Results Framework Document (RFD)

for

INDIAN INSTITUTE OF SUGARCANE RESEARCH

(2011- 2012)

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Section1: Vision, Mission, Objectives and Functions

Vision

Developing cost effective, eco-friendly, input use efficient sugarcane agriculture

Mission

Enhancement of sugarcane productivity, profitability and sustainability to meet future sugar and energy requirement of India

Objectives :

1. Developing high yielding, disease resistant and pest tolerant, good ratooning, input responsive sugarcane varieties
2. Evaluation of genetic resources in sugarcane (*Saccharum* germplasm) for sustainable sugar yield and for biotic and abiotic stress.
3. Improving quality seed production
4. Optimization of cultivation modules for plant and ratoon crop for different environments.
5. Design and development of technologies for mechanizing sugarcane cultivation
6. Providing training, consultancy and advisory services to farmers, industries and other users.
7. Developing integrated pests and disease management modules.
8. Strengthening of research efforts on sugarbeet cultivation

Functions:

To attend the followings aspects relating to sugarcane research in India with particular focus on sub-tropical India

- Developing high yielding, disease resistant and pest tolerant, good ratooning, input responsive sugarcane varieties
- Designing and developing planting methods, planting geometry, biotic and abiotic stress management modules and integrated nutrient supply system for maximizing yield of plant and ratoon crops.
- Increasing physiological efficiency of sugarcane varieties for biomass and sugar
- Mechanising sugarcane farming
- Bio-intensive management of red rot and borers
- Minimising post-harvest sucrose loss
- Strengthening research in the emerging and frontier areas like biotechnology, bioinformatics, product diversification, etc. in sugarcane.
- Developing liason/interactions with SAUs, State Cane Departments, KVKs and other organisations.
- Dissemination of technologies through training sugarcane development personnel, farmers, etc.
- Commercialization of technologies/knowledge developed at the institute.

Section 2: Inter se priorities among key objectives, Success indicators and Targets

Sl	Objectives	Wt	Action	Success Indicator	Unit	Wt	Target/Criteria value				
							Exlt	V Gd	Gd	Fr	Pr
							100 %	90%	80%	70%	60%
1	Developing high yielding, disease resistant and pest tolerant, good ratooning, input responsive sugarcane varieties	12	Developing high yielding and high sugar vars/genetic stock	Crosses made at Coimbatore	No.	0.5	60	50	40	35	30
				Seedlings raised and evaluated (thousands)	No.	1.0	25	20	15	10	5
				Selections made (Hundreds)	No.	0.5	10	9	8	7	5
				Genotypes advanced	No.	1.0	200	180	150	120	100
				Elite clones identified	No.	1.0	25	22	20	16	14
				Clones included in stations trial	No.	1.0	16	14	12	10	8
				Clones proposed for AICRP testing/ State Varietal Trial	No.	1.0	4	3	2	1	0
				Varieties identified/released	No.	1.0	1	0	0	0	0
				Genetic stock identified/ sent to NHG	No.	1.0	3	2	1	0	0
			Evaluation of genotypes for disease resistant and pest tolerance	Genotypes evaluated against red rot and smut through artificial inoculation	No.	2	80	70	60	50	40
				Sugarcane genotypes assessed for insect pests tolerance	No.	2	80	70	60	50	40
2	Evaluation of genetic resources in sugarcane (*Saccharum* germplasm) for sustainable sugar yield and for biotic and abiotic stress.	13	Germplasm evaluated	Genotypes added	No.	1.5	10	5	0	0	0
				Genotypes maintained and evaluated	No.	1.5	200	0	0	0	0
			Marker Assisted Selection (Biotechnological tools)	Primers design and evaluated	No.	0.5	50	40	30	20	10
				Polymorphic markers identified	No.	0.5	30	25	20	15	10
				Trait-linked markers/ QTL identified	No.	0.5	3	2	1	0	0
				Markers validated	No.	0.5	3	2	1	0	0
			Gene identification (Biotechnological tools)	Primers design and evaluated	No.	0.5	40	30	20	10	0
				ESTs/RGAs/genes identified	No.	0.5	4	3	2	1	0
				Attempts to co cultivate calli with agrobacterium	No.	0.5	6	5	4	3	2
				Genetic transformants developed	No.	0.5	10	8	6	4	2
			Research for increasing physiological efficiency of sugarcane varieties for biomass and sugar	Pysio-biochemical parameters identified/ PGR applied/ effectors found	No.	6.0	10	8	6	4	2

3	Improving quality seed production	10	Seedcane production and distribution to factories and progressive farmers	Area of seed crop raised (hectares)	No.	4.0	10	8	6	5	4
				Quantity of seedcane supplied (thousand quantals)	No.	4.0	8	7	6	5	4
				Sugar factories served	No.	2.0	10	9	8	7	5
4	Optimization of cultivation modules for plant and ratoon crop for different environments.	15	Development/verification of planting techniques/input-use efficient crop modules	Technologies/modules developed/ verified/ demonstrated on farmers fields	No	10	5	4	3	2	1
				Demonstrations carried out	No.	5	30	28	25	20	15
5	Design and development of technologies for mechanizing sugarcane cultivation	15	Development /improvement of machinery and equipments	Prototypes/technologies designed/ fabricated/tested/PFT/FLD	No.	15	4	3	2	1	0
6	Providing training, consultancy and advisory services to farmers, industries and other users	10	Training to sugarcane development personnel, farmers, etc	Personnel/farmers trained.	No.	4	175	160	150	125	100
			Commercialization of technologies/knowledge developed	Consultancy services provided.	No.	2	4	3	2	1	0
				Revenue generated (Rs in Lacs)	No.	2	10	9	8	7	6
			Capacity building of researchers/students	PG students trained in frontier research areas	No	2	20	16	14	12	10
7	Developing integrated pests and disease management modules.	10	Developing disease management modules	Survey and surveillance of diseases and collection of infected material (Sugarmill command area covered)	No.	0.5	5	4	3	2	1
				Isolation/characterization and race identification of red rot pathogen (No. of isolates collected)	No.	1.5	20	16	14	12	10
				Isolation identification, characterization and evaluation of bio-agents against red rot pathogen (No. of isolates collected)	No.	1.5	20	16	14	12	10
				Evaluation of disease management tools against major diseases (No. of tools evaluated)	No.	1.5	5	4	3	2	1
			Developing insect pests management modules	Survey and surveillance of insect pests and collection of parasitoids/natural enemies	No.	0.5	5	4	3	2	1

				(Sugarmill command area covered)							
				Augmentation and conservation of natural enemies of major insect pests of sugarcane (Sugarmill command area covered)	No.	1.5	5	4	3	2	1
				Development/refinement of rearing techniques for insect pests and their bioagents (Rearing technique evaluated)	No.	1.5	5	4	3	2	1
				Evaluation of different pests management tools against major pests (Tools evaluated)	No.	1.5	5	4	3	2	1
8	Strengthening of research efforts on sugarbeet cultivation	4	Crop Improvement Research	Germplasm lines acquired/ evaluated	No.	1.0	3	0	0	0	0
				Germplasm lines maintained	No.	1.0	20	18	16	14	12
				Seed produced (kgs)	No.	1.0	50	40	30	20	10
				Breeding lines developed/tested/ identified for root crop performance	No.	1.0	10	8	7	6	5
9*	Efficient functioning of the RFD system	11	Timely submission of RFD for 2011-12	On-time submission	Date	2	March 31, 2011	April, 3 2011	April, 4 2011	April, 5 2011	April, 6 2011
			Timely submission of Results for 2011-12	On-time submission	Date	1	May 1, 2012	May 3, 2012	May 4, 2012	May 5, 2012	May 6, 2012
			Finalize a Strategic Plan for RC	Finalize the Strategic Plan for next 5 years	Date	2	Dec. 10, 2011	Dec. 15, 2011	Dec. 20, 2011	Dec. 24, 2011	Dec. 31, 2011
			Identify potential aresas of corruption related to organization activities and develop an action plan to mitigate them	Finalize an action plan to mitigate potential areas of corruption	%	2	Dec. 10, 2011	Dec. 15, 2011	Dec. 20, 2011	Dec. 24, 2011	Dec. 31, 2011
			Implementation of Sevottam	Create a Sevottam compliant system to implement, monitor and review Citizen's Charter	Date	2	Dec. 10, 2011	Dec. 15, 2011	Dec. 20, 2011	Dec. 24, 2011	Dec. 31, 2011
				Create a Sevottam Compliant system to redress and monitor public Grievances	Date	2	Dec. 10, 2011	Dec. 15, 2011	Dec. 20, 2011	Dec. 24, 2011	Dec. 31, 2011

Section 3: Trend Values of the success indicators

Sl	Objectives	Action	Success Indicator	Unit	Actual valve for 09-10	Actual valve for 10-11	Target value for Fy 11-12 (April to Mar.)	Projected value for 12-13	Projected valve for 13-14
1	Developing high yielding, disease resistant and pest tolerant, good ratooning, input responsive sugarcane varieties	Developing high yielding and high sugar vars/genetic stock	Crosses made at Coimbatore	No.	-	-	60	60	60
			Seedlings raised and evaluated (thousands)	No.	-	-	15	15	15
			Selections made (Hundreds)	No.	-	-	10	10	10
			Genotypes advanced	No.	-	-	200	200	200
			Elite clones identified	No.	-	-	25	25	25
			Clones included in stations trial	No.	-	-	16	16	16
			Clones proposed for AICRP testing/ State Varietal Trial	No.	-	-	4	4	4
			Varieties identified/released	No.	-	-	1	1	1
			Genetic stock identified/ sent to NHG	No.	-	-	3	3	3
		Evaluation of genotypes for disease resistant and pest tolerance	Genotypes evaluated against red rot and smut through artificial inoculation	No.	70	70	80	80	80
			Sugarcane genotypes assessed for insect pests tolerance	No.	40	52	80	80	80
2	Evaluation of genetic resources in sugarcane (*Saccharum* germplasm) for sustainable sugar yield and for biotic and abiotic stress.	Germplasm evaluated	Genotypes added	No.	0	0	10	5	5
			Genotypes maintained and evaluated	No.	220	220	200	200	200
		Marker Assisted Selection (Biotechnological tools)	Primers design and evaluated	No.	100	200	50	50	50
			Polymorphic markers identified	No.	80	180	30	30	30
			Trait-linked markers/ QTL identified	No.	-	-	3	3	3
			Markers validated	No.	-	-	3	3	3
		Gene identification (Biotechnological tools)	Primers design and evaluated	No.	-	20	40	40	40
			ESTs/RGAs/genes identified	No.	-	2	4	4	4
			Attempts to co cultivate calli with agrobacterium	No.	-	8	6	6	6
			Genetic transformants developed	No.	-	10	10	10	10
		Research for increasing	Pysio-biochemical parameters	No.	2	6	8	9	10

		physiological efficiency of sugarcane varieties for biomass and sugar	identified/ PGR applied/ effectors found						
3	Improving quality seed production	Seedcane production and distribution to factories and progressive farmers	Area of seed crop raised (hectares)	No.	8	9	10	10	10
			Quantity of seedcane supplied (thousand quantals)	No.	7.8	8.1	8	8	8
			Sugar factories served	No.	8	8	10	10	10
4	Optimization of cultivation modules for plant and ratoon crop for different environments.	Development/verification of planting techniques/input-use efficient crop modules	Technologies/modules developed/ verified/ demonstrated on farmers fields	No	4	4	5	5	5
			Demonstrations carried out	No.	40	25	25	30	30
5	Design and development of technologies for mechanizing sugarcane cultivation	Development /improvement of machinery and equipments	Prototypes/technologies designed/ fabricated/tested/PFT/FLD	No.	3	3	4	4	4
6	Providing training, consultancy and advisory services to farmers, industries and other users	Training to sugarcane development personnel, farmers, etc	Personnel/farmers trained.	No.	56	200	155	160	160
		Commercialization of technologies/knowledge developed	Consultancy services provided.	No.	**3**	**2**	**4**	**5**	**5**
			Revenue generated (Rs in Lacs)	No.	8	9	10	10	10
		Capacity building of researchers/students	PG students trained in frontier research areas	No	13	15	20	20	20
7	Developing integrated pests and disease management modules.	Developing disease management modules	Survey and surveillance of diseases and collection of infected material (Sugarmill command area covered)	No.	3	6	5	5	5
			Isolation/characterization and race identification of red rot pathogen (No. of isolates collected)	No.	16	16	20	20	20
			Isolation identification, characterization and evaluation of bio-agents against red rot pathogen (No. of isolates collected)	No.	12	30	20	20	20
			Evaluation of disease management tools against major diseases (No. of tools evaluated)	No.	3	3	4	4	4
		Developing insect pests management modules	Survey and surveillance of insect pests and collection of	No.	3	6	5	5	5

			parasitoids/natural enemies (Sugarmill command area covered)						
			Augmentation and conservation of natural enemies of major insect pests of sugarcane (Sugarmill command area covered)	No.	3	3	5	5	5
			Development/refinement of rearing techniques for insect pests and their bioagents (Rearing technique evaluated)	No.	3	4	5	5	5
			Evaluation of different pests management tools against major pests (Tools evaluated)	No.	3	4	4	4	5
8	Strengthening of research efforts on sugarbeet cultivation	Crop Improvement Research	Germplasm lines acquired/ evaluated	No.	-	-	3	3	3
			Germplasm lines maintained	No.	20	20	20	20	20
			Seed produced (kgs)	No.	40	45	50	50	50
			Breeding lines developed/tested/ identified for root crop performance	No.	-	-	10	10	10
9*	Efficient functioning of the RFD system	Timely submission of RFD for 2011-12	On-time submission	Date	-	-	March 31, 2011	-	-
		Timely submission of Results for 2011-12	On-time submission	Date	-	-	May 1, 2012	-	-
		Finalize a Strategic Plan for RC	Finalize the Strategic Plan for next 5 years	Date	-	-	Dec. 10, 2011	-	-
		Identify potential aresas of corruption related to organization activities and develop an action plan to mitigate them	Finalize an action plan to mitigate potential areas of corruption	%	-	-	Dec. 10, 2011	-	-
		Implementation of Sevottam	Create a Sevottam compliant system to implement, monitor and review Citizen's Charter	Date	-	-	Dec. 10, 2011	-	-
			Create a Sevottam Compliant system to redress and monitor public Grievances	Date	-	-	Dec. 10, 2011	-	-

Section 4: Description and Definition of success indicators and proposed measurement methodology

Objective No 1: Developing high yielding, disease resistant and pest tolerant, good ratooning, fertilizer responsive sugarcane varieties. It is envisaged to carry out intergeneric crosses, inter-varietal crosses, evaluation of C1 crosses, C2 crosses, C3 crosses and subsequent evaluation and advancement to C4 crosses. The genetic stock developed is sent to National Hybridization Garden (NHG) at SBI Coimbatore. The promising selections made are then advanced to testing for Station, AICRP and other state varietal trials
Objective No 2: Collection and conservation of genetic resources in sugarcane for sustainable use. For carrying out basic and strategic research in sugarcane, the genetic resources of *Saccharum* genus are collected and maintained and evaluated for economic traits such as high sugar, red rot disease and/or top borer insect resistance.
Objective No 3: Improving quality seed production. The institute produces and supplies breeder/certified seed cane to farmers through sugarmills.
Objective No4 Optimization of cultivation modules for plant and ratoon crop. It is envisaged to develop input efficient crop production, biotic stress (disease and insect-pest) and abiotic stress management modules, verify them on fields and carry out their demonstrations. No of demonstrations in any particular year may be more when sponsored by some outside agency
Objective No5 Design and development of technologies for mechanizing sugarcane cultivation. It is envisaged to develop protypes of different machinery/equipments required in cane cultivation, fabricate them and carry out feasibility trials and demonstrations.
Objective No6 Providing training, consultancy and advisory services to farmers, industries and other users . It is envisaged to disseminate improved sugarcane production technology by organizing training programmes to farmers as well as to the cane development officials of sugar mills. Consutancies to sugar mills and to other private organizations through contract research are also provided. In frontier areas of research, the capacity building of researchers/students is also carried out
Objective No. 7: Developing integrated pests and disease management modules. It envisages survey and survillence of insect-pests diseases, parasites and predators in any sugarmill command area. It also include comments for resistance/susceptibility of sugarcane varieties to the prevalling race flora/fauna and assessment of biocontrol potentials of prevalent parasitoids/antagonists.
Objective No. 8: Strengthening of research efforts on sugarbeet cultivation Under this objective, it is envisaed to accure and evaluate germplasm lines, make crosses and evaluate breeding lines as well as to produce sugarbeet seed under suitable location.

Section 5: Performance requirements from other departments

The dissemination of capital intensive sugarcane cultivation technology will also depend upon the keen interest of the sugar mills in cane development activities in their cane command areas, as the extension in sugarcane is mill centred. Also, if the support of the state cane departments in popularizing the improved cane technology/ costly machinery is available, the dissemination would be fast and better.

Section 6: Outcome/Impact of activities of IISR, Lucknow

1	2	3	4	5	6	7	8	9	10
S. No.	**Outcome/ Impact of organization / RCs**	**Jointly responsible for influencing this outcome / impact with the following organization (s) / departments / ministry (ies)**	**Success Indicator (s)**	**Unit**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
1	Enhanced sugarcane productivity	DAC, State govts, State cane departments & its research wings, SAUs, sugar mills	Cane productivity levels in UP	t/ ha	52.3	59.2	56.7	-	
			Plant	t/ ha	50.20	58.39	56.14		
			Ratoon	t/ ha	52.69	58.65	56.57		
			Overall	t/ ha	51.77	58.80	56.34		
			Cane productivity in subtropical region	t/ ha	51.48	54.77	56.42	-	
			Cane productivity in India	t/ ha	64.5	70.0	68.6	-	
			Number of sugar mills with adoption of recommended crop/varietal planning comprising more than 15% area under early maturing varietiesin UP	No.	5	5	5		
2	Enhanced sugar production	Ministry of Food and Public Distribution, DAC, State govts, State cane departments, sugar mills	Sugar production in UP	Mln tonnes	4.06	5.18	5.89	-	
			Sugar production in India	Mln tonnes	14.54	18.91	24.39	-	
3	Enhanced sugarcane quality	State Govts, State cane departments, sugar mills	Sugar recovery levels in different regions of UP	%					
			i) East		8.99	9.22	9.31		
			ii) West		8.83	9.13	8.92		

			iii) Central		8.99	9.06	9.18		
			Sugar recovery levels in India	%	10.03	10.20	10.17	-	
4	Enhanced rural livelihood security	DAC, SAUs, Ministry of Rural Development, State Govts, State Cane Departments, sugar mills.	Extent of cane area in UP	Mln ha	2.08	1.98	2.12		
			Extent of cane area in sub-tropical region	Mln ha	2.64	2.44	2.77		
			Extent of cane area in India	Mln ha	4.41	4.17	4.94		
			Sugarcane used for production of sugar	%	53.4	63.5			
			Cane price payments to farmers	(Rs. 000, Crores)	17	20.2	39.3		
5	Rural industrialization and employment generation	Sugar mills, Ministry of Food and Public Distribution, DAC, State Cane Departments,	Number of sugar mills in operation in UP	No.	131	128	125*		
			Average annual cane crushing capacity in India	TCD	3725	3825	3650		
			Number of sugar mills in operation in India	No.	488	490	527		
6	Increase in the extent of mechanization of sugarcane cultivation	State cane departments, sugar mills, CACP, private manufacturers of implements	Number of sugarcane machineries sold and in operation in sugarcane.	No.	250	250	300		
			Extent of cost of machinery used in total operational cost of sugarcane cultivation in UP**	%	5.40	3.82	4.17		
			Average number of labour days employed in sugarcane cultivation in UP	Days/ha	164	170	147		
7	Knowledge development and dissemination on sugarcane and sugar beet	Journal Editorial Boards, professional Societies/academies	Technical papers published in research journals	No.	33	45	44		
			Books/ Bulletins/technical reports/news letters published	No.	6	6	3		
			Popular articles published	No.	4	17	11		

Note: *The small sized sugar mills of public sector (UP State Sugar Corporation) are in the process of being sold.,** The figure reported under a particular year is the value pertaining to 2 years back period.