

RPF I

**PROFORMA FOR SUBMISSION OF RESEARCH PROJECTS  
PART-I: GENERAL INFORMATION**

<b>200</b>	<b>Project Code</b>				
2001	Institute code No.	CT 2.10			
2002	ICAR Code No.				
<b>201</b>	<b>Name of the Institute and Division</b>				
2011	Name and address of Institute	Indian Grassland and Fodder Research Institute, Jhansi, 284003 (UP)			
2012	Name of Division/ Section	Crop Improvement Division			
2013	Location of project	IGFRI, Jhansi and IGFRI-RRS, Dharwad			
<b>202</b>	<b>Project Title</b>	Genetic improvement of bajra (Pearl millet) and napier-Bajra (NB) Hybrids for high Biomass Production			
<b>203</b>	<b>Priority Area</b>	Forage crop improvement			
2031	Research approach	Applied Research 01√	Basic Research 02√	Process/Technology Development 03	Transfer of Technology 04
<b>204</b>	<b>Specific Area</b>	Genetic improvement of bajra and napier-bajra hybrids			
2041	Previous project/projects in this specific area (Year, type of funding, cost etc.)	No			
<b>205</b>	<b>Duration</b>	5 years			
2051	Date of start	August, 2011			
2052	Likely date of completion	November, 2015			
<b>206</b>	<b>Total cost of the project</b>	NA			
2061	Foreign exchange component (if any)	Nil			

## 207 Project Profile Summary

The project is aimed at developing new superior pearl millet (bajra) single cross hybrids and interspecific napier-bajra (NB) hybrids for fodder purpose along with better nutritive values. The products of this research programme would be hybrids, suitable for the diverse crop production systems. Seed producing NB hybrids by enhancing ploidy level through colchicine treatment would be attempted. This will be achieved by using conventional breeding approaches like development of inbreds, male sterile (MS) lines, hybridisation, and Chromosome doubling as well. This will also involve physiological characterisation of yield related parameters of parents and their hybrids and biochemical analysis for the estimation of quality parameters in pearl millet and NB hybrids

**208 Key words:** Napier, bajra, pearl millet and napier-bajra hybrids

### PART – II: INVESTIGATORS

#### 210 Principal Investigator:

2101 Name : **Kumar Durgesh**  
2102 Designation : Scientist  
2103 Division/Section : Crop Improvement Division  
2104 Location : Indian Grassland and Fodder Research Institute, Jhansi  
2105 Institute Address : IGFRI, Jhansi-284003, Uttar Pradesh, India

#### 211 Co-investigator:

2111 Name : Chandan Gupta  
2112 Designation : Scientist  
2113 Division/Section : Seed Technology  
2114 Location : Indian Grassland and Fodder Research Institute, Jhansi  
2115 Institute Address : IGFRI, Jhansi-284003, Uttar Pradesh, India

#### 212 Co-investigator :

2121 Name : A K .Mishra  
2122 Designation : Principal Scientist  
2123 Division/Section : Plant and Animal Relationship  
2124 Location : Indian Grassland and Fodder Research Institute, Jhansi  
2125 Institute Address : IGFRI, Jhansi-284003, Uttar Pradesh, India

### PART - III: TECHNICAL DETAILS

#### 220 Introduction and objectives:

##### 2201 Origin of the project: (Problem identification)

Due to high demand and less supply of green fodder, we require high potential in terms of yield and good quality fodder crop for sustainable fodder production. According to an estimate, the country presently faces a deficit about of 63.7% green fodder and 23.46% in dry crop residues (Bhagmal *et al.*, 2009). In changing climate era, to meet these demands becomes even more challenging. Pearl millet is well adapted to production system characterised by drought, low soil fertility and high temperature, it can be grown in areas where other cereal crops, such as maize or wheat, would not survive. Pearl millet uses less water per unit of forage production, tolerates both lower and higher soil pH and higher aluminium concentration, and is rich in minerals as compare to other forage millets. Average green fodder productivity of pearl millet in India is 20-35 t/ha which is very less than its potential, while the productivity of hybrid Gahi-3 (USA)

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Premalal (2006) reported that variety CO-3 is highest yielding cultivar in highly irrigated area of TN and Sri Lanka and even performances of CO-3 is not uniform throughout the area of cultivation. Therefore, breeding of commercially viable low oxalate cultivars seems an approach to reducing the gap between demand and supply of green forage.

## 221 Project Technical Profiles:

2211 Organization of work elements (For each objectives and participating investigator giving man months involved). The component activities of the above set objectives include multi-disciplinary approaches in a co-ordinated manner. The contributions of each investigator and their annual man months involved are given below.

Name of investigator	Discipline	Contributions	Man months involved
Kumar Durgesh	Plant Breeding	Planning and conducting the experiments, development of inbreds lines, MS lines hybridisation and cytogenetical work.	8
Chandan Kumar Gupta	Plant Physiology	Physiological characterisation of Parents and their hybrids for yield related physiological parameters	2
A .K. Mishra	Plant and Animal Relationship	Estimation of Nutritional value of parents and their hybrids	2

## 2212 Methodology:

### Germplasm Enrichment

- Enrichment of germplasm by procurement of pearl millet (from National Institute and ICRISAT, Hyderabad) and of napier (from ILRI, Ethiopia).

### Varieties/ Hybrid Development

- Identification of superior parents- out of available germplasms for hybridisation.
- Development of MS lines, inbreds for Pearl millet hybrids.
- Hybridization- Protogyny (For NB) and MS lines (for Pearl millet and NB).
- Physiological characterisation of selected parents and their hybrids for yield related parameters viz. -photosynthetic and respiration efficiency (by using IRGA / spectrophotometers) and antioxidant system etc.
- Estimation of quality parameter - Lower oxalate content, high Crude Protein, crude fibre etc.

### Cytogenetical studies

- Cytogenetical studies for chromosomal behaviour of N-B hybrids and its enhanced ploidy level.
- Cytological validation of developed male sterile lines.

## 2213 Plan of action


- Acquisition and multiplication of germplasm.
- Identification and selection of parents for hybrid production.
- Development of inbreds and male sterile lines in fodder type pearl millet lines.

- Hybridisation among promising lines and developments of F<sub>1</sub> hybrids.
- Enhancement of ploidy level in NB hybrids for seed producing NB.
- Physiological characterisation of selected parents and their hybrids for yield related parameters /traits-photosynthetic and respiration efficiency, antioxidant systems etc.
- Estimation of quality parameters.
- Station trial of promising F<sub>1</sub> hybrids.

2214 Time schedule of activities (milestone)

2215 Annual targets for each activity:

Activities	Particulars	1 <sup>st</sup> yr	2 <sup>nd</sup> yr	3 <sup>rd</sup> yr	4 <sup>th</sup> yr	5 <sup>th</sup> yr
Germplasm enrichment and characterization of bajra and napier lines	Acquisition from national international/institutes	√	√			
	Multiplication of germplasm lines	√	√			
	Identification and selection of parents and development of inbreds and MS lines for hybrid production	√	√	√	√	
	Physiological characterisation of selected parents and the hybrids in pearl millet and NB hybrids		√	√	√	
Cytogenetical Studies in NB hybrids and their polyploids	√	√				
	Inducing polyploidy in NB using colchicine		√	√		
Generation of high yielding with better nutritive value bajra (pearl millet) and NB hybrids	Development of hybrids in pearl millet		√	√	√	
	Hybrid development in NB hybrids		√	√		
	Test for quality parameters parameters of Parents and their hybrids pearl millet and NB			√	√	



	Evaluation of NB hybrids			√		
	Evaluation of pearl millet hybrids			√		
Conduction of station trial	Station trial of promising selected pearl millet hybrid and compilation of data				√	√
	Station trial of promising selected NB hybrid and compilation of data				√	√

**2216 Estimated man months:**

- a. Scientific: 12 man-months per year
- b. Technical: 06 man –months per year
- c. Supporting: 05 man- months per year

**222 Proposed Research Details**

**2221 Importance of the project (gaps in knowledge/ products/ process technology) to the institute mandate.**

Pearl millet is one of the important crop in the rainfed area of the country. Due to unavailability of popular hybrids for forage pearl millet the actual or realised yield is very less than its potential yield. When Gahi-3 (USA) yields 111 t/ha, most of the varieties in India, yield 30-35 t/ha. We have diverse ms sources in pearl millet along with germplasm/ advance lines that can be used as parents in Pearl millet hybrid development programme to fill the gap between demands and supply of green forage by nearly 64% up to some extent. Hybrid pearl millet is not released yet especially for fodder purpose, so it is essential to develop the same, keeping in mind the large rainfed area under Pearl millet fodder cultivation.

Napier – bajra hybrid is one of the important hybrid fodder crop and in high demand in now a days. National check CO-3 is best suited to irrigated area of T.N. and other varieties also are suited to specific area of the country. Though IGFRI-3 have high fodder potential, is not out yielded CO-3 and suitable in central and hill region of the country. Keeping in view the rich germplasm resources maintained at IGFRI and about 27 lines of napier are supposed to come from ILRI, Ethiopia in 2012, that will be used in development of NB hybrids to get maximum heterosis and to utilise one of the maximum variability of napier in the country. Development of new NB hybrid to fill the cover the larger area of forage cultivation is important and priority of the Institute and also stands fit for the mandate of the institute

**2222 Questions attempted to be answered:**

Prospect of pearl millet hybrid for forage purpose with wider acceptability would be known. Differential response of different cytoplasmic male sterile sources in pearl millet hybrid development for forage purpose would be known. Prospect of seed development in NB hybrid at enhanced ploidy level, achieved by colchipoity and their further use for forage purpose in India will be estimated. Feasibility of using 4x pearl millet as female parent to produce seed producing NB hybrids (4x) would be answered. Impact of diverse germplsm of napier on antinutritional factor like oxalic acid would be estimated.

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**PART- V: DECLARATION**

This is to certify that;The research work proposed in the scheme/ project does not in any way duplicate the work already done or being carried out in the institute on the subject.

The same project has been/ has not been submitted to any other agency (ies) for financial support (if already submitted identify project and agency). The Investigator/co-investigators have been fully consulted in the development of project and have fully undertaken the responsibility to carry out the programme as per the technical programme.

Signature of the Project Investigator:

*K Durgesh*  
(Kumar Durgesh) 08/02/12

Co-investigators:

*Chandan Kumar Gupta*  
(Chandan Kumar Gupta)

*A.K. Mishra*  
(A .K Mishra)

Signature and comments of the Head of the Division/ Section

*the present proposal  
may be included as  
project Ct 2.9.*

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*9/1/12*

Signature and comments of the Director

*S. Jaiswal*  
*08/02/12*