = \frac{\text{Area of ordinary paper (cm) x weight of replica (g)}}{\text{Weight of ordinary paper (g)}}$$

d. Leaf sheath color. This was taken using the scale used by Borromeo *et al*., (1994).

Rating	Remarks
1	green
2	purple lines
3	light purple
4	purple tips

e. Blade color. This was taken by determining the color of the leaves using the following scale (Borromeo *et al*., 1994).

Rating	Remarks
1	pale green
2	green
3	dark green
4	purple tips

5	purple margins
6	purple blotch
7	purple

f. Blade pubescence. This was taken using the following scale by Borromeo *et al*., (1994).

Rating	Remarks
1	glabrous
2	intermediate
3	pubescent

g. Ligule color. This was taken using the scale used by Borromeo *et al*., (1994).

Rating	Remarks
0	absent
1	whitish
2	purple lines
3	purple

h. Auricle color. This was taken using the following scale (Borromeo *et al*., 1994).

Rating	Remarks
0	absent
1	pale green
2	purple

5. Culm/Stem Characteristics

a. Initial height (cm.). This was taken by measuring ten sample plants at 30 DBT per treatment during pulling from the base to the youngest leaf of the plant using tape measure.

b. Final height (cm). This was taken by measuring ten sample plants from the base to the tip of the flag leaf at 130 DAT using tape measure.

c. Stem diameter (cm). This was taken by measuring the stem of the same sample plant at the basal internode using vernier caliper.

d. Stem strength. This was taken using the following scale (Borromeo *et al*., 1994).

Rating	Remarks
1- strong	no lodging
3-moderately strong	most plant leaning
5- intermediate	most plant moderately lodging
7 - weak	most plant nearly flat
9-very weak	all plants flat

e. Number of nodes. This was taken by counting the total number of nodes of ten samples plants.

f. Internode color. This was taken by determining the color of the internode at the tip of the main stem using the scale by Borromeo (1994).

Rating	Remarks
1	green
2	light gold
3	purple lines
4	purple

6. Number of tillers per hill. This was taken by counting the number of tillers of ten sample hills per treatment.

Pest and Disease Incidence

a. Stemborer infection. This was taken using the following scale (NCT for Rice, 1996).

Index Rating	% Dead Heart	% White Head	Description
1	1 – 10	1 – 5	Resistant
3	11 – 20	6 – 10	Moderately Resistant
5	21 – 30	11 – 15	Intermediate
7	31 – 60	16 – 25	Moderately susceptible
9	61 – above	26 – above	Susceptible

b. Rice blast (neck, leaf). This was taken from the center row at hill 4-2. Computation on percent infection following the formula:

$$\text{Percent Infection} = \frac{\text{Number of Infected Plants}}{\text{Total Number of Plants}} \times 100$$

Index Rating	% Infection	Description
1	0 – 25%	Resistant
2	26 – 50%	Intermediate
3	51 – 100%	Susceptible

RESULTS AND DISCUSSION

Meteorological Data

Table 1 presents the monthly air temperature (maximum and minimum) relative humidity (RH), rainfall amount and total sunshine brightness. Mean air temperature (maximum and minimum)relative humidity, total rain fall amount and total sunshine brightness were 23.26 ^oC, 14.77 ^oC, 77.76%, 6.24 mm and 374.17 mm, respectively.

Maximum temperature (24^oC) was highest during the month of June and lowest minimum temperature was obtained in January (11.06 ^oC).

Leonard and Martin (1970) reported that temperature is the most important factor in rice production, rice can grow successfully in areas that have mean temperature of 21 ^oC or above. Furthermore IRRI (1975) as cited by Salcedo (2002) explained that rice is considered as short day plant which grows better in places with temperature ranges from 21 to 32 ^oC. Higher than 32 ^oC and lower than 21^oC may cause injury or sterility at ripening stage. As explained by De data (1981), low temperature (15-20^oC) delay panicle initiation and heading, causes failure of an anther dehiscence and fertilization, spikelet sterility and poorly filled grains. This could be the reason why rice planted in areas with temperature lower than 21^oC were late maturing and low yielding. In this experiment, it was observed that grains were not filled resulting to empty grains at harvest.

Relative humidity during the conduct of the study ranged from 70.81% to 85.33%. Belino (1999) cited that RH may affect grain formation during milk stage, ripening and disease incidence. High RH favors crop growth at vegetative stage while low humidity favors diseases during grain formation particular in rainfed rice fields.

Total rainfall amount was highest in the month of June (16.35) with the highest total sunshine brightness (493mm) in the month of February.

Table 1. Meteorological data during the conduct of the study

MONTH	TEMPERATURE		RELATIVE HUMIDITY (%)	RAINFALL AMOUNT (mm)	TOTAL SUNSHINE BRIGHTNESS (mm)
	Max	Min			
January	21.29	11.06	00	Trace	383
February	22.40	12.16	77.14	00	493
March	23.31	14.35	70.81	0.91	443
April	23.80	16.11	77.77	2.80	355
May	24.74	16.48	77.74	11.13	287
June	24.01	18.46	85.33	16.35	235
Mean	23.26	14.77	77.76	6.24	374.17

Source: BSU PAG-ASA office

Grain Characteristics

Table 2 shows the source or place of collection of the 16 rice landraces and their respective grain characteristics such as seed coat color, presence and absence of awn, color of awn, grain color, aroma and their sources.

Seed coat color. The landraces have different seed coat color but most of them show light brown seed coat. Four landraces (Butalga, Diket, Red Diket and Dicet) displayed dark brown seed coat. Lalay, Kabal, Makamining and Luk-ab expressed speckled seed coat and Kintoman and Gal-ong however, had stripe color of seed coat.

Presence, absence and color of awn. Most of the landraces with brown seed coat are awned. It was also observed that most of the awned grains exhibited straw awn while others had black (Monay and Nawal), brown (Red Diket) and white (Saba) awns.

Salcedo (2002) found that some characteristics of rice grown in Cordillera region as awned grains, low tillering, tall stalks, and late maturing. The present study corroborates such result.

Table 2. Grain characteristics of the 16 rice landraces

LANDRACES	SOURCE	SEED COAT COLOR	PRESENCE/ ABSENCE OF AWN	AWN COLOR	GRAIN COLOR	AROMA
Bongkitan	Tinongdan, Itogon	Light brown	Absent	-	White	Aromatic
Butalga	Poblacion, Kibungan	Dark brown	Present	Straw	Red	Not aromatic
Diket	Poblacion, Kibungan	Dark brown	Present	Straw	White	Aromatic
Diset	Poblacion, Kibungan	Dark brown	Present	Straw	Red	Not aromatic
Kabal	Poblacion, Kibungan	Speckled	Absent	-	Red	Aromatic
Kintoman	Poblacion, Kibungan	Striped	Absent	-	Red	Sligtly aromatic
Lalay	Poblacion, Kibungan	Speckled	Absent	-	Red	Not aromatic
Longgot	Poblacion, Kabayan	Light brown	Absent	-	Red	Not aromatic
Makamining	Poblacion, Kibungan	Speckled	Present	Straw	White	Aromatic
Maximu	Gadang Kapangan	Light brown	Present	Straw	White	Slightly aromatic
Monay	Poblacion, Bakun	Light brown	Present	Black	White	Not aromatic
Nawal	Tinongdan, Itogon	Light brown	Present	Black	Red	Aromatic
Oplan	Poblacion, Kibungan	Light brown	Present	Straw	White	Not aromatic
Red Diket	Bila, Bokod	Dark brown	Present	Brown	Red	Aromatic
Saba	Poblacion, Bakun	Light	Present	White	Red	Not aromatic
Walay	Sinacbat, Bakun	Light brown	Absent	-	White	Not aromatic

Grain color. Grain color was recorded by determining the color of uncoated seeds. It was observed that the color of the grains vary from red to white. Varieties with red grains are Lalay, Butalga, Kabal, Red Diket, Kintoman, Nawal, Saba, Longgot, and Dicet, while the white grains are Bonkitan, Diket, Oplan, Monay, Walay, Makamining and Maximu.

Aroma. Observation shows that Lalay, Butalga, Oplan, Monay, Walay, Saba, Longgot and Dicet are not aromatic. Maximu and Kintoman had slight aroma and the rest are aromatic. These landraces exhibit the exotic aroma and flavor compared to the fancy rice (such as jasmine, milagrosa and dinorado) sold in the market that have nutty aroma and flavor similar to that of roasted nuts or popcorn. This aroma is attributed to a much higher proportion of 2-acytel – 1-pyroline that is present in all rice but have much higher concentration in aromatic rice, (Anonymous, 2004).

Number of Days From Transplanting to Tillering

Number of days from transplanting to tillering was recorded when 50% of the total plant in a bed started producing tillers. It was observed that Saba, Maximu and Dicet took longer days to produce tillers (Table 3). On the other hand, Longgot was the earliest to produce tillers among the landraces with average mean of 19.00 days. This finding is an indicative of the later maturity of Saba, Maximu and Dicet while it would mean earlier maturity for Longgot, Monay, Makamining and Lalay.

Table 3. Number of days from transplanting to tillering of the 16 rice landraces

LANDRACES	DAYS
Bongkitan	21.00^{abcde}
Butalga	22.00^{abcd}
Diket	22.00^{abc}
Diset	23.00^{a}
Kabal	21.00^{abcde}
Kintoman	21.00^{abcde}
Lalay	20.00^{cde}
Longgot	19.00^{e}
Makamining	20.00^{cde}
Maximu	23.00^{a}
Monay	20.007^{de}
Nawal	21.00^{bcde}
Oplan	22.00^{abcd}
Red Diket	21.00^{abcde}
Saba	23.00^{ab}
Walay	20.00^{cde}
CV (%)	5.21

Means in a column with the same letter are not significantly different by DMRT (P>0.05).

<u>Leaf Characters</u>

Data on leaf characters such as leaf length, leaf angle and leaf area are presented in Table 4 while other leaf characteristics such as leaf sheath color, blade color and blade pubescence, and ligule and auricle color are presented in Table 5.

<u>Leaf length</u>. This was measured from the base of the leaves to the tip of the leaves. Results show that leaf has comparable length ranging from 37.96 to 42.25 cm. Butalga (42.25cm), Makamining (41.08cm) and Nawal (41.09cm) recorded the longest leaves while Bongkitan (37.96cm), Monay (38.67cm) and Diket (38.92cm) displayed the

shortest leaves. Further observation shows that the landraces possess relatively long leaves.

Vergara (1992), reported that long leaves are an indication of drooping. Droopy leaves means that the lower leaves receive little light, thus, production of food is lesser. However, Butalga, Nawal and Makamining did not exhibit a high leaf angle which is an indication of droopy leaves. These findings might contradict other studies reporting that longer leaves are droopy leaves because they have more weight to carry hence, lesser photosynthetic efficiency and eventually low yield. However, it should be understood that different genotypes have different photosynthetic capacity to adapt in the environment to which they are introduced.

Leaf angle. Results shows that Red diket variety has the highest leaf angle (29.10) comparable to Butalga (28.90) and Kintoman (28.63) degrees while Nawal and Lalay revealed the lowest leaf angle of 21.77 and 22.13. This means that the leaves of the plant is spreading.

Leaf area. Highly significant differences were observed among the landraces on leaf area. Butalga exhibited the largest leaves with an average mean of 24.65 while Saba, Dicet and Monay had the smallest leaves of 21.19, 21.00 and 20.80cm^2, respectively.

Table 4. Leaf characters of the 16 rice landraces

LANDRACES	LEAF LENGTH (cm)	LEAF ANGLE	LEAF AREA (cm^2)
Bongkitan	37.96^{d}	23.27^{bcd}	23.14^{b}
Butalga	42.25^{a}	28.90^{a}	24.60^{a}
Diket	38.92^{bcd}	24.43^{bcd}	21.47^{c}
Diset	39.08^{bcd}	23.57^{bcd}	21.00^{c}
Kabal	39.36^{bcd}	23.73^{bcd}	21.64^{c}
Kintoman	40.74^{abc}	28.63^{a}	21.40^{c}
Lalay	40.56^{abc}	22.13^{cd}	23.40^{b}
Longgot	40.12^{abcd}	25.90^{abcd}	21.41^{c}
Makamining	41.08^{ab}	27.03^{ab}	23.58^{b}
Maximu	40.18^{abcd}	24.17^{bcd}	21.59^{c}
Monay	38.67^{cd}	24.10^{bcd}	20.80^{c}
Nawal	41.09^{ab}	21.77^{d}	23.75^{ab}
Oplan	40.52^{abc}	23.97^{bcd}	21.60^{c}
Red Diket	40.09^{abcd}	29.10^{a}	21.60^{c}
Saba	39.75^{bcd}	23.17^{bcd}	21.19^{c}
Walay	40.53^{abc}	26.20^{abcd}	21.67^{c}
CV (%)	2.97	8.37	3.00

Means in a column with the same letter are not significantly different by DMRT (P>0.05).

Other Leaf Characters

Leaf sheath color. Other leaf characteristics such as leaf sheath color are presented in Table 5. Butalga, Makamining and Dicet exhibited purple lines color of leaf sheath while the other landraces had green color.

Blade color and blade pubescence. Almost all the landraces displayed green leaves except Red Diket and Kintoman which had dark green; Butalga and Dicet with purple margins and Makamining with purple tips color of leaves. This could be attributed to the leaf sheath color of the plant . Vergara *et al*., (1992) explained that the more green color of the plant the higher the carbohydrates production, thus, higher in food production.

Table 5. Other leaf characteristics of the 16 rice landraces

LANDRACES	LEAF SHEATH COLOR	BLADE COLOR	BLADE PUBESCENCE	LIGULE COLOR	AURICLE COLOR
Bongkitan	Green	Green	Intermediate	Whitish	Pale green
Butalga	Purple lines	Purple margins	Intermediate	Purple lines	Pale green
Diket	Green	Green	Intermediate	Whitish	Pale green
Diset	Purple lines	Purple margins	Intermediate	Purple lines	Pale green
Kabal	Green	Green	Intermediate	Whitish	Pale green
Kintoman	Green	Dark green	Intermediate	Whitish	Pale green
Lalay	Green	Green	Intermediate	Purple lines	Pale green
Longgot	Green	Green	Intermediate	Whitish	Pale green
Makamining	Purple lines	Purple tips	Intermediate	Purple lines	Pale green
Maximu	Green	Green	Intermediate	Whitish	Pale green
Monay	Green	Green	Intermediate	Whitish	Pale green
Nawal	Green	Green	Intermediate	Whitish	Pale green
Oplan	Green	Green	Intermediate	Whitish	Pale green
Red Diket	Green	Dark green	Intermediate	Purple lines	Pale green
Saba	Green	Green	Intermediate	Whitish	Pale green
Walay	Green	Green	Intermediate	Whitish	Pale green

Leaf pubescence. All landraces exhibited intermediate leaf pubescence. Salcedo (2002) conducted a study on characterization of collected traditional rices from Mountain Province and Ifugao Province and found out the same result on leaf pubescence which are intermediate. This means that some traditional varieties grown in Cordillera region have hairy and some have smooth or hairless leaves.

Ligule and auricle color. The auricle color of the landraces are all pale green. Lalay, Butalga, Red Diket, Makamining and Dicet displayed purple lines ligule among the varieties and the rest had whitish ligule.

Plant Height

Initial height. Initial height was measured at 30 days before transplanting using tape measure. Red Diket recorded the tallest rice seedlings at transplanting with an average mean of 15.20 cm comparable with Saba with 14.78. Makamining, Dicet, Oplan and Diket revealed the shortest with means of 11.70cm, 12.17 cm, 12.90cm and 12.35 cm respectively (Table 6).

Final height. Final height was measured at 130 DAT. Walay and Maximu had the tallest at 130 DAT with means of 84.98 cm and 83.64 cm. However, statistically they were not significantly different from each other. Makamining showed the shortest height at 130 DAT with 63.99 cm.

Walay and Maximu which displayed the tallest plants at 130 DAT also revealed the highest number of nodes which determines the final height of the plant. This could mean that the longer the stem, the more nodes component of the plant. However, it should be consider that different genotypes have different genotypic constitution.

Number of Nodes per Plant

Significant difference was observed in number of nodes per plant. Almost all the landraces had 4.00 nodes per plant except Maximu, Saba and Walay which has the highest nodes of 5.00.

Table 6. Plant height and number of nodes of the 16 rice landraces

LANDRACES	PLANT HEIGHT (cm)		NUMBER OF NODES
	30DAS	130DAT	
Bongkitan	13.67[cd]	77.45[abc]	4.00 [b]
Butalga	13.29[cd]	71.39[cd]	4.00 [b]
Diket	12.35[ef]	70.43[cd]	4.00 [b]
Diset	12.17[ef]	73.43[cd]	4.00 [b]
Kabal	13.96[bc]	70.19[cd]	4.00 [b]
Kintoman	13.84[bcd]	74.89[bcd]	4.00 [b]
Lalay	13.88[bcd]	71.73[cd]	4.00[b]
Longgot	13.39[cd]	76.33[abcd]	4.00 [b]
Makamining	11.70[f]	66.90[cd]	4.00 [b]
Maximu	14.03[bc]	83.64[ab]	5.00 [a]
Monay	13.83[bcd]	73.97[bcd]	4.00 [b]
Nawal	13.62[cd]	77.65[abc]	4.00 [b]
Oplan	12.90[de]	68.25[cd]	4.00 [b]
Red Diket	15.20[a]	70.96[cd]	4.00 [b]
Saba	14.78[ab]	75.34[abcd]	5.00 [a]
Walay	13.61[cd]	84.99[a]	5.00 [a]
CV (%)	3.91	7.09	7.35

Means in a column with the same letter are not significantly different by DMRT (P>0.05).

Stem Diameter and Stem Strength

The stem diameter and stem strength of the different landraces are shown in Table 7.

Stem diameter. Results revealed that stem size of the 16 landraces ranged from 1.08cm to 0.7 5cm. Highly significant differences were observed among the varieties. Bongkitan show the widest stem (1.08 cm) while Longgot had the narrowest diameter with 0.75 cm only.

Table 7. Stem diameter of the 16 rice landraces

LANDRACES	STEM DIAMETER (cm)	STEM STRENGTH
Bongkitan	1.08[a]	Strong
Butalga	0.88[b]	Strong
Diket	0.80[b]	Strong
Diset	1.03[a]	Strong
Kabal	0.78[b]	Strong
Kintoman	0.80[b]	Strong
Lalay	1.04[a]	Strong
Longgot	0.75[a]	Strong
Makamining	0.78[b]	Strong
Maximu	1.02[a]	Strong
Monay	1.07[a]	Strong
Nawal	1.07[a]	Strong
Oplan	0.78[b]	Strong
Red Diket	0.78[b]	Strong
Saba	1.07[a]	Strong
Walay	1.04[a]	Strong
CV (%)	19.67	

Means in a column with the same letter are not significantly different by DMRT (P>0.05).

Stem strength. It was observed that all the landraces exhibited strong stem m during the growth stage of the plant indicating that all the landraces are resistant to lodging. This findings gives support to the explanation that traditional rices are good sources of resistance and grain quality traits which a plant breeder desires (PhilRice, 2001).

Internode Color

Table 8 shows the internode color of the plant. It was observed that almost all the landraces displayed purple lines internode except that Lalay, Red Diket and Longgot exemplified light gold internode. Walay however, is the only variety with green internode.

Number of Tillers Per Hill

The number of tillers per hill was presented also in Table 8. Every sample hill consists of two mother rice plants. Result shows that Dicet recorded the highest number of tillers per hill with mean average of 16.00 comparable with Kabal and Walay (14.00). Vergara (1992) explained that the number of tillers determines the number of panicles, thus, the most important in achieving high grain yield. On the other hand Maximu and Nawal produce the least number of tillers per hill with means of 9.00. This findings corroborates with the CECAP and PHILRICE (2000) reports that the some characteristics of traditional rice being grown in the Cordillera region are awned grains, tall stalks, low tillering and late maturing.

Table 8. Internode color and number of tillers per hill of the 16 rice landraces

LANDRACES	INTERNODE COLOR	NUMBER OF TILLERS PER HILL
Bongkitan	Purple lines	11.00[cde]
Butalga	Purple lines	12.00[cd]
Diket	Purple lines	11.00[cde]
Diset	Purple lines	16.00[a]
Kabal	Purple lines	14.00[abc]
Kintoman	Purple lines	10.00[de]
Lalay	Light gold	1.3.00[bcd]
Longgot	Light gold	12.00[cd]
Makamining	Purple lines	11.00[cde]
Maximu	Purple lines	9.00[e]
Monay	Purple lines	10.00[de]
Nawal	Purple lines	9.00[e]
Oplan	Purple lines	13.00[bcd]
Red Diket	Light gold	10.00[de]
Saba	Purple lines	10.00[de]
Walay	Green	14.00[abc]
CV (%)	7.35	16.49

Means in a column with the same letter are not significantly different by DMRT (P>0.05).

Pest and Disease Incidence

There were no spraying of chemical pesticides during the conduct of the study.

Stemborer damage. Infestation of stemborer damage particularly dead heart was noted at 35 and 50 days after transplanting (Table 9). Observation shows that there are no incidence of dead heart infestations both at 35 and 50DAT. All the landraces were strongly resistant against stemborer.

Rice blast (leaf blast). The Table shows the rice blast infestation particularly in the leaves of the plant. Results shows that all the landraces exhibit strong resistance to leaf blast .

Table 9. Reaction of the 16 rice landraces to stemborer and rice blast incidence

LANDRACES	STEMBORER		RICE BLAST
	35 DAT	50 DAT	
Bongkitan	Resistant	Resistant	Resistant
Butalga	Resistant	Resistant	Resistant
Diket	Resistant	Resistant	Resistant
Diset	Resistant	Resistant	Resistant
Kabal	Resistant	Resistant	Resistant
Kintoman	Resistant	Resistant	Resistant
Lalay	Resistant	Resistant	Resistant
Longgot	Resistant	Resistant	Resistant
Makamining	Resistant	Resistant	Resistant
Maximu	Resistant	Resistant	Resistant
Monay	Resistant	Resistant	Resistant
Nawal	Resistant	Resistant	Resistant
Oplan	Resistant	Resistant	Resistant
Red Diket	Resistant	Resistant	Resistant
Saba	Resistant	Resistant	Resistant
Walay	Resistant	Resistant	Resistant

Correlation Among Vegetative Characters

Table 10 summarizes the correlation coefficient of eight rice characters such as number of days from transplanting to tillering, leaf length, leaf angle, leaf area, height at 130 DAT, stem diameter, number of nodes per plant and number of tiller per hill.

Strong correlation were noted mainly involving leaf length and number of tillers per hill produced. Other significant correlations however, were observed involving stem diameter, height at 130 DAT and number of nodes per plant.

Correlation coefficient of number of day from transplanting to tillering with other characters were not significant except with number of tiller per hill which has positive correlation with number of days from transplanting to tillering. This may means that as the number of days from transplanting to tillering lengthens, the number of tillers per hill increases.

Significant positive correlation was obtained between leaf length and that of leaf area and height at 130 DAT, but negative correlated with number of tiller per hill. This suggest that as the leaf length increases, so is the leaf area and height at 130 DAT. These results agree with what Tanaka *et al*., (1966) found by Salcedo (2002) that leaf area is influenced by leaf length, hence, the longer the leaves, the more bent they are. He further explained that tall stature plant was associated with long leaves and so NT reduces as the leaf length increases.

Stem diameter is positively correlated with leaf area and height at 130 DAT suggesting that an increase in stem diameter will result to a similar increase in the other two parameters. While, strong negative correlation was obtained between stem diameter and number of nodes per plant indicating that when stem diameter is greater, fewer number of tillers are produced.

As to number of nodes per plant, all characters are not significantly correlated except that of height at 130 DAT which is positively correlated with number of nodes per plant but not so strong.

The number of tillers per plant produced seem to be the most affected by other negative traits of rice. It is negatively correlated to both stem diameter and leaf length but is positively influenced by number of days from transplanting to tillering and leaf angle. The negative correlation could mean that as the plants produce more tillers, the thinner the stem and the longer the leaves become, while at the lower tiller number, the stem becomes wider. Vergara *et al.*, (1990) claims that a lower tiller number type would ensure a higher number of vascular bundles.

Table 10. Correlation among vegetative characters of 16 rice landraces

	DTT	LL	LAn	LAr	FH	Sdm	NN	NT
DTT	1.000							
LL	-0.205	1.000						
LAn	0.282	-0.280	1.000					
LAr	0.279	0.745*	0.449	1.000				
FH	0.265	0.791*	-0.325	-0.266	1.000			
Sdm	-0.256	0.396	-0.402	0.705*	0.658*	1.000		
NN	-0.243	-0.164	0.494	0.439	0.547*	-0.131	1.000	
NT	0.748*	-0.835*	0.536*	-0.282	0.234	-0.806*	0.377	1.000

Legend:

DTT – Number of Days from Transplanting to Tillering
LL – Leaf Length
LAn – Leaf Angle
LAr – Leaf Area
FH – Height at 130 DAT
Sdm – Stem diameter
NN – Number of Nodes per plant
NT – Number of Tillers per hill

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

There were 16 rice landraces collected from Benguet Province that represented variability for leaf, stem and grain characters were used in the study. They were characterized and statistically analyzed from January 2005 to June 2005.

Based on the results, Monay and Longgot were the earliest to produce tillers. However, neither of the two landraces produce the most number of tillers which determines the number of panicles and component of yield. Moreover, Dicet produce more tillers although it took longer days to produce tillers.

As to leaf length, Butalga, Nawal and Makamining displayed the longest leaves, however, these landraces produce lesser tillers, thus, the three said landraces could be assumed as medium tillering and low yielding because of this traits.

In terms of leaf angle, Red diket, Butalga and Kintoman had comparable leaf angle. These landraces exhibited the widest leaf angle which determines the spread of the leaves. Nonetheless, only Butalga exhibited the longest leaves among the three said landraces. Furthermore, almost all the landraces expressed dark green to green leaves that could be attributed to its leaf sheath color with intermediate leaf pubescent.

Among the landraces, Red diket and Saba recorded the tallest seedlings when transplanted but the tallest at 130 DAT were Walay and Maximu. Saba, Walay and Maximu displayed the widest stem, nevertheless, all the landraces had strong stem.

For number of nodes, Walay had the most nodes, which could be attributed to its height. It also displayed green internodes.

Considering the correlation analysis between characters, leaf length revealed most significant relationship between other characters. While significant correlation was found between other characters that could be used as selection index for specific characters.

Significant positive correlation were obtained between number of days from transplanting to tillering, leaf length, height at 130 DAT, stem diameter and number of nodes per plant indicating that as one character increases so is the other parameter measured. On the other hand, strong significant negative correlation were observed between number of tillers per hill, leaf length and stem diameter suggesting that lesser tillers are produced when leaf length increases and stem diameter expands.

Conclusion

The findings showed differences in leaf and culms/stems characters of the rice landraces. It showed that leaf length influenced the leaf area as shown by Butalga. Among the landraces, Oplan has the traits of landrace a rice breeder desired. With these characters such as short, dark green, and erect leaves (Tanaka *et al*., 1966), this landrace could be used in improving the existing rice cultivars. Moreover, the leaf and stem characters could be used as descriptors to determine the differences among cultivars.

Furthermore, correlation analysis among the vegetative characters measured showed correlations between the characters, thus, such traits could be used as selection indices.

Recommendation

Although all the landraces studied possess some of the characters desired by rice breeders, closer observation showed that Oplan displayed more of the characters of plant breeder desired such as short, with green leaves, strong stems, and resistant to pest and diseases. Thus it may be recommended for inclusion in a breeding program or it may be included in further evaluation for yield and adaptability.

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APPENDICES

Appendix Table 1.Number of days from transplanting to tillering of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	23.00	21.00	20.00	64.00	21.00
Butalga	21.00	22.00	22.00	65.00	22.00
Diket	22.00	23.00	21.00	66.00	22.00
Diset	24.00	23.00	23.00	70.00	23.00
Kabal	20.00	23.00	21.00	64.00	21.00
Kintoman	19.00	23.00	22.00	64.00	21.00
Lalay	20.00	20.00	20.00	60.00	20.00
Longgot	19.00	19.00	20.00	58.00	19.00
Makamining	20.00	20.00	20.00	60.00	20.00
Maximu	23.00	24.00	23.00	70.00	23.00
Monay	19.00	20.00	20.00	59.00	2.00
Nawal	22.00	20.00	21.00	63.00	21.00
Oplan	22.00	21.00	22.00	65.00	22.00
Red Diket	23.00	21.00	20.00	64.00	21.00
Saba	24.00	23.00	21.00	68.00	23.00
Walay	20.00	22.00	19.00	61.00	20.00
TOTAL	341.00	345.00	335.00	1,201.00	

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Block	2	3.17	1.58			
Treatment	15	65.48	4.37	3.55**	2.02	2.70
Error	30	36.83	1.23			
TOTAL	47	105.48				

** = highly significant

Coefficient of Variation = 5.21%

Appendix Table 2. Leaf length (cm) of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	37.78	38.82	37.28	113.88	37.96
Butalga	44.40	42.31	40.05	126.76	42.25
Diket	38.53	38.29	39.95	116.77	38.92
Diset	38.44	40.19	38.60	117.23	39.08
Kabal	39.54	38.97	39.58	118.09	39.36
Kintoman	40.42	40.88	40.93	122.23	40.74
Lalay	42.47	41.35	37.85	121.67	40.56
Longgot	39.80	41.86	38.72	120.38	40.12
Makamining	41.84	40.78	40.63	123.25	41.08
Maximu	40.99	40.74	38.80	120.53	40.18
Monay	37.53	38.24	40.24	116.01	38.67
Nawal	41.20	40.37	41.70	123.27	41.09
Oplan	39.55	41.89	40.29	127.73	40.52
Red Diket	39.79	39.93	40.56	120.28	40.09
Saba	38.88	39.96	40.42	119.26	39.75
Walay	40.91	41.25	39.43	121.59	40.53
TOTAL	642.07	645.83	635.03	1,922.93	

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Block	2	3.76	1.88			
Treatment	15	51.96	3.46	2.45*	2.02	2.70
Error	30	42.44	1.41			
TOTAL	47	98.16				

* = significant

Coefficient of Variation = 2.97%

Appendix Table 3. Leaf angle of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	22.30	26.00	21.50	69.80	23.27
Butalga	26.30	28.40	32.00	86.70	28.90
Diket	22.40	23.00	27.90	73.30	24.43
Diset	21.60	25.60	23.50	70.70	23.57
Kabal	21.30	23.50	26.40	71.20	23.73
Kintoman	26.00	30.90	29.00	85.90	28.63
Lalay	22.50	21.90	22.00	66.40	22.13
Longgot	24.20	25.50	28.00	77.70	25.90
Makamining	27.00	26.00	28.10	81.10	27.03
Maximu	23.00	28.00	21.50	72.50	24.17
Monay	22.40	26.40	23.50	72.30	24.10
Nawal	22.40	21.40	21.50	65.30	21.77
Oplan	25.00	22.10	24.80	71.90	23.97
Red Diket	29.40	30.00	27.90	87.30	29.10
Saba	25.00	23.00	21.50	69.50	23.17
Walay	25.70	23.90	29.00	78.60	26.20
TOTAL	386.50	405.60	408.10	1,200.20	

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Block	2	17.45	8.73			
Treatment	15	249.59	16.64	3.80	2.02	2.70
Error	30	131.52	4.38			
TOTAL	47	398.56				

** = highly significant

Coefficient of Variation = 8.37%

Appendix Table 4. Leaf area (cm^2) of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	23.02	23.44	22.95	69.41	23.14
Butalga	25.40	24.70	23.87	73.97	24.66
Diket	21.13	21.40	21.88	64.41	21.47
Diset	22.00	20.18	20.83	63.01	21.00
Kabal	22.00	21.40	21.51	64.91	21.64
Kintoman	21.37	22.06	20.77	64.20	21.40
Lalay	23.05	24.35	22.81	70.21	23.40
Longgot	21.40	20.80	22.03	64.23	21.41
Makamining	23.30	23.38	24.07	70.75	23.58
Maximu	21.97	21.37	21.43	64.77	21.59
Monay	20.23	20.80	21.37	62.40	20.80
Nawal	23.90	24.03	23.33	71.26	23.75
Oplan	21.40	22.03	21.37	64.80	21.60
Red Diket	21.97	21.40	21.43	64.80	21.60
Saba	20.20	21.97	21.40	63.57	21.19
Walay	21.91	21.60	21.43	65.00	21.67
TOTAL	354.31	354.91	352.48		
MEAN	22.41	22.18	22.03		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Block	2	0.1972	0.0986			
Treatment	15	61.45501	4.0967	12.32**	2.02	2.70
Error	30	10.0461	0.3349			
TOTAL	47	71.6934				

** = highly significant

Coefficient of Variation = 3.00%

Appendix Table 5. Initial height (cm) at 30DAS of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	13.14	13.59	14.28	41.01	13.67
Butalga	13.29	13.63	12.96	39.88	13.29
Diket	13.14	11.90	12.00	37.04	12.35
Diset	12.10	11.40	13.00	36.50	12.17
Kabal	13.90	13.99	14.00	41.89	13.96
Kintoman	13.71	13.70	14.12	41.53	13.84
Lalay	13.62	14.15	13.86	41.63	13.88
Longgot	14.09	13.08	13.00	40.17	13.39
Makamining	11.90	11.20	12.00	35.10	11.70
Maximu	14.01	14.08	13.99	42.08	14.03
Monay	13.43	13.76	14.31	41.50	13.83
Nawal	13.37	13.69	13.81	40.87	13.62
Oplan	12.80	13.00	12.90	38.70	12.90
Red Diket	15.90	14.70	15.00	45.60	15.20
Saba	16.10	14.05	14.20	44.35	14.78
Walay	13.85	13.98	13.00	40.83	13.61
TOTAL	218.35	213.90	216.43	648.68	

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Block	2	0.62	0.31			
Treatment	15	36.65	2.44	8.71**	2.02	2.70
Error	30	8.36	0.28			
TOTAL	47	45.63				

** = highly significant

Coefficient of Variation = 3.91%

Appendix Table 6. Final height (cm) at 130 DAT of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	78.00	80.31	74.05	232.36	77.45
Butalga	78.65	66.40	69.12	214.17	71.39
Diket	68.20	77.33	65.75	211.28	70.43
Diset	78.00	70.00	72.30	220.30	73.43
Kabal	68.00	76.09	66.50	210.59	70.19
Kintoman	72.69	69.00	83.00	224.69	74.89
Lalay	70.18	67.00	78.00	215.18	71.73
Longgot	85.00	74.99	69.00	228.99	76.33
Makamining	65.41	65.00	70.30	200.17	66.90
Maximu	78.00	83.92	89.01	250.93	83.64
Monay	72.80	69.00	80.10	221.90	73.97
Nawal	82.83	74.00	76.12	232.95	77.65
Oplan	67.38	70.44	66.94	204.76	68.25
Red Diket	75.87	67.00	70.01	212.88	70.96
Saba	75.38	70.66	80.00	226.04	75.34
Walay	80.95	85.01	89.00	254.96	84.99
TOTAL	1,197.34	1,166.15	1,199.20	3,562.69	

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	0.01
Block	2	43.10	21.55			
Treatment	15	1,135.10	75.67	2.74**	2.02	2.70
Error	30	829.67	27.66			
TOTAL	47	2,007.86				

** = highly significant

Coefficient of Variation = 7.09%

Appendix Table 7. Number of nodes per plant of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	3.90	3.70	4.40	4.00	4.00
Butalga	34.00	4.00	4.00	4.37	4.00
Diket	4.60	3.90	3.70	4.07	4.00
Diset	3.90	4.20	4.00	4.03	4.00
Kabal	4.60	4.70	4.20	4.50	4.00
Kintoman	4.40	3.80	3.90	4.03	4.00
Lalay	4.00	4.00	4.00	4.20	4.00
Longgot	4.20	3.90	3.90	4.10	4.00
Makamining	4.70	4.40	4.40	4.50	4.00
Maximu	3.90	4.40	4.30	4.20	5.00
Monay	4.70	3.80	4.00	4.16	4.00
Nawal	4.40	4.60	4.30	4.43	4.00
Oplan	3.90	4.10	4.00	4.00	4.00
Red Diket	3.80	3.90	4.30	4.00	4.00
Saba	4.70	4.70	4.90	4.77	5.00
Walay	4.90	4.90	4.80	4.87	5.00
TOTAL	69.00	67.60	67.80		

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Block	2	0.05	0.03			
Treatment	15	3.64	0.24	2.67*	2.02	2.70
Error	30	2.95	0.09			
TOTAL	47	6.64				

* = significant

Coefficient of Variation = 7.35%

Appendix Table 8. Stem diameter (mm) of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	1.08	1.07	1.08	3.23	1.07
Butalga	0.75	0.81	1.08	2.64	0.88
Diket	0.82	0.78	0.81	2.41	0.80
Diset	1.07	0.97	1.06	3.10	1.03
Kabal	0.77	0.76	0.80	2.33	0.78
Kintoman	0.76	0.86	0.77	2.39	0.79
Lalay	1.08	1.07	0.99	3.14	1.04
Longgot	0.75	0.72	0.79	2.26	0.75
Makamining	0.78	0.77	0.78	2.33	0.78
Maximu	1.07	0.92	1.08	3.07	1.02
Monay	1.06	1.08	1.07	3.21	1.07
Nawal	1.08	1.07	1.06	3.21	1.07
Oplan	0.77	0.75	0.82	2.34	0.78
Red Diket	0.75	0.80	0.80	2.35	0.78
Saba	1.06	1.06	1.08	3.20	1.07
Walay	1.01	1.07	1.06	3.14	1.04
TOTAL	14.66	14.56	15.13	44.35	
MEAN	1.466	1.456	1.513		1.475

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F	
					0.05	0.01
Block	2	0.0116	0.0058			
Treatment	15	0.8519	0.0568	17.75**	2.02	2.70
Error	30	0.0946	0.0032			
TOTAL	47	0.9581				

** = highly significant

Coefficient of Variation = 6.08%

Appendix Table 9. Number of tillers per hill of the 16 rice landraces

LANDRACES	REPLICATION			TOTAL	MEAN
	I	II	III		
Bongkitan	13.20	8.40	11.10	32.70	11.00
Butalga	14.40	9.00	12.40	35.80	12.00
Diket	10.40	12.30	9.00	31.70	11.00
Diset	15.60	17.10	14.50	47.20	16.00
Kabal	13.60	15.30	14.00	42.90	14.00
Kintoman	10.70	9.50	8.90	29.10	10.00
Lalay	13.10	12.20	13.50	38.80	13.00
Longgot	10.30	11.70	12.70	34.70	12.00
Makamining	10.20	11.40	11.70	33.30	11.00
Maximu	6.30	8.60	12.30	27.20	9.00
Monay	11.40	7.50	11.10	30.00	10.00
Nawal	7.80	10.20	10.00	28.00	9.00
Oplan	10.30	15.70	11.80	37.80	13.00
Red Diket	9.50	10.80	10.50	30.80	10.00
Saba	13.40	8.10	8.90	30.40	10.00
Walay	13.90	13.40	13.20	40.50	14.00
TOTAL	184.10	181.20	185.60	550.90	

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Block	2	0.63	0.31			
Treatment	15	162.28	10.82	3.02**	2.02	2.70
Error	30	107.41	3.58			
TOTAL	47	270.32				

** = highly significant

Coefficient of Variation = 16.49%