PROPOSAL FOR IDENTIFICATION OF PEARL MILLET HYBRID MPMH 17 (MH 1663)

(Mandor Pearl Millet Hybrid 17)

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Summary of Proposal (in bullets only)

- MPMH 17 is a dual-purpose hybrid of pearl millet providing high grain and stover yields.
- The hybrid MPMH 17 is a cross between male-sterile line ICMA04999 (female parent) and restorer MIR 525-2 (male parent). The line ICMA04999 is based on A_1 source of cytoplasmic male-sterility.
- Tested in the All India Coordinated Pearl Millet Improvement Project tirals during 2009-2011 at 57 locations (18 locations each in 2009 and 2011; and 21 locations in 2010) along with four checks viz., Pusa 23, ICMH 356, GHB 744 and RHB 121.
- Consistent performance of MPMH 17 very during three years of evaluations: hybrid ranked first among all test entries including checks in 2009 and 2011 and ranked 2nd in 2010.
- On an average, it provided grain yield of 2835 kg/ha which was 10-40% higher than yields of four checks i.e. Pusa 23 (2028 kg/ha), ICMH 356 (2371 kg/ha), GHB 744 (2543 kg/ha) and RHB 121 (2576 kg/ha).
- MPMH 17 also provided higher stover yield (64q/ha) than Pusa 23 (52 q/ha), ICMH 356 (56 q/ha) and GHB 744 (63 q/ha), though its stover yield was slightly (1.5%) lesser than that of RHB 121 (65 q/ha).
- The maturity duration of MPMH 17 and four checks was almost at par (77-79 days). In spite of same crop duration, the considerable superiority of MPMH 17 to checks highlights that the growth rate and per day productivity of this hybrid is higher than those of checks.
- Another distinctive advantage of MPMH 17 is its high level of resistance to downy mildew and blast, two most important diseases of pearl millet. Under artificially created epiphytotic conditions at 19 hot-spot locations during 2009-2011, MPMH 17 showed only 1.2% downy mildew incidence in comparison to 2-6% downy mildew incidence on checks.
- Blast incidence in this hybrid was 9% in comparison to 10-15% of that of four checks.
- MPMH 17 responded very favourably to the additional doses of nitrogen. The yield improvement at 60 kg N/ha and 90 kg N/ha 802 was 12% and 20%, respectively over the basal dose of 30 kg N/ha during testing in AICPMIP trials.
- The hybrid MPMH 17 matures, on an average, in 79 days and takes 48 days to flower. It is high tillering (2.7 panicles/plant) and produces very compact panicles of 22-24 cm length filled with medium sized grains (seed weight of 8.0 g/1000 grain) of globular shape and grey-brown colour. The hybrid attains the height of approximately 180 cm and produces panicles that are, on an average, 2.6 cm thick.
- Looking to its grain and stover yields and disease resistance, MPMH 17 is being proposed for identification for rainfed conditions of Kharif season in the states of Rajasthan, Gujarat, Haryana, Punjab, Madhya Pradesh, Uttar Pradesh and Delhi under rainfed conditions of kharif season.

Proforma for Submission of Proposals for Identification of Crop Varieties/ Hybrids by Workshops

1	Name of the crop and species	:	Pearl millet (*Pennisetum glaucum* (L.) R. Br.]
2	a) Name of the variety under which tested in AICRP trials	:	MH 1663
	b) Proposed name of the variety	:	MPMH 17
3	Sponsored by (institute)	:	
4	a) Institution or agency responsible for developing variety (with full address)	:	Project Coordinator All India Coordinated Pearl Millet Improvement Project, Mandor, Jodhpur (Raj.)
	b) Name of the person who helped in the development of the variety Developers Collaborators	:	• Xxxxx • Xxxxx • Xxxxx • Xxxxx • Xxxxx
5	a) Parentage (with details of its pedigree including source from which variety/Inbred/ A, B and R lines of hybrid has been developed)	:	ICMA 04999 x MIR 525-2 Female parent **ICMA 04999** developed at ICRISAT, Patancheru by backcrossing ICMB 04999 to 81A cytoplasm source. Male parent **MIR 525-2** developed at AICPMIP, Jodhpur
	b) Source of material in case of introduction	:	NA
	c) DNA profile of variety/hybrid/inbred/A, B, R line of hybrid vis-à-vis check variety/ line		Attached (see annexure ---)
	d) Breeding method used	:	Pedigree and back cross breeding for parental lines and heterosis Breeding for hybrid
	e) Breeding objective	:	High and stable yields, resistance to downy mildew and blast and other diseases
6	State the varieties which are most closely resemble the proposed variety in general characters	:	RHB 121 (Alternative to ICMH 356, Pusa 23, RHB 121 and GHB 744)
7	Recommended productions ecology (Rainfed/Irrigated; high/low fertility; season)	:	Rainfed, Kharif, both high and low fertility

8	Specific area of its adaptation (zones and states for which variety is proposed) and recommended productions ecology	:	Zone A of AICPMIP comprising of states of Rajasthan, Gujarat, Haryana, Punjab, Madhya Pradesh, Uttar Pradesh and Delhi		
9	Description of hybrid/variety	:			
	a) Plant height	:	179 cm (175 - 185 cm)		
	b) Distinguishing morphological characters	:	Hybrid MPMH 17 possesses yellow anthers, has pubescence at nodes, shows complete exertion and has long brown bristles that are very helpful in reducing the extent of bird damage in crop. Anthocyanin pigmentation of glumes and tip sterility are absent in hybrids as well as in both parental lines of hybrid. The flowering time of both parental lines is similar (47 days) and thus no problem in nicking is encountered in certified seed production plots of hybrid.		
	c) Maturity (range in number of days) (from seedling/ transplanting to flowering, seed to seed)	:	79 days (--- to – days)		
	d) Maturity group (early, medium and late wherever such classification exists)	:	Medium		
	e) Reaction to major diseases under field and controlled conditions (reaction to physiological strains/ races/pathotypes/ bio-types to be indicated wherever possible)	:	Highly resistant to downy mildew Highly resistant to blast		
	f) Reaction to major pests (under field and controlled condition including store pests)	:	Resistant to stem borer, shoot fly (see Annexure ----)		
	g) Agronomic features (e.g. resistance to lodging, shattering, fertilizer responsiveness, suitability to early or late sown conditions, seed rate etc.)	:	Highly responsive to fertilizers and suitable for both early and late plantings (see Annexure ----)		
	h) Quality of produce	:			
	Grain quality	:	Good and acceptable		
	Fodder quality	:	Good and acceptable		
	i) Reaction to stresses	:	Tolerant (see Annexure ----)		
10	Description of the parents of	:	A line/Inbred 1	B line/Inbred 2	R line

	the hybrid				
	a) Plant height (cm)	:	181 cm	180 cm	185 cm
	b) Distinguishing morphological characters	:	No bristles Brown anther	No bristles Brown anther	Brown bristles Yellow anther
	c) Days to flowering	:	47	47	47
	d) Days to maturity (range in number of days – from seed to seed)	:			
	e) Is there any problem of synchronization? If yes, method to overcome it	:	No	No	No
	f) Reaction to major diseases (under field and controlled conditions, reaction to physiological strains/ races/bio-types/ pathotypes to be indicated wherever possible)	:	Resistant	Resistant	Resistant
	g) Reaction to major pests (under field and controlled conditions including store pests)	:	Resistant	Resistant	Resistant
	h) Agronomic features (e.g. resistance to lodging, shattering, fertilizer responsiveness, suitability to early or late sown conditions, seed rate etc.)	:	Highly responsive to fertilizers and good management	Highly responsive to fertilizers and good management	Highly responsive to fertilizers and good management
	i) Reaction to stresses	:			
11	a) Yield data in coordinated trials (breeding, agronomy, pathology, entomology, quality etc) regional/inter regional district trials year wise (levels of fertilizer application, density of plant population and superiority over local control/standard variety to be indicated (to be attached)	:	See Table ---		
	b) Yield data from national, demonstration/large scale demonstrations (to be attached)	:	See Table ---		
12	a) Agency responsible for maintaining breeder seed	:	All India Coordinated Pearl Millet Improvement Project, Mandor, Jodhpur (Raj.)		

	b) Quantity of breeder seed in stock (kg) Variety A line B line R line Hybrid	:	 --- kg --- kg --- kg --- kg
13	Specific recommendations, if any, for seed production (e.g. staggered sowing, plating ratio of parental lines of hybrids in foundation and certified seed production, probable area of seed production)	:	Flowering time of both A and R lines are similar and hence no need of staggered planting. Ratio of 4Female and 1Male can be followed in seed production plots. Any area that highly productive and where isolations are available preferably in the rain-free season.
14	Vivid presentation (field view, close-up of single plant and seed/economic parts)		Pictures attached
15	Package of practices along with attainable yield levels		Attached (See Annexure ----) a) Sustainability of variety for the area; b) Selection of field/land preparation; c) Seed treatment; d) Sowing time; e) Seed rate/sowing method-line sowing with Row to row & Plant to Plant distance; f) Fertilizer doses; g) Weed control; h) Disease & Pest Control; i) Irrigation; j) Harvesting; k) Quality characteristics of the variety, if any
16	Any other pertinent information	:	The presence of long bristles in the hybrid are very effective in preventing the bird damage

Signature of proposer and contributors

Signature of Head of institution

Table 1. Summary of grain yield (kg/ha) data of Coordinated HybridTrials

Name of proposed Hybrid: MH 1663 (MPMH 17) **Adaptability zone : Zone A** (Raj., Guj., Haryana, Punjab, MP. UP, Delhi)

Production condition : Kharif (Rainfed)

Parameter	Year of testing	No. of trials	Proposed Hybrid MH 1663	Check Hybrids				Qualifying Hybrid MH 1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
Mean grain yield (kg/ha)	2009	18	2818	2232	2409	2677	2680	2756
	2010	21	2584	1930	2272	2436	2443	2521
	2011	18	3144	1938	2448	2533	2627	2967
	Mean	**57**	**2835**	**2028**	**2371**	**2543**	**2576**	**2736**
Per cent increase (+)or decrease (-) over checks	2009			(+) 26.2	(+) 17.0	(+) 5.3	(+) 5.1	(+) 2.2
	2010			(+) 33.9	(+) 13.7	(+) 6.1	(+) 5.8	(+) 2.5
	2011			(+) 62.2	(+) 28.4	(+) 24.1	(+) 19.7	(+) 6.0
	Mean			(+) **39.8**	(+) **19.6**	(+) **11.5**	(+) **10.1**	(+) **3.6**
Frequency in the top 5 group	2009		8/18	0/18	1/18	4/18	5/18	5/18
	2010		14/21	1/21	5/21	11/21	11/21	11/21
	2011		16/18	1/18	3/18	5/18	6/18	12/18
Pooled for 3 years	**Mean**		**38/57**	**2/57**	**9/57**	**20/57**	**22/57**	**28/57**

Note: 1. The proposed hybrid MH 1663 and qualifying hybrid have completed three years of testing in coordinated trials
2. Year wise and centre wise data appended at Annexure I.

Ref. – AIPMIP Annual Report 2009-10 (Page BR 37), 2010-11 (Page BR 99), and 2011-12 (Page Breeding 84)

Note:

1. Qualifying variety is one which has completed three years of testing in coordinated trials
2. Centre- wise and year -wise data must be appended, otherwise proposal will not be considered

Table 2. Summary of dry fodder yield (q/ha) data of Coordinated Hybrid Trials

Name of proposed Hybrid: MH 1663 (MPMH 17) **Adaptability zone** **: Zone A** (Raj., Guj., Haryana, Punjab, MP. UP, Delhi)

Production condition **: Kharif (Rainfed)**

Parameter	Year of testing	No. of trials	Proposed Hybrid MH 1663	Check Hybrids				Qualifying Hybrid MH 1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
Mean dry fodder yield (kg/ha)	2009	15	69	64	61	72	71	69
	2010	18	61	45	55	60	63	65
	2011	16	62	48	52	58	63	62
	Mean	**49**	**64**	**52**	**56**	**63**	**65**	**65**
Per cent increase (+)or decrease (-) over checks	2009			(+) 7.8	(+) 13.1	(-) 4.2	(-) 2.8	0.0
	2010			(+) 35.6	(+) 10.9	(+) 1.7	(-) 3.2	(-) 6.2
	2011			(+) 29.2	(+) 19.2	(+) 6.9	(-) 1.6	0.0
	Mean			(+) **23.1**	(+) **14.3**	(+) **1.6**	(-) **1.5**	(-) **1.5**

Note: 1. The proposed hybrid MH 1663 and qualifying hybrid have completed three years of testing in coordinated trials

2. Year wise and centre wise data appended at Annexure II.

Ref. – AIPMIP Annual Report 2009-10 (Page BR 39), 2010-11 (Page BR 100), and 2011-12 (Page Breeding 85)

Table 3. Summary of days to 50% flowering data of Coordinated Hybrid Trials

Name of proposed Hybrid: MH 1663 (MPMH 17) **Adaptability zone** **: Zone A** (Raj., Guj., Haryana, Punjab, MP. UP, Delhi)

Production condition **: Kharif (Rainfed)**

Parameter	Year of testing	No. of trials	Proposed Hybrid MH 1663	Check Hybrids				Qualifying hybrid MH 1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
Mean Days to 50% flowering	2009	19	49	48	48	51	49	48
	2010	21	48	47	47	49	47	48
	2011	18	47	45	46	47	46	49
	Mean	**58**	**48**	**47**	**47**	**49**	**47**	**48**

Note: Year wise and centre wise data appended at Annexure III.

Table 4. Summary of days to maturity data of Coordinated Hybrid Trials

Name of proposed Hybrid: MH 1663 (MPMH 17) **Adaptability zone** **: Zone A** (Raj., Guj., Haryana, Punjab, MP. UP, Delhi)

Production condition **: Kharif (Rainfed)**

Parameter	Year of testing	No. of trials	Proposed Hybrid	Check Hybrids				Qualifying hybrid
			MH 1663	Pusa 23	ICMH 356	GHB 744	RHB 121	MH 1655
Mean Days to maturity	2009	16	79	77	79	80	78	78
	2010	16	79	79	79	80	77	80
	2011	14	78	76	78	78	77	78
	Mean	**46**	**79**	**77**	**79**	**79**	**77**	**79**

Note: Year wise and centre wise data appended at Annexure IV.

Table 5. Summary of ancillary data of Coordinated Hybrid Trials

Name of proposed hybrid: MH 1663 (MPMH 17) **Adaptability zone : Zone A** (Raj., Guj., Haryana, Punjab, MP. UP, Delhi)

Production condition : Kharif (Rainfed)

Parameter	Year of testing	No. of trials	Proposed Hybrid MH 1663	Check Hybrids				Qualifying Hybrid MH 1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
Mean Plant height (cm)	2009	19	175	184	174	188	181	175
	2010	21	178	191	183	194	187	187
	2011	18	185	195	188	185	189	190
	Mean	**58**	**179**	**190**	**182**	**189**	**186**	**184**
Mean Productive Tillers/ plant	2009	19	2.7	2.3	2.5	2.4	2.6	2.7
	2010	20	2.8	2.4	2.7	2.7	2.9	2.8
	2011	17	2.6	2.3	2.6	2.6	2.9	3.0
	Mean	**56**	**2.7**	**2.3**	**2.6**	**2.6**	**2.8**	**2.8**
Mean Panicle length (cm)	2009	19	22	24	20	22	22	24
	2010	20	23	24	20	22	22	23
	2011	17	23	24	20	21	21	23
	Mean	**56**	**23**	**24**	**20**	**22**	**22**	**23**
Mean Panicle girth (cm)	2009	8	2.5	2.5	2.5	2.4	2.5	2.6
	2010	11	2.7	2.6	2.6	2.7	2.5	2.6
	2011	10	2.7	2.3	2.8	2.5	2.3	2.7
	Mean	**29**	**2.6**	**2.5**	**2.6**	**2.5**	**2.4**	**2.6**
Mean 1000 seed Wt. (g)	2010	15	8.0	8.6	9.6	9.4	7.8	7.4
	2011	12	8.1	7.9	8.9	7.9	7.6	8.2
	Mean	27	**8.0**	**8.3**	**9.3**	**8.7**	**7.7**	**7.8**
Protein (%)	2010	2	8.7	12.8	9.2	8.3	10.1	9.1
	2011	2	10.2	10.0	11.8	10.4	10.3	10.1
	Mean	4	**9.5**	**11.4**	**10.5**	**9.4**	**10.2**	**9.6**
Fat (%)	2010	2	5.8	4.7	6.0	5.4	5.3	4.6
	2011	2	6.8	5.8	6.3	5.9	6.1	6.2
	Mean	4	**6.3**	**5.2**	**6.2**	**5.7**	**5.7**	**5.4**

Ref: AIPMIP Annual Report 2009-10 (Page BR 45-54), Annual Report 2010-11 (Page BR 103-108 and BR 197-198) and Annual Report 2011-12 (Page Breeding 88-94 and Breeding 195-197)

Table 6. Adaptability to change in agronomic conditions

Name of proposed Hybrid: MH 1663 (MPMH 17) **Adaptability zone** **: Zone A** (Raj., Guj., Haryana, Punjab, MP. UP, Delhi)

Production condition **: Kharif (Rainfed)**

Experiment	Year of testing	No. of trials	Item	Proposed Hybrid MH 1663	Check Hybrid RHB 121	Qualifying Hybrid MH 1655
Fertilizer experiment response to nitrogen	**2011**	**5**	**Grain yield (kg/ha)**			
			N_1 (30 kg/ha)	2403	2364	2497
			N_2 (60 kg/ha)	2700	2637	2795
			N_3 (90 kg/ha)	2893	2863	3137
			Mean	**2665**	**2621**	**2810**
			Dry fodder yield (kg/ha)			
			N_1 (30 kg/ha)	74	72	75
			N_2 (60 kg/ha)	79	77	80
			N_3 (90 kg/ha)	85	83	89
			Mean	**79**	**77**	**81**
			Days to 50% flowering			
			N_1 (30 kg/ha)	46	45	49
			N_2 (60 kg/ha)	47	46	49
			N_3 (90 kg/ha)	47	46	48
			Mean	**47**	**46**	**49**
			Plant height (cm)			
			N_1 (30 kg/ha)	184	186	180
			N_2 (60 kg/ha)	184	186	183
			N_3 (90 kg/ha)	194	194	188
			Mean	**187**	**189**	**184**

Ref: AIPMIP Annual Report 2011-12 (Page Agro 22)

Table 7. Reaction to major diseases

Name of proposed Hybrid: MH 1663 (MPMH 17) **Adaptability zone : Zone A** (Raj., Guj., Haryana, Punjab, MP. UP, Delhi)

Production condition : Kharif (Rainfed)

Parameter	Year of testing	No. of Trials	Proposed Hybrid	Check Hybrids				Qualifying hybrid
			MH 1663	Pusa 23	ICMH 356	GHB 744	RHB 121	MH 1655
Downy mildew % at 30 DAS	2009	7	0.8	0.18	1.07	0.58	0.8	0.0
	2010	7	0.3	0.7	0.9	0.5	2.8	0.2
	2011	5	0.0	1.4	0.5	2.7	6.1	1.0
	Mean	19	**0.4**	**0.7**	**0.8**	**1.1**	**2.9**	**0.3**
Downy mildew % at 60 DAS	2009	7	1.1	0.6	1.8	2.1	3.7	0.9
	2010	7	1.1	5.1	4.9	1.1	6.5	0.9
	2011	7	1.4	1.2	1.6	4.1	7.8	1.2
	Mean	21	**1.2**	**2.3**	**2.8**	**2.4**	**6.0**	**1.0**
Smut %	2009	4	13.0	20.3	25.4	7.6	11.7	9.6
	2010	4	9.4	19.6	26.6	14.1	19.3	10.7
	2011	4	8.7	24.5	20.9	20.2	16.4	11.1
	Mean	12	**10.3**	**21.4**	**24.3**	**14.0**	**15.8**	**10.5**
Rust %	2009	3	10.8	5.0	10.0	8.3	15.0	1.7
	2010	3	34.3	26.7	33.3	18.3	30.0	32.5
	2011	4	28.8	24.4	36.6	29.8	22.0	22.5
	Mean	10	**25.0**	**19.3**	**27.6**	**19.9**	**22.3**	**19.3**
Ergot %	2009	-	-	-	-	-	-	-
	2010	1	3.4	7.6	4.1	2.9	1.2	2.0
	2011	1	8.6	7.8	4.5	6.6	3.0	9.5
	Mean	2	**6.0**	**7.7**	**4.3**	**4.8**	**2.1**	**5.8**
Blast %	2009	1	7.5	17.5	9.0	17.5	17.5	5.0
	2010	3	6.7	12.0	5.2	4.2	7.7	7.7
	2011	3	12.6	19.8	16.7	13.5	20.6	11.0
	Mean	7	**9.3**	**16.1**	**10.6**	**10.1**	**14.6**	**8.7**

Ref: AIPMIP Annual Report 2009-10 (Page PP 52-67), 2010-11 (Page PP 72-81) and 2011-12 (Page Pathology 41-50)
Note: Year wise and centre wise data appended at Annexure IX.

Table 8. Reaction to major insects

Name of proposed hybrid: MH 1663 (MPMH 17) **Adaptability zone : Zone A** (Raj., Guj., Haryana, Punjab, MP. UP, Delhi)

Production condition : Kharif (Rainfed)

Parameter	Year of testing	No. of trials	Proposed Hybrid	Check Hybrids				Qualifying Hybrid
			MH 1663	Pusa 23	ICMH 356	GHB 744	RHB 121	MH 1655
Shoot fly damage (%) Seedling/vegetative stage (at 28-DAG)	2010	2	11.0	9.9	8.0	7.1	9.0	11.3
	2011	2	1.3	3.5	3.4	1.5	5.1	3.1
	Mean	4	**6.2**	**6.7**	**5.7**	**4.3**	**7.0**	**7.2**
Shoot fly damage (%) Earhead stage	2010	2	4.9	7.8	10.7	4.3	7.8	5.0
	2011	2	5.3	3.0	7.2	3.7	7.1	1.3
	Mean	4	**5.1**	**5.4**	**9.0**	**4.0**	**7.4**	**3.1**
Stem borer Damage Seedling stage (% infestation)	2010	2	7.4	5.5	5.1	6.5	4.4	7.3
	2011	1	6.1	5.2	6.1	11.3	13.5	14.8
	Mean	3	**7.0**	**5.4**	**5.4**	**8.1**	**7.4**	**9.8**
Stem borer Damage Earhead stage (% earhead loss)	2010	2	5.2	4.7	8.0	7.3	9.0	9.0
	2011	2	10.7	4.0	9.3	6.2	4.6	8.8
	Mean	4	**8.0**	**4.4**	**8.6**	**6.8**	**6.8**	**8.9**
Grey weevil Damage score Seedling stage (35 DAG)	2010	2	0.8	1.0	1.2	1.0	0.5	1.2
	2011	1	0.0	1.3	1.1	1.0	2.0	1.3
	Mean	**3**	**0.6**	**1.1**	**1.1**	**1.0**	**1.0**	**1.2**
Grey weevil Damage score Earhead stage (50 DAG)	2010	2	2.5	2.8	2.5	1.0	1.7	3.5
	2011	1	1.0	4.3	1.3	2.3	5.3	4.0
	Mean	**3**	**2.0**	**3.3**	**2.1**	**1.4**	**2.9**	**3.7**
Chafer Beetle Damage score	2010	2	0.8	0.0	0.3	1.2	0.2	1.2
	2011	2	0.0	0.5	0.0	0.2	0.8	0.0
	Mean	**4**	**0.4**	**0.3**	**0.2**	**0.7**	**0.5**	**0.6**

Ref: AIPMIP Annual Report 2010-11 (Page ENTO 13-16) and Annual Report 2011-12 (ENTO 9-12)

Appendix I: DESCRIPTION OF THE PEARL MILLET HYBRID AND PARENTAL LINES

S. No.	Description		Hybrid	Female	Male
			MH 1663	ICMA 04999	MIR 525-2
1.	Plant :Growth habit	:	Erect	Erect	Erect
2.	Time of spike emergence (days)	:	Very Early (42)	Medium (47)	Medium (47)
3.	Leaf : Sheath pubescence	:	Absent	Absent	Absent
4.	Leaf : Sheath length (cm)	:	Long (17.4)	Long (15.9)	Medium (14.1)
5.	Leaf : Blade length (cm)	:	Long (61.05)	Short (42.3)	Medium (51.4)
6.	Leaf : Blade width (at widest point) (cm)	:	Broad (4.7)	Narrow (2.9)	Broad (4.2)
7.	Spike : Anther colour	:	Yellow	Brown	Yellow
8.	Plant : Node pubescence	:	Present	Absent	Present
9.	Plant : Number of nodes	:	Low (8.4)	Low (9.9)	Low (7.5)
10.	Plant : Node pigmentation	:	Purple	Brown	Brown
11.	Plant : Internode pigmentation	:	Green	Green	Green
12.	Spike exertion	:	Complete	Complete	Complete
13.	Spike : Length (cm)	:	Medium (26.0)	Small (19.2)	Small (17.0)
14.	Spike : Anthocyanin pigmentation of glume	:	Absent	Absent	Absent
15.	Spike : Bristle	:	Present	Absent	Present
16.	Spike : Bristle colour	:	Brown	-	Brown
17.	Spike : Girth [maximum point (excluding bristles] (cm)	:	Medium (3.0)	Medium (2.5)	Medium (2.2)
18.	Spike : Shape	:	Lanceolate	Lanceolate	Conical
19.	Plant : Number of productive tillers	:	Low (3.0)	Low (2.4)	Low (2.6)
20.	Plant : Height (excluding spike) (cm)	:	Medium (181.2)	Short (105.5)	Short (141.5)
21.	Spike : Tip sterility	:	Absent	Absent	Absent
22.	Spike : Density	:	Very Compact	Compact	Compact
23.	Seed : Colour	:	Grey brown	Deep grey	Yellow brown
24.	Seed shape	:	Globular	Globular	Globular
25.	1000 Seed weight		Small (6.5)	Small (7.2)	Small (6.6)

Centre-wise and year-wise data of grain yield (kg/ha)

Year	Name 0f Trial	Location	Proposed Hybrid	Check Varieties				Qualifying Hybrid
			MH1663	Pusa 23	ICMH 356	GHB 744	RHB 121	MH1655
2009	IHT II A	Bikaner	1400	1156	756	1111	1156	1422
		Jaipur	1853	1600	1547	1822	1778	2080
		Rajasthan Mean	1627	1378	1151	1467	1467	1751
		Kothara	1348	1304	1407	1778	1689	1367
		S.K.Nagar*	1991	1348	1604	2485	1813	1348
		Mahuva	2359	1741	2311	1474	2407	1796
		Anand	4911	3556	4067	4436	4356	3993
		Jamnagar	2163	1376	924	1524	1372	1213
		Ahmedabad	2649	2262	3400	3384	3868	3844
		Vadodara	3876	2520	2458	3680	3373	3929
		Gujarat Mean	2757	2015	2310	2680	2697	2499
		Kalai	1667	2000	2156	2467	1822	2289
		Eglas	4517	2606	2300	2811	3778	3272
		U P Mean	3092	2303	2228	2639	2800	2781
		Hisar	3270	2794	3125	3083	2932	3764
		Bawal	1882	1424	2038	1979	1899	2531
		Shikohpur	2320	2120	3062	2383	2550	2363
		Raipur	3799	4313	4016	4865	4663	4383
		Aryanagar	4680	3210	3789	3949	3497	3754
		Haryana Mean	3190	2772	3206	3252	3108	3359
		Gwalior	2096	2242	1665	2344	1915	2301
		Ludhiana	3584	1987	2389	3053	3053	3028
		New Delhi	2357	1969	1949	2051	2128	2284
		Zone Mean	2818	2232	2409	2677	2680	2756
2010	AHT (M) A	Mandor	1624	1522	1189	1449	1630	1766
		Bikaner	1844	1500	1789	1700	2144	2456
		Alwar	4324	2343	3838	4208	3722	4333
		Jaipur	689	527	664	871	689	640
		Tabiji	2844	2244	2444	2467	3156	2133
		Rajasthan Mean	2265	1627	1985	2139	2268	2266
		Kothara	1217	1115	1111	1522	1269	1335
		S.K.Nagar	1157	680	1000	1310	1223	1013
		Anand	4044	3111	3089	3267	3396	3644
		Jamnagar	1469	1057	1728	1318	1285	1382
		Ahmedabad	2502	1874	2339	2064	2358	2059
		Vadodara	3409	1541	2231	3259	3130	3648
		Gujarat Mean	2300	1563	1916	2123	2110	2180
		Kalai	2256	2356	1233	2356	900	2344
		Aligarh	1968	2451	2627	2396	2981	2731
		U P Mean	2112	2403	1930	2376	1941	2538
		Hisar	3112	2018	2588	2966	2799	4310
		Bawal	2599	1897	3136	1914	2467	2247
		Shikohpur	2856	2012	2177	2022	1309	1364
		Raipur	4810	2947	3861	4178	4209	4370
		Haryana Mean	3344	2218	2940	2770	2696	3073
		Morena	2106	2564	2521	2979	3117	2585
		Gwalior	4716	3329	3928	4406	4849	4492
		M P Mean	3411	2946	3225	3693	3983	3538
		Ludhiana	2936	2130	2400	2770	2953	2168
		New Delhi	1778	1304	1822	1733	1719	1911
		Zone Mean	2584	1930	2272	2436	2443	2521
2011	AHT (M) A	Mandor	5448	2665	3040	4459	3778	4852
		Bikaner	784	573	664	684	624	744
		Alwar	3940	3009	3101	2671	3773	3710
		Jaipur	1702	976	1747	1418	1467	1096
		Tabiji	2800	2833	2917	3100	2833	3233
		Rajasthan Mean	2935	2011	2294	2467	2495	2727
		S.K.Nagar	2330	1472	1918	2344	2083	1618
		Mahuva	892	1147	989	1169	1100	731
		Anand	4067	1800	2800	2356	2844	3889
		Jamnagar	1426	1125	1169	1162	881	1347
		Ahmedabad	3683	2530	2750	3058	3481	4070
		Gujarat Mean	2479	1615	1925	2018	2078	2331
		Hisar	5051	2651	3201	3711	4087	4467
		Bawal	3739	2588	3176	3171	3343	2942
		Shikohpur	2850	1083	2786	2119	2191	3537
		Haryana Mean	3880	2107	3054	3000	3207	3649
		Morena	4500	2271	3417	2604	3313	3854
		Gwalior	2781	1622	2011	2161	2511	3329
		M P Mean	3640	1947	2714	2382	2912	3591
		Ludhiana	3429	1818	2647	2671	2591	2893
		New Delhi	2711	1719	1674	2652	2444	2741
		Najab garh	4460	3009	4056	4086	3948	4355
		Delhi Mean	3585	2364	2865	3369	3196	3548
		Zone Mean	3144	1938	2448	2533	2627	2967

Ref: AIPMIP Annual Report 2009-10 (Page BR 37), Annual Report 2010-11 (Page BR 99) and Annual Report 2011-12 (Page Breeding 84)

*= Not included in zonal mean

Annexure-II

Centre-wise and year-wise data of fodder yield (q/ha)

Year	Name 0f Trial	Location	Proposed Hybrid	Check Varieties				Qualifying Hybrid
				Pusa 23	ICMH 356	GHB 744	RHB 121	
			MH1663					MH1655
2009	IHT II A	Bikaner	21	22	15	19	24	21
		Jaipur	49	60	44	42	42	60
		Rajasthan Mean	35	41	30	30	33	41
		Kothara	26	25	27	32	31	27
		S.K.Nagar*	17	20	24	30	18	17
		Mahuva*	22	22	48	37	52	22
		Anand	87	73	58	71	80	65
		Jamnagar	25	18	11	16	15	16
		Ahmedabad	56	47	73	59	81	83
		Vadodara	87	113	93	98	80	89
		Gujarat Mean	46	46	48	49	51	46
		Kalai	67	66	63	99	77	81
		Eglas	94	72	67	106	72	50
		U P Mean	81	69	65	102	75	65
		Hisar	95	94	86	91	85	102
		Bawal	49	55	60	78	73	62
		Raipur	95	108	120	146	140	131
		Aryanagar	127	115	124	128	125	127
		Haryana Mean	91	93	98	111	106	106
		Gwalior	66	40	37	50	74	56
		Ludhiana	98	53	31	49	71	67
		Zone Mean	69	64	61	72	71	69
2010	AHT (M) A	Mandor	22	27	20	29	25	28
		Bikaner	38	43	36	41	44	35
		Alwar	161	86	117	147	150	173
		Jaipur	21	24	22	24	28	23
		Rajasthan Mean	60	45	49	60	62	65
		Kothara	21	19	19	26	22	23
		S.K.Nagar	22	18	21	26	26	22
		Anand	68	46	56	60	64	64
		Jamnagar	37	23	32	40	32	39
		Ahmedabad	51	47	70	73	71	61
		Vadodara	37	30	45	46	51	38
		Gujarat Mean	39	30	40	45	44	41
		Kalai	83	79	54	74	43	84
		Aligarh	53	34	51	53	61	63
		U P Mean	68	56	53	64	52	73
		Hisar	66	52	59	72	64	92
		Bawal	58	46	78	66	78	75
		Raipur	108	71	91	61	88	98
		Haryana Mean	77	56	76	66	77	88
		Morena	49	41	34	44	64	44
		Gwalior	134	75	115	133	144	140
		M P Mean	91	58	74	88	104	92
		Ludhiana	69	47	64	62	78	71
		Zone Mean	61	45	55	60	63	65
2011	AHT (M) A	Mandor	69	41	40	68	68	69
		Bikaner	14	21	16	20	19	17
		Alwar	69	55	55	57	68	71
		Jaipur	29	19	24	26	28	22
		Tabiji	59	63	58	69	63	73
		Rajasthan Mean	48	40	39	48	49	50
		S.K.Nagar	31	25	32	28	33	20
		Mahuva	22	28	25	22	22	14
		Anand	56	50	58	72	62	58
		Jamnagar	34	27	29	34	33	30
		Ahmedabad	81	58	58	56	83	103
		Gujarat Mean	45	38	40	43	47	45
		Hisar	125	94	106	123	128	125
		Bawal	63	46	47	56	59	56
		Haryana Mean	94	70	77	89	93	90
		Morena	57	57	56	61	66	71
		Gwalior	94	70	85	75	96	85
		M P Mean	76	64	70	68	81	78
		Ludhiana	83	51	57	63	73	70
		Najab garh	97	60	93	100	103	103
		Zone Mean	62	48	52	58	63	62

Ref: AIPMIP Annual Report 2009-10 (Page BR 39), Annual Report 2010-11 (Page BR 100) and Annual Report 2011-12 (Page Breeding 85)

*= Not included in zonal mean

Centre-wise and year-wise data of days to 50% flowering

Year	Name 0f Trial	Location	Proposed Hybrid	Check Varieties				Qualifying Hybrid
			MH1663	Pusa 23	ICMH 356	GHB 744	RHB 121	MH1655
2009	IHT II A	Bikaner	63	62	66	64	63	63
		Jaipur	42	45	45	48	43	43
		Rajasthan Mean	53	53	55	56	53	53
		Kothara	50	47	47	51	46	46
		S.K.Nagar	48	47	45	51	45	52
		Mahuva	49	48	48	50	49	51
		Anand	41	38	42	41	42	43
		Jamnagar	49	51	48	50	44	52
		Ahmedabad	44	37	42	45	44	42
		Vadodara	47	47	47	49	49	46
		Gujarat Mean	47	45	45	48	45	47
		Kalai	54	48	49	51	51	49
		Eglas	46	47	47	50	50	47
		U P Mean	50	48	48	50	50	48
		Hisar	51	54	52	56	54	51
		Bawal	43	38	39	53	48	40
		Shikohpur	54	54	53	58	54	53
		Raipur	48	48	47	54	50	45
		Aryanagar	49	43	42	52	47	41
		Haryana Mean	49	47	47	55	51	46
		Gwalior	37	42	41	41	40	37
		Ludhiana	58	56	53	62	58	56
		New Delhi	50	50	53	52	53	51
		Zone Mean	49	48	48	51	49	48
2010	AHT (M) A	Mandor	54	52	52	53	51	54
		Bikaner	53	51	50	55	51	52
		Alwar	51	51	51	51	52	52
		Jaipur	52	49	50	52	48	54
		Tabiji	43	52	47	39	42	52
		Rajasthan Mean	51	51	50	50	49	53
		Kothara	50	51	49	50	51	51
		S.K.Nagar	56	54	52	56	54	57
		Anand	41	39	41	44	40	40
		Jamnagar	47	44	44	47	42	49
		Ahmedabad	47	46	44	46	45	47
		Vadodara	49	48	48	49	48	48
		Gujarat Mean	48	47	46	49	47	49
		Kalai	49	49	50	49	49	48
		Aligarh	47	47	47	49	48	48
		U P Mean	48	48	49	49	49	48
		Hisar	51	50	50	55	51	52
		Bawal	49	47	46	50	48	48
		Shikohpur	48	47	48	54	47	49
		Raipur	41	42	41	45	41	40
		Haryana Mean	47	47	46	51	47	47
		Morena	42	38	37	46	40	43
		Gwalior	38	37	37	36	39	39
		M P Mean	40	37	37	41	39	41
		Ludhiana	51	51	48	53	49	52
		New Delhi	46	50	50	52	46	43
		Zone Mean	48	47	47	49	47	48
2011	AHT (M) A	Mandor	49	47	49	50	48	48
		Bikaner	59	57	56	58	57	60
		Alwar	55	45	48	51	49	49
		Jaipur	46	45	45	46	45	51
		Tabiji	50	40	48	44	46	48
		Rajasthan Mean	52	47	49	50	49	51
		S.K.Nagar	42	45	41	44	42	47
		Mahuva	44	43	43	43	42	48
		Anand	41	39	40	41	41	45
		Jamnagar	40	41	43	42	41	44
		Ahmedabad	45	44	44	45	45	48
		Gujarat Mean	43	42	42	43	42	47
		Hisar	49	47	48	52	49	48
		Bawal	43	41	43	48	44	47
		Shikohpur	52	52	51	51	51	50
		Haryana Mean	48	47	47	50	48	49
		Morena	45	46	44	48	46	48
		Gwalior	42	39	41	42	43	46
		M P Mean	44	42	43	45	45	47
		Ludhiana	48	50	47	48	47	51
		New Delhi	47	44	49	45	45	51
		Najab garh	52	50	50	52	52	52
		Delhi Mean	50	47	50	49	49	52
		Zone Mean	47	45	46	47	46	49

Ref: AIPMIP Annual Report 2009-10 (Page BR 41), Annual Report 2010-11 (Page BR 101) and Annual Report 2011-12 (Page Breeding 86)

Centre-wise and year-wise data of days to maturity

Year	Name 0f Trial	Location	Proposed Hybrid	Check Varieties				Qualifying Hybrid
			MH1663	Pusa 23	ICMH 356	GHB 744	RHB 121	MH1655
2009	IHT II A	Bikaner	93	82	96	94	93	93
		Jaipur	71	75	75	79	73	74
		Rajasthan Mean	82	79	85	87	83	83
		Kothara	78	75	75	79	74	75
		S.K.Nagar	80	84	85	81	78	82
		Mahuva	79	77	79	81	78	81
		Anand	81	81	81	81	80	81
		Jamnagar	80	82	79	81	79	82
		Ahmedabad	72	66	71	74	72	68
		Vadodara	76	77	76	78	77	77
		Gujarat Mean	78	77	78	79	77	78
		Kalai	84	82	84	82	81	81
		Eglas	81	79	82	83	82	78
		U P Mean	82	81	83	83	82	79
		Bawal	66	65	64	73	66	65
		Shikohpur	82	82	81	81	82	80
		Aryanagar	78	71	70	79	74	70
		Haryana Mean	75	73	72	78	74	72
		Gwalior	78	80	80	81	79	77
		New Delhi	80	78	80	79	80	79
		Zone Mean	79	77	79	80	78	78
2010	AHT (M) A	Mandor	78	85	80	84	76	82
		Bikaner	85	82	83	86	83	83
		Alwar	81	81	80	81	80	79
		Jaipur	82	80	81	82	78	84
		Tabiji	76	86	83	77	70	84
		Rajasthan Mean	80	83	81	82	77	82
		Kothara	78	81	77	79	79	80
		S.K.Nagar	89	89	89	89	90	88
		Anand	83	81	81	85	82	81
		Jamnagar	78	73	76	77	75	83
		Ahmedabad	75	75	73	74	74	76
		Gujarat Mean	81	80	79	81	80	82
		Kalai	84	80	84	84	81	83
		Aligarh	73	73	74	75	74	75
		U P Mean	78	77	79	80	78	79
		Hisar	73	75	74	80	75	76
		Bawal	69	69	71	75	67	74
		Haryana Mean	71	72	73	77	71	75
		Gwalior	78	79	77	77	76	77
		New Delhi	75	79	79	81	78	73
		Zone Mean	79	79	79	80	77	80
2011	AHT (M) A	Mandor	78	75	76	78	75	76
		Alwar	85	77	80	81	80	79
		Jaipur	76	75	75	76	75	81
		Tabiji	85	75	87	94	79	82
		Rajasthan Mean	81	75	79	82	77	80
		S.K.Nagar	90	91	90	92	91	90
		Mahuva	76	74	74	74	74	77
		Anand	81	81	81	82	83	84
		Jamnagar	69	69	72	71	70	75
		Ahmedabad	73	70	72	73	72	74
		Gujarat Mean	78	77	78	78	78	80
		Hisar	73	73	72	73	74	70
		Bawal	67	66	68	70	68	69
		Shikohpur	72	76	74	71	76	72
		Haryana Mean	71	72	71	71	73	70
		Morena	80	79	82	79	79	82
		Gwalior	85	84	86	86	86	87
		M P Mean	83	82	84	83	83	84
		Zone Mean	78	76	78	78	77	78

Ref: AIPMIP Annual Report 2009-10 (Page BR 43), Annual Report 2010-11 (Page BR 102) and Annual Report 2011-12 (Page Breeding 87)

Centre-wise and year-wise data of plant height (cm)

Year	Name 0f Trial	Location	Proposed Hybrid	Check Varieties				Qualifying Hybrid
			MH1663	Pusa 23	ICMH 356	GHB 744	RHB 121	MH1655
2009	IHT II A	Bikaner	141	146	120	141	144	131
		Jaipur	172	181	168	174	169	161
		Rajasthan Mean	157	163	144	158	157	146
		Kothara	141	143	152	168	158	147
		S.K.Nagar	111	128	112	125	116	143
		Mahuva	158	170	164	168	165	157
		Anand	186	182	185	192	189	177
		Jamnagar	105	130	95	113	102	115
		Ahmedabad	172	175	178	187	172	178
		Vadodara	152	158	160	162	168	155
		Gujarat Mean	146	155	149	159	153	153
		Kalai	180	203	210	213	215	195
		Eglas	189	192	166	173	189	181
		U P Mean	184	198	188	193	202	188
		Hisar	178	209	172	227	199	193
		Bawal	161	188	173	206	187	155
		Shikohpur	215	209	210	212	214	212
		Raipur	235	218	232	247	250	233
		Aryanagar	230	244	212	220	219	232
		Haryana Mean	204	214	200	222	214	205
		Gwalior	195	209	208	221	203	182
		Ludhiana	208	201	170	203	188	183
		New Delhi	199	205	217	213	193	200
		Zone Mean	175	184	174	188	181	175
2010	AHT (M) A	Mandor	162	173	165	188	173	162
		Bikaner	157	212	156	182	169	187
		Alwar	203	213	221	213	224	214
		Jaipur	153	186	176	175	167	164
		Tabiji	178	185	174	180	175	179
		Rajasthan Mean	171	194	178	188	182	181
		Kothara	132	138	140	128	128	143
		S.K.Nagar	125	148	146	148	135	139
		Anand	188	191	181	208	195	187
		Jamnagar	147	157	150	162	139	166
		Ahmedabad	182	200	187	194	212	189
		Vadodara	154	165	136	173	168	157
		Gujarat Mean	155	167	157	169	163	163
		Kalai	161	174	165	185	160	168
		Aligarh	193	205	207	215	207	199
		U P Mean	177	190	186	200	184	184
		Hisar	229	237	233	247	222	234
		Bawal	201	210	211	209	213	211
		Shikohpur	214	220	205	235	232	204
		Raipur	205	222	227	222	213	227
		Haryana Mean	212	222	219	228	220	219
		Morena	194	202	207	214	204	201
		Gwalior	195	207	184	211	218	208
		M P Mean	195	205	196	213	211	205
		Ludhiana	199	196	193	199	191	196
		New Delhi	168	172	175	182	173	187
		Zone Mean	178	191	183	194	187	187
2011	AHT (M) A	Mandor	204	217	220	232	219	232
		Bikaner	146	151	128	141	173	152
		Alwar	195	222	185	184	203	204
		Jaipur	185	194	183	192	189	176
		Tabiji	173	167	189	157	178	174
		Rajasthan Mean	181	190	181	181	192	188
		S.K.Nagar	140	157	145	136	142	145
		Mahuva	149	178	154	139	156	184
		Anand	193	203	196	196	200	201
		Jamnagar	157	190	182	145	147	153
		Ahmedabad	155	172	158	159	162	165
		Gujarat Mean	159	180	167	155	161	170
		Hisar	244	243	232	251	237	227
		Bawal	197	195	207	208	199	203
		Shikohpur	229	226	211	206	209	225
		Haryana Mean	223	221	216	222	215	218
		Morena	166	178	174	171	176	187
		Gwalior	216	226	198	219	228	214
		M P Mean	191	202	186	195	202	200
		Ludhiana	184	201	237	216	184	188
		New Delhi	184	152	157	163	167	170
		Najab garh	215	248	235	220	230	225
		Delhi Mean	200	200	196	192	198	198
		Zone Mean	185	195	188	185	189	190

Ref: AIPMIP Annual Report 2009-10 (Page BR 45), Annual Report 2010-11 (Page BR 103) and Annual Report 2011-12 (Page Breeding 88)

Centre-wise and year-wise data of productive tillers/plant

Year	Name 0f Trial	Location	Proposed Hybrid MH1663	Check Varieties				Qualifying Hybrid MH1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
2009	IHT II A	Bikaner	1.4	1.5	1.1	1.2	1.6	1.6
		Jaipur	1.9	1.3	1.3	1.3	1.0	1.8
		Rajasthan Mean	1.6	1.4	1.2	1.3	1.3	1.7
		Kothara	1.9	2.2	2.1	2.8	2.4	3.2
		S.K.Nagar	2.2	1.3	1.9	1.5	1.7	2.0
		Mahuva	2.7	2.7	3.1	2.6	2.9	2.7
		Anand	5.5	4.0	5.2	4.5	4.0	5.7
		Jamnagar	2.4	1.3	2.3	2.3	1.2	2.2
		Ahmedabad	1.9	1.9	1.7	1.6	2.7	2.2
		Vadodara	2.7	2.1	2.5	2.5	2.5	2.7
		Gujarat Mean	2.7	2.2	2.7	2.5	2.5	3.0
		Kalai	3.2	1.5	1.6	2.0	1.9	2.3
		Eglas	2.0	2.7	2.3	2.3	2.7	2.3
		U P Mean	2.6	2.1	2.0	2.2	2.3	2.3
		Hisar	3.3	2.5	2.3	1.8	2.7	2.7
		Bawal	1.7	1.1	1.5	1.4	2.1	1.5
		Shikohpur	5.3	5.0	6.0	5.3	5.7	5.3
		Raipur	2.7	2.7	2.7	2.3	2.0	2.0
		Aryanagar	2.7	2.1	2.8	1.5	1.5	2.6
		Haryana Mean	3.1	2.7	3.0	2.5	2.8	2.8
		Gwalior	1.5	1.7	2.0	1.3	2.0	2.2
		Ludhiana	2.5	3.4	3.5	3.5	5.3	3.2
		New Delhi	3.0	2.5	2.7	2.9	2.9	3.0
		Zone Mean	2.7	2.3	2.5	2.4	2.6	2.7
2010	AHT (M) A	Mandor*	1.8	2.0	1.4	1.3	2.7	1.6
		Bikaner	4.2	4.0	3.8	4.7	3.5	3.0
		Alwar	2.9	2.5	2.9	2.7	2.6	2.9
		Jaipur*	1.5	1.0	1.5	1.3	1.2	1.3
		Rajasthan Mean	2.6	2.4	2.4	2.5	2.5	2.2
		Kothara	2.2	1.9	1.9	2.1	3.7	3.3
		S.K.Nagar	2.1	1.6	1.9	1.9	1.9	1.7
		Anand	4.3	3.1	4.2	4.4	4.1	4.7
		Jamnagar	2.8	1.5	1.6	2.6	3.0	2.2
		Ahmedabad	1.4	1.4	1.6	1.6	2.1	1.7
		Vadodara	2.5	1.9	2.5	2.2	2.4	2.6
		Gujarat Mean	2.5	1.9	2.3	2.5	2.9	2.7
		Kalai	2.6	2.5	2.6	1.9	1.9	2.0
		Aligarh	2.8	2.9	2.8	2.5	2.9	2.5
		U P Mean	2.7	2.7	2.7	2.2	2.4	2.3
		Hisar	1.8	2.3	2.8	1.8	2.6	2.9
		Bawal	2.1	1.6	1.2	1.5	2.2	2.0
		Shikohpur	4.3	4.0	6.0	5.0	4.7	4.0
		Raipur	3.6	3.1	3.1	2.5	3.3	3.5
		Haryana Mean	3.0	2.7	3.3	2.7	3.2	3.1
		Morena	3.8	3.4	3.4	3.8	5.2	4.0
		Gwalior	2.2	2.0	1.6	2.0	1.7	2.1
		M P Mean	3.0	2.7	2.5	2.9	3.5	3.0
		Ludhiana	3.2	1.7	2.2	2.0	2.2	2.4
		New Delhi	2.3	2.3	3.0	3.0	3.0	3.0
		Zone Mean	2.8	2.4	2.7	2.7	2.9	2.8
2011	AHT (M) A	Mandor	2.7	2.2	2.4	2.6	3.4	2.7
		Bikaner	1.4	1.5	1.6	1.2	1.7	1.9
		Alwar	3.3	2.6	3.2	3.1	4.3	3.8
		Jaipur	1.0	1.1	1.0	1.0	1.7	1.5
		Rajasthan Mean	2.1	1.8	2.0	2.0	2.8	2.5
		S.K.Nagar	1.8	1.8	1.8	2.5	2.2	2.5
		Mahuva	2.7	2.7	2.3	2.7	2.3	2.7
		Anand	1.7	1.7	2.3	2.0	2.2	2.5
		Jamnagar	3.0	2.9	2.9	2.9	3.0	2.8
		Ahmedabad	2.3	1.8	1.8	2.2	2.7	2.5
		Gujarat Mean	2.3	2.2	2.2	2.4	2.5	2.6
		Hisar	2.2	2.1	1.7	2.1	2.1	2.1
		Bawal	2.6	1.7	3.2	2.6	3.0	3.7
		Shikohpur	4.3	3.0	4.0	4.0	4.0	4.7
		Haryana Mean	3.0	2.3	3.0	2.9	3.0	3.5
		Morena	6.3	5.7	6.3	6.7	7.0	7.7
		Gwalior	2.8	2.6	3.2	2.9	3.0	3.0
		M P Mean	4.6	4.1	4.8	4.8	5.0	5.3
		Ludhiana	1.0	1.0	1.3	2.0	1.0	1.0
		New Delhi	3.3	3.0	3.0	2.7	2.7	3.0
		Najab garh	1.9	1.7	1.9	1.8	2.4	2.1
		Delhi Mean	2.6	2.3	2.4	2.3	2.5	2.6
		Zone Mean	2.6	2.3	2.6	2.6	2.9	3.0

Ref: AIPMIP Annual Report 2009-10 (Page BR 47), Annual Report 2010-11 (Page BR 104) and Annual Report 2011-12 (Page Breeding 89)

*= Not included in zonal mean

Centre-wise and year-wise data of panicle length (cm)

Year	Name 0f Trial	Location	Proposed Hybrid MH1663	Check Varieties				Qualifying Hybrid MH1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
2009	IHT II A	Bikaner	24	25	18	23	21	24
		Jaipur	21	22	20	23	24	26
		Rajasthan Mean	23	24	19	23	23	25
		Kothara	16	19	16	19	18	22
		S.K.Nagar	20	22	18	22	20	20
		Mahuva	22	22	20	21	21	23
		Anand	25	26	20	25	23	22
		Jamnagar	20	20	14	18	14	20
		Ahmedabad	24	25	19	25	21	26
		Vadodara	19	19	17	19	22	19
		Gujarat Mean	21	22	18	21	20	22
		Kalai	19	28	20	22	19	25
		Eglas	23	23	20	23	23	23
		U P Mean	21	25	20	22	21	24
		Hisar	24	25	18	24	22	23
		Bawal	22	24	21	23	22	25
		Shikohpur	24	23	24	21	22	24
		Raipur	27	29	23	27	25	30
		Aryanagar	23	27	22	23	22	28
		Haryana Mean	24	26	22	23	23	26
		Gwalior	20	22	19	22	20	14
		Ludhiana	25	27	23	22	24	26
		New Delhi	25	24	23	23	27	27
		Zone Mean	22	24	20	22	22	24
2010	AHT (M) A	Mandor	23	26	19	24	22	23
		Bikaner	25	26	21	24	21	26
		Alwar	23	27	21	25	22	26
		Jaipur	22	24	20	21	20	22
		Rajasthan Mean	23	25	20	23	21	24
		Kothara	19	19	17	19	18	16
		S.K.Nagar	20	24	18	20	19	22
		Anand	23	26	22	23	24	26
		Jamnagar	19	22	17	20	18	22
		Ahmedabad	23	25	21	23	24	24
		Vadodara	23	23	19	22	23	24
		Gujarat Mean	21	23	19	21	21	22
		Kalai	22	19	17	22	21	23
		Aligarh	24	25	22	23	23	24
		U P Mean	23	22	19	23	22	24
		Hisar	25	27	22	22	21	26
		Bawal	23	24	22	23	24	25
		Shikohpur	23	25	22	23	23	24
		Raipur	24	26	21	22	22	25
		Haryana Mean	24	26	22	23	23	25
		Morena	23	22	22	22	22	22
		Gwalior	22	25	18	21	22	23
		M P Mean	22	23	20	22	22	22
		Ludhiana	24	22	19	23	22	25
		New Delhi	24	27	17	24	22	23
		Zone Mean	23	24	20	22	22	23
2011	AHT (M) A	Mandor	24	26	21	23	23	25
		Bikaner	20	21	17	15	19	21
		Alwar	26	32	21	24	23	27
		Jaipur	22	24	19	21	21	21
		Rajasthan Mean	23	26	20	21	21	23
		S.K.Nagar	21	22	18	21	20	23
		Mahuva	21	20	20	20	21	21
		Anand	20	22	16	20	20	23
		Jamnagar	19	27	18	17	16	19
		Ahmedabad	22	24	19	18	20	23
		Gujarat Mean	21	23	18	19	19	22
		Hisar	25	24	23	24	23	23
		Bawal	25	27	23	22	24	25
		Shikohpur	24	22	21	22	22	23
		Haryana Mean	25	24	22	23	23	24
		Morena	22	24	21	20	22	23
		Gwalior	24	25	22	24	23	23
		M P Mean	23	24	21	22	22	23
		Ludhiana	20	20	20	20	20	19
		New Delhi	27	25	25	25	25	25
		Najab garh	25	30	23	24	25	25
		Delhi Mean	26	27	24	25	25	25
		Zone Mean	23	24	20	21	21	23

Ref: AIPMIP Annual Report 2009-10 (Page BR 49), Annual Report 2010-11 (Page BR 105) and Annual Report 2011-12 (Page Breeding 90)

Centre-wise and year-wise data of panicle diameter (cm)

Year	Name 0f Trial	Location	Proposed Hybrid MH1663	Check Varieties				Qualifying Hybrid MH1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
2009	IHT II A	Bikaner	2.6	2.7	2.5	2.4	2.6	2.5
		Jamnagar	2.5	2.6	2.7	2.6	2.8	2.6
		Ahmedabad	2.7	2.5	2.7	2.6	2.5	2.4
		Vadodara	2.3	2.0	2.5	2.3	2.4	2.3
		Gujarat Mean	2.5	2.4	2.6	2.5	2.6	2.4
		Eglas	2.7	2.7	2.0	2.0	2.7	3.0
		Shikohpur	3.2	2.9	2.8	2.8	2.6	2.9
		Gwalior	1.6	1.7	1.8	1.7	1.7	1.7
		New Delhi	2.7	2.5	2.9	2.7	2.6	3.1
		Zone Mean	2.5	2.5	2.5	2.4	2.5	2.6
2010	AHT (M) A	Mandor	2.8	2.7	2.8	2.7	2.4	2.5
		Bikaner	2.6	2.4	2.9	3.0	2.8	3.0
		Jaipur	2.3	2.0	2.7	2.4	2.0	2.4
		Rajasthan Mean	2.6	2.4	2.8	2.7	2.4	2.6
		Jamnagar	2.3	2.2	2.3	2.5	2.3	2.3
		Ahmedabad	2.6	2.5	2.7	2.7	2.6	2.5
		Vadodara	2.9	2.5	2.8	2.8	2.6	2.6
		Gujarat Mean	2.6	2.4	2.6	2.7	2.5	2.5
		Hisar	3.2	3.0	2.6	3.0	2.5	2.9
		Bawal	3.4	3.4	3.4	3.2	3.0	3.1
		Shikohpur	2.9	3.0	2.7	3.1	2.8	2.4
		Haryana Mean	3.2	3.1	2.9	3.1	2.8	2.8
		Gwalior	1.7	1.5	1.3	1.8	1.7	1.7
		New Delhi	2.9	2.8	2.6	2.8	2.7	2.8
		Zone Mean	2.7	2.6	2.6	2.7	2.5	2.6
2011	AHT (M) A	Mandor	3.2	2.6	3.1	2.7	2.7	3.1
		Bikaner	2.3	1.9	2.2	1.7	1.8	2.0
		Jaipur	2.6	2.2	2.7	2.4	2.5	2.5
		Rajasthan Mean	2.7	2.2	2.7	2.3	2.3	2.5
		Jamnagar	2.4	2.2	2.6	2.4	2.1	2.7
		Ahmedabad	2.6	2.4	2.7	2.2	2.3	2.5
		Gujarat Mean	2.5	2.3	2.7	2.3	2.2	2.6
		Hisar	3.2	2.5	3.4	3.2	2.8	2.9
		Shikohpur	2.7	2.6	3.2	2.8	2.7	2.7
		Haryana Mean	3.0	2.5	3.3	3.0	2.7	2.8
		Gwalior	1.9	1.7	1.9	2.0	1.7	2.0
		New Delhi	2.9	2.2	3	2.4	2.3	3.0
		Najab garh	3.3	3.0	3.2	2.9	2.6	3.3
		Delhi Mean	3.1	2.6	3.1	2.6	2.5	3.1
		Zone Mean	2.7	2.3	2.8	2.5	2.3	2.7

Ref: AIPMIP Annual Report 2009-10 (Page BR 51), Annual Report 2010-11 (Page BR 106) and Annual Report 2011-12 (Page Breeding 91)

Annexure-IX

Centre-wise and year-wise data of 1000 seed wt. (g)

Year	Name 0f Trial	Location	Proposed Hybrid MH1663	Check Varieties				Qualifying Hybrid MH1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
2010	AHT (M) A	Mandor	7.0	8.2	9.0	8.9	7.2	6.9
		Bikaner	9.0	10.1	8.9	8.9	8.6	8.7
		Alwar	8.3	9.7	11.8	11.6	8.1	7.5
		Jaipur	9.3	8.0	8.2	11.0	11.5	9.6
		Rajasthan Mean	8.4	9.0	9.5	10.1	8.8	8.2
		S.K.Nagar	7.0	7.6	8.1	8.0	7.2	7.9
		Anand	8.1	8.9	9.2	9.1	7.5	7.3
		Jamnagar	6.7	7.2	9.6	8.6	7.1	7.8
		Ahmedabad	8.1	8.5	10.0	8.1	8.1	6.4
		Vadodara	8.4	8.0	10.1	10.0	8.4	8.2
		Gujarat Mean	7.7	8.0	9.4	8.7	7.6	7.5
		Kalai	8.9	10.1	9.2	10.5	9.3	9.0
		Aligarh	8.3	9.9	11.9	11.5	7.9	7.3
		U P Mean	8.6	10.0	10.5	11.0	8.6	8.1
		Hisar	7.3	7.4	7.9	8.4	7.3	7.6
		Bawal	9.1	8.4	10.0	9.2	5.9	5.9
		Haryana Mean	8.2	7.9	9.0	8.8	6.6	6.8
		Morena	6.7	9.3	11.7	9.8	7.1	6.1
		Gwalior	7.2	7.0	7.8	7.0	5.9	5.0
		M P Mean	7.0	8.2	9.8	8.4	6.5	5.6
		Zone Mean	8.0	8.6	9.6	9.4	7.8	7.4
2011	AHT (M) A	Mandor	9.9	8.8	11.0	11.1	8.5	9.2
		Bikaner	7.5	8.3	9.2	7.7	7.7	8.2
		Alwar	10.3	8.7	9.2	8.9	8.6	9.5
		Jaipur	9.5	7.1	6.5	5.3	9.1	7.1
		Rajasthan Mean	9.3	8.2	9.0	8.3	8.5	8.5
		S.K.Nagar	5.9	6.5	7.4	7.7	5.7	6.4
		Anand	6.7	7.8	8.1	7.9	7.0	7.1
		Jamnagar	6.2	8.1	8.0	6.6	6.9	7.7
		Ahmedabad	8.9	6.8	7.0	6.6	7.6	9.5
		Gujarat Mean	6.9	7.3	7.6	7.2	6.8	7.7
		Morena	10.7	9.5	12.4	9.5	9.0	11.2
		Gwalior	5.9	5.2	7.1	6.1	5.5	7.0
		M P Mean	8.3	7.4	9.7	7.8	7.2	9.1
		Ludhiana	9.6	9.4	11.3	9.5	8.3	7.7
		Najab garh	5.6	8.5	9.7	7.6	6.9	7.5
		Zone Mean	8.1	7.9	8.9	7.9	7.6	8.2

Ref: AIPMIP Annual Report 2010-11 (Page BR 106) and Annual Report 2011-12 (Page Breeding 92)

Annexure-X

Centre-wise and year-wise reaction to downy mildew

Year	Name 0f Trial	Location	Proposed Hybrid MH1663	Check Varieties				Qualifying Hybrid MH1655
				Pusa 23	ICMH 356	GHB 744	RHB 121	
2009	PMPT I	Mandor	0.0	3.2	0.0	0.0	0.0	0.0
		Jaipur	0.0	0.0	0.0	1.0	0.0	0.0
		Fatehpur Shekhawati	0.0	0.0	0.0	0.0	11.1	3.5
		Hisar	3.2	0.0	3.8	7.5	9.0	2.7
		Gwalior	4.5	1.3	4.9	3.2	3.0	0.0
		Jamnagar	0.0	0.0	4.2	0.0	1.2	0.0
		Anand	0.0	0.0	0.0	3.1	1.6	0.0
		Zone Mean	1.1	0.6	1.8	2.1	3.7	0.9
2010	PMPT II	Mandor	1.8	3.8	0.0	0.0	4.5	0.0
		Jaipur	3.0	2.6	2.2	3.2	3.3	1.0
		Fatehpur Shekhawati	0.0	9.1	6.1	0.0	3.3	0.0
		Hisar	0.0	6.3	9.0	0.0	7.8	2.5
		Gwalior	2.6	0.0	2.4	4.2	5.6	1.3
		Jamnagar	0.0	4.2	0.0	0.0	8.5	1.5
		Anand	0.0	9.4	14.6	0.0	12.5	0.0
		Zone Mean	1.1	5.1	4.9	1.1	6.5	0.9
2011	PMPT II	Mandor	0.0	0.0	2.3	6.0	13.2	3.4
		Jaipur	1.2	2.3	1.2	3.8	6.8	2.3
		Fatehpur Shekhawati	4.9	0.0	0.0	8.3	0.0	0.0
		Hisar	0.0	0.0	0.0	0.0	8.2	0.0
		Gwalior	3.7	1.3	1.3	4.2	12.5	0.0
		Jamnagar	0.0	4.6	0.0	2.1	9.2	2.8
		Anand	0.0	0.0	6.6	4.5	4.8	0.0
		Zone Mean	1.4	1.2	1.6	4.1	7.8	1.2

Ref: AIPMIP Annual Report 2009-10 (PP 56), Annual Report 2010-11 (PP 76) and Annual Report 2011-12 (Page Pathology 44)

Checklist for proforma for submission of proposal for Identification of Crop Varieties/ Hybrids by Workshops

Details/document	Attached	
Parentage with details of its pedigree including source from which variety/Inbred/A, B and R lines of hybrid has been developed	Yes√	No
Source of material in case of introduction (IC/EC numbers provided by NBPGR)	Yes√	No
Flow chart of details of development of variety/ parental lines of hybrids	Yes√	No
Molecular/ DNA profile of variety/hybrid/A, B, R line of hybrid vis-à-vis check variety/ line (details of unique amplicons that distinguishing markers along with photographs	Yes√	No
Detailed description of hybrid/variety	Yes√	No
Detailed description of the parental lines of hybrid	Yes√	No
Yield data and other data on diseases, insect-pest, quality etc. from coordinated trials	Yes√	No
Yield data from national, demonstration/large scale demonstrations	Yes√	No
Specific recommendations, if any, for seed production (e.g. staggered sowing, plating ratio of parental lines of hybrids in foundation and certified seed production, probable area of seed production etc.)	Yes√	No
Vivid presentation (field view, close-up of single plant and seed) with the help of photographs of the variety)	Yes√	No
Package of practices	Yes√	No
Author/ Proforma signed by all co-authors and Head of Organization	Yes√	No
Any other pertinent information	Yes√	No

Signature of Head of Institution

PACKAGE OF PRACTICES

Name of the Crop: Pearl millet Variety: -----

S.N.	Particulars	Details to be filled by SAU/ICAR Institute releasing the variety
1.	Suitability of the variety for the area (Recommended area for which variety has been released/recommended)	Rainfed conditions of kharif season for the state of Maharashtra
2.	Selection of field/land preparation (Type of topography, soil condition, tillage operation for seed bed etc.	Well drained and leveled field with plain topography, at least medium fertile soil
3	Seed Treatment(Recommended chemical with dosages)	No seed treatment required
4	Sowing time(Optimum sowing period)	Last week of June and first fortnight of July, depending upon the rains
5	Seed Rate/sowing method-line sowing with row to row and plant to plant distance	5 kg/ha, sowing to be done using seed drill or by animal-drawn plough
6	Fertilizer doses & Time of fertilizer's Application(Type and Quantity of fertilizers)	Fertilize with 30-40 kg P_2O_5 /ha basal dose and 40-60 kg N/ha in two splits, half as basal and the second half 3 to 4 weeks later synchronizing with rains
7	Weed Control(Name of weedicide(s) with dosages and timing of mechanical weeding, if any)	Keep the field weed-free for the first 30 days either with weeding and hoeing or application of Atrazine @ 0.5 a.i./ha as pre-emergence spray followed by one weeding and hoeing at 4 to 6 weeks after sowing.
8	Major diseases and pest control (Type of pest and diseases with name of chemicals and dosages & timing of application	Use Apron 35 SD @ 2 g a.i./kg of seed followed by Ridomil 25 WP (1000 ppm) spray 20 days later to check downy mildew occurrence
9	Irrigation schedule(Critical stage for irrigation and method of irrigation)	Life saving irrigation should be provided at seedling stage and grain-filling stage
10	Harvesting(Approximate days of harvestable maturity)	Harvest the crop at maturity (76-80 days)
11	Quality characteristics of the variety, if any (Prominent characteristics of variety)	High in iron content and large seed size as compared to other currently available varieties of pearl millet
12	Expected yield of the variety per acre from …….qtls to …….qtls/acre (yield subject to use under area of adaption and the recommended climate conditions and adoption of package and practices)	1333-3477 kg/ha subject to use under area of adaption and the recommended climate conditions and adoption of package and practices)


17.09.201


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12.03.2

Guidelines for Filling-up Proforma for Submission of Proposals for Identification of Crop Varieties/ Hybrids by the Workshops

1. Name of the crop and species

   The name given to the variety may be indicative of crop name, institute name/code, and number, if any.

2. Name of the variety under which tested

   This should include the name under which the variety was tested in coordinated trials.

3. Proposed name of the variety

   This should include the name of the variety that is being proposed for its commercial use as per existing guidelines.

4. Sponsored by (institute)

   This should include the name of the institute/organization that is sponsoring the variety

5. Institution or agency responsible for developing variety (with full address)

   Institute or organization where the variety was developed along with full address

6. Name of the person who helped in the development of the variety

   Only those workers should be included who have contributed in the development of variety/hybrid. The co-workers can be grouped in 2 categories as 'Developer' and 'Collaborator'**.** The co-worker should be associated with the project (from which cultivar has been developed) for a period of minimum of 2 years. The proposal should be signed by each of co-worker and validated by Head of Organization.

7. Parentage (with details of its pedigree including source from which variety/Inbred/ A, B and R lines of hybrid has been developed)

   This should essentially include the details of base population/ source of material used for developing the variety/parental lines of hybrid. Pedigree and parentage have to be furnished in detail as to how the parents have been developed with flow charts instead of just giving the code numbers. Flow chart should clearly depict the development of the proposed culture with year-wise details of attempting the initial cross followed by handling of segregating generation.

   The details of indigenous collection (IC) or exotic collection (EC) number of accessions (provided by NBPGR), if used, in the development of variety or parental lines of hybrids must be provided. Please note that this IC number is different from the one that is provided by NBPGR upon submission of seed sample of line/hybrid/variety once variety/ hybrid is recommended by the Variety Identification Committee (VIC).

8. Source of material in case of introduction

   Details of EC (Exotic collection) number provided by NBPGR for the imported material used in variety development.

9. DNA profile of variety/hybrid/inbred/A, B, R line of hybrid vis-à-vis check variety/ line

   Detailed information on the molecular discrimination should be provided. Such information can be developed at crop based institutes/NBPGR/Other labs. The information should include details of amplicons (name, sequence number, primer sequence) with reference to polymorphic markers. The relevant photographs should also be attached.

10. Breeding method used

    The method used in developing the variety/parental line

11. Breeding objective

    The breeding objective in the development of variety

12. State the varieties which are most closely resemble the proposed variety in general characters

    The information should include the name of the varieties that resemble most closely with proposed variety with reference to different phenotypic traits.

13. Specific area of its adaptation (zones and states for which variety is proposed) and recommended productions ecology

    The information on zones (name of the states), season and production conditions whether rainfed or irrigated should be mentioned.

14. Description of hybrid/variety

    The average and expected normal range with respect to various characters may be mentioned.

15. Description of the parents of the hybrid

    The average and expected normal range with respect to characters may be mentioned with reference to inbred/A line/ B line/ R line.

16. Yield data in coordinated trials (breeding, agronomy, pathology, entomology, quality etc) regional/inter regional district trials year wise (levels of fertilizer application, density of plant population and superiority over local control/standard variety to be indicated (to be attached)

    The yield data and other data of coordinated trials and other details as per the format of tables should be appended. Please note that mean is ‘weighted mean’ and not ‘arithmetic mean’.

17. Yield data from national, demonstration/large scale demonstrations (to be attached)

    The yield and other details as per the format of tables should be appended.

18. Agency responsible for maintaining breeder seed

    Name of the institute/organization/agency that is responsible to maintain the breeder seed of variety/parental line of hybrid.

19. Quantity of breeder seed in stock (kg)

    Quantity (kg) of available seed with reference to variety, hybrid, inbred/ A/B/R lines of hybrid to be clearly indicated.

20. Information on acceptability of the variety by farmers/ consumers/ industry

    Any information on such aspects can be given

21. Specific recommendations, if any, for seed production (e.g. staggered sowing, plating ratio of parental lines of hybrids in foundation and certified seed production, probable area of seed production)

The seed production technology and specific requirements should clearly be mentioned along with proposal. With respect to seed production of hybrid, the staggered sowing of parental lines, if required, should be clearly indicated. The planting ratio of male and female parents in the seed production plots should also be indicated. In addition, if there are some other precautions to be taken they are to be clearly mentioned. The probable area of seed production needs to be given.

22. Vivid presentation (field view, close-up of single plant and seed/economic parts)

    The proposal should invariably have coloured pictures with a clear field view of variety, a close-up of single plant and seed/economic part. Photograph of other plant parts which can be helpful in identification of varieties can also be given. The cover page of proposal should also have a coloured photograph of variety and should be well-designed.

23. Package of practices along with attainable yield levels

    A note on the package of practices of crop with respect to the variety needs to be provided particularly highlighting specific requirement of variety to realize its attainable yield levels.

24. Any other pertinent information

    Any other relevant information which is important with reference to variety, hybrid or parental lines of hybrids.

25. Others

- One-page ‘executive summary’ of proposal may be provided in the beginning highlighting the specific features of the variety/hybrid. Excessive presentation in executive summary needs to be avoided.
- Page numbers should be provided at each page of proposal.
- Check-list needs to be part of the proposal.
- The CVRC proposal should be scrutinized at the level of Project Coordinator/Project Director before submission to CVRC. PCs/PDs will provide their comments on the proposal to member secretary (CVRC).