Key access and utilization descriptors for rice genetic resources

This list consists of an initial set of characterization and evaluation descriptors for rice utilization. This strategic set of descriptors, together with passport data, will become the basis for the global accession level information portal being developed by Bioversity International with the support of the Global Crop Diversity Trust (GCDT). It will facilitate access to and utilization of rice accessions held in genebanks and does not preclude the addition of further descriptors, should data subsequently become available.

Based on the comprehensive list of 'Descriptors for wild and cultivated Rice (*Oryza* spp.)' published by IRRI, WARDA (now Africa Rice Center) and Bioversity International in 2007, the evaluation category was subsequently compared with a number of sources such as results from the Global Public Goods Activity 4.2.1.1, UPOV technical guidelines for rice (2004), Descriptors for Rice (USDA, ARS, GRIN), the IRRI publication 'Standard Evaluation System for Rice' (SES, 2002), and with the traits that were awarded funds for further research by the Global Crop Diversity Trust through the Evaluation Award Scheme (EAS, 2008).

This minimal set defines a first priority set of characteristics to describe, to access and to utilize *Oryza* genetic resources. This list was developed in two different phases. During phase one, a list of highly discriminating Bioversity-IRRI descriptors for rice was defined and published in 2007 under the scientific direction of Dr Ruaraidh Sackville Hamilton of IRRI. For evaluation traits defined during phase two, a worldwide distribution of experts involved in an online survey was assured and the list was afterwards validated by a Core Advisory Group (see 'Contributors') led by Dr Edilberto D. Redoña of IRRI.

Biotic and abiotic stresses included in the list were chosen because of their wide geographic occurrence and significant economic impact at a global level.

Numbers in parentheses on the right-hand side are the corresponding descriptor numbers listed in the 2007 publication. Descriptors with numbers ending in 'letters' are new descriptors that were added during the development of the list below.

The code numbers of IRRI-SES for the corresponding characteristics are indicated beside the descriptor name between brackets [IS-] for easy reference. These codes belong to the Standard Evaluation System for Rice (INGER, Genetic Resources Centre, IRRI, July 1996).

To keep colour description simple, both Bioversity and IRRI colour codes have been listed. The IRRI colour coding system uses one code for one colour regardless of the descriptor.

PLANT DATA

Main heading (7.2.3)

Date on which 80% of the plants are heading. It is specified either as the number of days from effective seeding date to main heading date or as effective seeding date and main heading date

Auricle: colour (7.3.11)

Stage: late vegetative

	(IRRI)	
0	0	Absent (no auricles)
1	011	Whitish
2	062	Yellowish green
3	080	Purple
4	081	Light purple
5	084	Purple lines

Flag leaf: attitude (early observation) (7.3.22)

Measured near the collar. Angle of attachment between the flag leaf blade and the main panicle axis. Record the average of five samples.

Stage: cultivated species at anthesis; wild species seven days after anthesis

1 Erect
3 Semi-erect (intermediate)
5 Horizontal
7 Descending

Plant: height [cm] [IS-5] (7.3.25a)

Use actual measurement in cm from soil surface to the tip of the tallest panicle (awns excluded). For height measurements at other growth stages, specify the stage. Record in whole numbers (do not use decimals).

Stage: after flowering to maturity.

Alternatively, they can be coded as follows:

1 Semidwarf (lowland: less than 110 cm; upland: less than 90 cm)
5 Intermediate (lowland: 110–130 cm; upland: 90–125 cm)
9 Tall (lowland: more than 130 cm; upland: more than 125 cm)

Culm: length [cm] (7.3.25)

Measured from ground level to the base of the panicle. Record the average of five actual measurements, to the nearest cm.

Stage: cultivated species after flowering to maturity; wild species seven days after anthesis.

Alternatively, cultivated species can be coded as follows:

1	Very short	(<50 cm)
2	Very short to short	(51–70 cm)
3	Short	(71–90 cm)
4	Short to intermediate	(91–105 cm)
5	Intermediate	(106–120 cm)
6	Intermediate to long	(121–140 cm)
7	Long	(141–155 cm)
8	Long to very long	(156–180 cm)
9	Very long	(>180 cm)

Culm: anthocyanin colouration on nodes (7.3.28)

The presence and distribution of purple colour from anthocyanin, observed on the outer surface of the nodes on the culm.
Stage: after flowering to near maturity

	(IRRI)	
0	0	Absent
1	080	Purple
2	081	Light purple
3	084	Purple lines

Culm: underlying node colour (7.3.29)

The underlying colour of the outer surface of the nodes on the culm, ignoring any anthocyanin colouration.
Stage: after flowering to near maturity

	(IRRI)	
0	0	No underlying colour visible due to anthocyanin
1	041	Light gold
2	060	Green

Flag leaf: attitude (late observation) (7.3.34)

(Cultivated species). Observed near the collar. Angle of attachment between the flag leaf blade and the main panicle axis. Record the average of five samples.
Stage: maturity

1	Erect
3	Semi-erect
5	Horizontal
7	Descending

Stigma: colour (7.4.2)

Observed at anthesis (between 0900 and 1400) using a hand lens

	(IRRI)	
1	010	White
2	061	Light green
3	030	Yellow
4	081	Light purple
5	080	Purple

Lemma: colour of apiculus (early observation) (7.4.6)

Stage: cultivated species after anthesis to hard dough stage (pre-ripening stage); wild species at anthesis

	(IRRI)	
1	010	White
2	020	Straw
3	052	Brown (tawny)
4	060	Green
5	070	Red
6	071	Red apex
7	080	Purple
8	087	Purple apex
9	100	Black

Awns: distribution (7.4.9)

(Cultivated species). The presence and distribution of awns along the panicle.
Stage: flowering to maturity

0 None (awnless)
1 Tip only
2 Upper quarter only
3 Upper half only
4 Upper three-quarters only
5 Whole length

Panicle: length [cm] (7.4.18)

(Wild species). Length of main axis of panicle measured from the panicle base to the tip. Record the average of five representative plants.
Stage: seven days after anthesis or upon full panicle exsertion

Panicle: attitude of main axis (7.4.19)

Stage: near maturity

1 Upright
2 Semi-upright
3 Slightly drooping
4 Strongly drooping

Panicle: attitude of branches (7.4.20)

The compactness of the panicle, classified according to its mode of branching, angle of primary branches, and spikelet density.
Stage: cultivated species near maturity; wild species seven days after anthesis

1 Erect (compact panicle)
3 Semi-erect (semi-compact panicle)
5 Spreading (open panicle)
7 Horizontal
9 Drooping

Panicle: exsertion (7.4.22)

Extent to which the panicle is exserted above the flag leaf sheath.
Stage: near maturity

1 Enclosed (panicle is partly or entirely enclosed within the leaf sheath of the flag leaf blade)
3 Partly exserted (panicle base is slightly beneath the collar of the flag leaf blade)
5 Just exserted (panicle base coincides with the collar of the flag leaf blade)
7 Moderately well exserted (panicle base is above the collar of the flag leaf blade)
9 Well exserted (panicle base appears well above the collar of the flag leaf blade)

Lemma and palea: pubescence (7.5.4)

Visual assessment of the presence and distribution of mature grains using a hand lens

1 Glabrous
2 Hairs on lemma keel
3 Hairs on upper portion
4 Short hairs
5 Long hairs (velvety)

Sterile lemma: length [mm] (7.5.10)

Record the average length of five spikelets. For spikelets with symmetrical sterile lemmas (i.e. sterile length the same on both sides), record the length here. For spikelets with asymmetrical sterile lemmas (i.e. sterile lemma on one side longer than that on the other), record here only the length of the shorter sterile lemma (see **7.5.11** for the longer sterile lemma).
May be coded as:

3 Short
5 Medium
7 Long
9 Extra long

Longer sterile lemma: length [mm] (7.5.11)

(Only for spikelets with asymmetrical sterile lemmas). Record the average length of the longer sterile lemma on five spikelets.
May be coded as:

3 Short
5 Medium
7 Long
9 Extra long

Sterile lemma: colour (7.5.13)

Observe five representative plants

	(IRRI)	
1	020	Straw
2	040	Gold
3	070	Red
4	080	Purple

Caryopsis: length [mm] (7.5.20)

Caryopsis: shape (7.5.22)

1 Round
2 Semi-round
3 Half spindle-shaped
4 Spindle-shaped
5 Long spindle-shaped

Caryopsis: pericarp colour (7.5.23)

	(IRRI)	
1	010	White
2	051	Light brown
3	055	Speckled brown
4	050	Brown
5	070	Red
6	088	Variable purple
7	080	Purple

Caryopsis: scent (8.1.2)

From cooked kernel. Use freshly harvested grain. A molecular marker for fragrance is described in Section **12.3, Fragrance** of 'Descriptors for wild and cultivated Rice (*Oryza* spp.)'

0 Non-scented
1 Lightly scented
2 Scented

Endosperm amylose content [%] (8.1.3)

Amylose content of all cultivars of low amylose and many of intermediate amylose is sensitive to high temperatures during grain-filling. Molecular markers for classifying amylose are listed in Section **12.1, Amylose content** of 'Descriptors for wild and cultivated Rice (*Oryza* spp.)'

0	Waxy-glutinous	(<3)
1	Very low	(~9)
3	Low	(~17)
5	Intermediate	(~20)
7	High	(~23)
9	Very high	(>25)

Phenotypic acceptability [IS-10] (8.1.a)

Breeding objectives for each location vary. The score should reflect the overall acceptability of the variety in the location where it is being grown.
Stage: maturity

1 Excellent
3 Good
5 Fair
7 Poor
9 Unacceptable

ABIOTIC STRESSES

Cold [IS-75] (9.1)

Heat [IS-76] (9.2)

Drought [IS-80] (9.3)

Alkali injury and salt injury [IS-70-71] (9.4)

Flood or submergence [IS-86] (9.8)

BIOTIC STRESSES

Leaf blast (*Magnaporthe grisea*) [IS-30] (10.1.1)

Brown spot (*Cochliobolus miyabeanus*) [IS-32] (10.1.3)

Bacterial leaf streak (*Xanthomonas oryzae* pv. *oryzicola*) [IS-33] (10.1.5)

Bacterial blight (*Xanthomonas oryzae* pv. *oryzae*) [IS-35] (10.1.7)

Sheath blight (*Thanatephorus cucumeris*) [IS-37] (10.2.6)

Rice tungro bacilliform virus (RTBV) [IS-36] (10.2.a)

Brown planthopper (*Nilaparvata lugens*) [IS-60] (10.3.1)

Stem borer (*Chilo suppressalis*) [IS-63] (10.3.5)

CONTRIBUTORS

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