Results Framework Document (RFD)

for

INDIAN INSTITUTE OF SUGARCANE RESEARCH

(2012- 2013)

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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. To develop efficient, eco-friendly sugarcane crop management practices/tools for diverse agro-system.
2. To develop input responsive, high yielding, high sugar, biotic and abiotic stress tolerant sugarcane varieties.
3. To provide training, consultancy and advisory services to stakeholders.

Functions:

- Developing high yielding, disease resistant and pest tolerant, good ratooning, input responsive sugarcane varieties with particular focus on sub-tropical India.
- 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
- Non-conventional methods to increase sucrose content and minimising post-harvest sucrose loss
- Strengthening research in the emerging and frontier areas like biotechnology, bioinformatics, product diversification including lignocellulosic bio-ethanol production, juice preservation, etc. in sugarcane.
- Studies related to climate change/resilient agriculture
- Strengthening research work on sugar beet cultivation
- Developing liason/interactions with SAUs, State Cane Departments, sugar mills, KVKs and other organisations.
- Dissemination of technologies through training sugarcane development personnel, farmers, etc.
- Commercialization of technologies, products and knowledge developed at the institute.

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

Sl	Objectives	Weight (%)	Action	Success Indicator	Unit	Weight (%)	Target/Criteria value				
							Exlt	VG d	Gd	Fr	Pr
							100%	90%	80%	70%	60%
1	To develop efficient, eco-friendly sugarcane crop management practices/ tools for diverse agro-system.	44	Development of input-use efficient crop production practices/ tools.	Recommendations developed/ verified for newly released varieties/ methods/ machineries.	No.	6	8	5	4	3	2
				Crop management tools developed for stress conditions	No.	2	5	3	2	1	0
				Field and farm demonstrations carried out	No.	5	50	35	25	20	15
			Development of insect-pest and disease management tools.	Sugar mill command areas covered for collection of infected material/parasitoids/natural enemies	No.	2	6	4	3	2	1
				Isolates collected for identification of races of major disease pathogen and evaluation of bio-agents	No.	2	20	16	14	12	10
				Natural enemies of major insect-pests of sugarcane conserved and augmented.	No.	1	6	4	3	2	1
				Rearing techniques for insect-pests/bio-agents evaluated/ refined/developed	No.	2	6	4	3	2	1
				Pest management tools developed/ evaluated	No.	2	6	4	3	2	1
			Increasing physiological efficiency of sugarcane	Physio-biochemical parameters identified/ PGR applied/ effectors found/ enzymes/gene expression study performed	No.	5	10	8	6	4	2
				Effective chemical/formulations tested/ verified & demonstrations conducted for increasing sucrose content/ management of post-harvest sucrose loss	No.	2	6	4	3	2	1
			Development/improvement of equipment/ machinery for sugarcane cultivation	Prototypes designed/ fabricated	No.	5	8	5	3	2	1
				Prototype feasibility test / FLDs carried out in fields	No.	5	12	8	6	4	2
				Area operated with machines developed	hectares	5	40	20	10	5	1
2	To develop input responsive, high yielding, high sugar, biotic and abiotic stress	24	Management, collection and conservation of genetic resources of sugar crops	Number of sugarcane germplasm/ breeding material maintained and conserved.	No.	0.5	350	300	250	200	150
				Number of sugar beet germplasm/ breeding material collected/introduced	No.	1	16	10	6	4	2

	tolerant sugarcane varieties.			and characterized.							
			Evaluation of genetic resources in sugarcane germplasm	Number of genotypes evaluated for desirable traits such as sustainable sugar yield and abiotic stress tolerance.	No.	3	200	150	100	50	25
				Number of genotypes evaluated for biotic stress tolerance (insect-pests and diseases).	No.	2	90	70	50	40	30
				Breeding lines of sugar beet tested for root crop performance	No.	0.5	10	8	6	4	3
			Identification of novel genes to combat stress and improve quality	Novel genes identified/ genetic transformants developed/ Trait-linked markers/QTL identified and validated	No.	3	10	5	4	3	2
			Development of improved variety, suited to diverse agro-systems	Number of progenies handled (seedling raised and evaluated)	thousands No.	3	30	20	15	10	5
				Elite clones proposed for AICRP testing/ State Varietal Trial and finally varieties identified	No.	5	6	4	3	2	1
			Identification/registration of novel/promising germplasm/variety	Germplasm/genetic stock/variety identified/ sent to NHG/ registered with NBPGR/PPV&FRA	No.	1	6	4	3	2	1
			Production of breeder's and commercial seed cane	Quantity of seed cane produced and marketed (Sugarcane)	000 qtls.	3	10	8	6	4	2
				Quantity of seed produced and marketed (Sugarbeet)	kg	0.5	50	40	30	20	10
				Number of sugar mills served	No.	1.5	20	16	12	8	4
3	To provide training, consultancy and advisory services to stakeholders	20	Training to sugarcane development personnel, farmers etc	Training programmes organized.	No.	5	10	6	3	2	1
				Farmers trained.	No.	1	200	160	100	75	50
				Extension personnel/ sugar mill cane development officers trained	No.	2	40	25	20	10	5
			Commercialization of technologies / products / knowledge developed	MoUs signed for contract research/ Consultancy services provided.	No.	6	6	4	3	2	1
				Quantity of quality by-products marketed.	Qtls.	1	50	30	20	10	5
			Providing advisory services	Socio-economic surveys, surveillance, and other advisory services provided to sugar mills/departments	No.	2	7	5	3	2	1
			Capacity building of researchers/students	Capacity building of researchers/UG/PG students trained in frontier research areas	No.	2	60	40	30	20	10
			Revenue Generation	Revenue generated (Rs in Lacs)	No.	1	150	100	75	50	25

			including sale of farm produce								
4*	Efficient functioning of the RFD system	3	Timely submission of RFD for 2012-13	On-time submission	Date	2	Mar 23 2012	Mar 26, 2012	Mer 27, 2012	Mar 28, 2012	Mar 31, 2012
			Timely submission of Results for 2012-13	On-time submission	Date	1	Mar 26, 2013	Mar 27, 2013	Mar 28, 2013	Mar 29, 2013	Mar 31, 2013
5*	Administrative Reforms	5	Implement ISO 9001	Prepare ISO 9001 action plan	Date	1	Jun 4, 2012	Jun 5, 2012	Jun 6, 2012	Jun 7, 2012	Jun 8, 2012
				Implementation of ISO 9001 action plan	Date	2	23/03/13	26/03/13	27/03/13	28/03/13	31/03/13
			Implement mitigating strategies for reducing potential risk of corruption	% of implementation	%	2	100	95	90	85	80
6*	Improving Internal Efficiency / responsiveness/ service delivery of Ministry / Department*	4	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	2	100	95	90	85	80
				Independent Audit of implementation of public grievance redressal system	%	2	100	95	90	85	80

* Mandatory objectives as decided by ICAR

Section 3: Trend Values of the success indicators

Sl	Objectives	Action	Success Indicator	Unit	Actual valve for 10-11	Actual valve for 11-12	Target value for Fy 12-13 (April to Mar.)	Projected value for 13-14	Projected valve for 14-15
1	To develop efficient, eco-friendly sugarcane crop management practices/ tools for diverse agro-system.	Development of input-use efficient crop production practices/ tools.	Recommendations developed/ verified for newly released varieties/ methods/ machineries.	No.	3	5	5	5	5
			Crop management tools developed for stress conditions	No.	1	2	3	3	3
			Field and farm demonstrations carried out	No.	36	40	35	40	40
		Development of insect-pest and disease management tools.	Sugar mill command areas covered for collection of infected material/parasitoids/natural enemies	No.	3	8	4	8	9
			Isolates collected for identification of races of major disease pathogen and evaluation of bio-agents	No.	10	32	16	32	35
			Natural enemies of major insect-pests of sugarcane conserved and augmented.	No.	3	4	4	4	5
			Rearing techniques for insect-pests/bio-agents evaluated/ refined/developed	No.	1	4	4	4	4
			Pest management tools developed/ evaluated	No.	1	3	4	4	4
		Increasing physiological efficiency of sugarcane	Physio-biochemical parameters identified/ PGR applied/ effectors found/ enzymes/gene expression study performed	No.	3	5	8	8	9
			Effective chemical/formulations tested/ verified & demonstrations conducted for increasing sucrose content/ management of post-harvest sucrose loss	No.	2	4	4	4	5
		Development/improvement of equipment/ machinery for sugarcane cultivation	Prototypes designed/ fabricated	No.	2	3	5	6	6
			Prototype feasibility test / FLDs carried out in fields	No.	3	7	8	8	9
			Area operated with machines developed	hectares	15	21	20	28	30

2	To develop input responsive, high yielding, high sugar, biotic and abiotic stress tolerant sugarcane varieties.	Management, collection and conservation of genetic resources of sugar crops	Number of sugarcane germplasm/ breeding material maintained and conserved.	No.	284	284	300	320	320
			Number of sugar beet germplasm/ breeding material collected/introduced and characterized.	No.	7	11	10	11	12
		Evaluation of genetic resources in sugarcane germplasm	Number of genotypes evaluated for desirable traits such as sustainable sugar yield and abiotic stress tolerance.	No.	142	210	150	170	175
			Number of genotypes evaluated for biotic stress tolerance (insect-pests and diseases).	No.	65	142	70	75	75
			Breeding lines of sugar beet tested for root crop performance	No.	7	10	8	8	8
		Identification of novel genes to combat stress and improve quality	Novel genes identified/ Genetic transformants developed/ Trait-linked markers/QTL identified and validated	No.	3	5	6	7	8
		Development of improved variety, suited to diverse agro-systems	Number of progenies handled (seedling raised and evaluated)	thousands No.	19	32	20	22	22
			Elite clones proposed for AICRP testing/ State Varietal Trial and finally varieties identified	No.	4	**7**	4	4	4
		Identification/registration of novel/promising germplasm/variety	Germplasm/genetic stock/variety identified/ sent to NHG/ registered with NBPGR/PPV&FRA	No.	10	4	4	4	5
		Production of breeder's and commercial seed cane	Quantity of seed cane produced and marketed (Sugarcane)	000 qtls.	8	8	8	8.5	8.5
			Quantity of seed produced and marketed (Sugarbeet)	kg	54	54	40	42	43
			Number of sugar mills served	No.	12	10	16	17	18
3	To provide training, consultancy and advisory services to stakeholders	Training to sugarcane development personnel, farmers etc	Training programmes organized.	No.	9	4	6	6	7
			Farmers trained.	No.	3	400	160	170	170
			Extension personnel/ sugar mill cane development officers trained	No.	80	34	25	30	30
		Commercialization of technologies / products / knowledge developed	MoUs signed for contract research/ Consultancy services provided.	No.	3	3	4	4	4
			Quantity of quality by-products marketed.	Qtls.	10	25	30	35	35

		Providing advisory services	Socio-economic surveys, surveillance, and other advisory services provided to sugar mills/departments	No.	2	4	5	5	5
		Capacity building of researchers/students	Capacity building of researchers/UG/PG students trained in frontier research areas	No.	34	29	40	45	50
		Revenue Generation including sale of farm produce	Revenue generated	Rs in Lacs	13.25	115	100	115	125
4*	Efficient functioning of the RFD system	Timely submission of RFD for 2012-13	On-time submission	Date	-	-	Mar 26, 2012	Mar 26, 2013	Mar 26, 2014
		Timely submission of Results for 2012-13	On-time submission	Date	-	-	Mar 27, 2013	Mar 27, 2014	Mar 27, 2015
5*	Administrative Reforms	Implement ISO 9001	Prepare ISO 9001 action plan	Date	-	-	Jun 5, 2012	-	-
			Implementation of ISO 9001 action plan	Date	-	-	26/03/13	26/03/14	26/03/15
		Implement mitigating strategies for reducing potential risk of corruption	% of implementation	%	-	-	95	95	95
6*	Improving Internal Efficiency / responsiveness/ service delivery of Ministry / Department*	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	-	-	95	95	95
			Independent Audit of implementation of public grievance redressal system	%	-	-	95	95	95

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

Objective No 1: It is envisaged to develop input efficient crop production, biotic stress (disease and insect-pest) and abiotic stress management practices/tools for diverse agro-eco systems, 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. It also envisages physio-biochemical solutions to help reduce stress conditions or to minimize post-harvest losses. It also envisages collecting reports of resistance/susceptibility of sugarcane varieties to the prevailing race of flora/fauna (insect-pests, diseases, parasites and predators) and undertaking development/assessment of efficient control/management practices and tools in diverse agro-ecosystems. Emphasis in this respect is on the assessment of bio-control potentials of prevalent parasitoids/antagonists. The objective also envisages designing and developing technologies for mechanizing sugarcane cultivation, i.e., developing prototypes of different machinery/equipments required in cane cultivation, fabricating them and carrying out feasibility trials and demonstrations.
Objective No 2: For developing varieties of sugarcane, the parent stock is identified for utilization in breeding programme, hybridization at NHG, raising of seedling and subsequent selection at IISR and its regional station at Motipur, Bihar. 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. It is envisaged to carry out inter-generic & inter-varietal crosses, evaluation of crosses at different stages (C1, C2, C3 evaluation and subsequent advancement to C4 crosses). The genetic stock developed is sent for hybridization to National Hybridization Garden (NHG) at SBI, Coimbatore. The promising selections made are advanced to testing for Station, sugar mill, AICRP and other state varietal trials before their release as commercial varieties. The biotechnological tools comprising marker assisted selection and gene identification is also be carried out. The production of breeder/commercial seed cane will be carried out for distribution to farmers through sugar mills. The acquisition/evaluation of germplasm of other sugar crops particularly of sugar beet for the development of varieties is also envisaged.
Objective No 3: 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. Consultancies to sugar mills and to other private organizations through contract research will also be provided and efforts will be made to earn revenue. It also envisages survey and surveillance of insect-pests, diseases, parasites and predators in sugar mill command areas and provide advisories for better crop/varietal planning. It is also envisaged to provide advisory services on diverse aspects of sugarcane cultivation (such as likely scenarios of sugarcane cultivation, prices etc., in near future, cost of sugarcane cultivation, region/sugar mill specific advisories) to Central/state govts., state cane departments, sugar mills and/or to the farmers. In frontier areas of research, the capacity building of researchers/students is also carried out by providing short term training or through co-guidance in Ph.D research work.

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. The expenditure on cane development by the sugar mills of sub-tropical region is at very low level compared to their tropical region counter parts. If investment on cane development is increased by sugar mills, the impact on cane yield levels would be much discernible. The sugar mills may also sponsor more number of their cane development officials for their proper capacity building in efficient sugarcane production management at research organisations.

The support of the state cane departments in popularizing the improved cane technology/ costly machinery is also required in the form of subsidies/incentives for fast and better dissemination of the technologies.

The availability of fertilizers to farmers in time is the main factor for obtaining higher cane yield but the farmers face acute shortage of fertilizers at the time of planting of sugarcane. The farm-factory relations are the other determinant for the overall growth of the sugar sector. The sugar mills in UP generally challenge the price offered by the state govt and the litigation results in the disadvantage to the farmers, providing disincentives to them.

The data on number of outcome parameters is not being collected by the state machinery. For example, the varieties released by the Institute/AICRP on Sugarcane network are not recognized by some state govts and hence, the area under the varieties released by the Institute or the AICRP (S) network is not available even though these varieties are under cultivation. Similarly the information on pulse/oilseed/other crops intercropped area in sugarcane based cropping systems is not compiled by any identified agency and hence is not available to ascertain the impact of the Institute research. So is the case with respect to the information on the area operated with sugarcane planting/interculturing improved machinery developed and popularized by the institute.

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

1	2	3	4	5	8	9	10	11	12
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**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**
1	Enhanced sugarcane & sweeteners productivity	State cane departments & its research wings, SAUs, sugar mills	Cane productivity in India	t/ ha	70.1	68.9	73	74	75
			Cane productivity in subtropical region	t/ ha	57.0	58.2	59.4	60.6	62.0
2	Introduction of alternative sugar crops (sugar beet) and its expansion	DAC, Sugar mills, Seed companies	Area covered	ha	1000	1500	2500	4000	6000
			No. of states covered	No	2	2	3	4	6
3	Increase in mechanization of sugarcane cultivation	State cane departments, sugar mills, private manufacturers of implements	Number of IISR designed sugarcane machineries sold and in operation in sugarcane.	No.	300	360	410	500	6 00
			Manufacturers promoted	No.	2	3	5	6	8
4	Enhanced rural industrialization and livelihood and nutritional security	Sugar mills, Ministry of Food and Public Distribution, DAC, State Cane Departments,	Area under autumn planting	ha	10000	11000	12000	14000	16000
			Area under intercropping	ha	5000	5500	6000	7000	8000
			Technological upgradation of jaggery manufacturing units vis-a-vis and value addition	Nos.	2	3	5	8	10
5	Knowledge development and dissemination on sugar crops	Journal Editorial Boards, Professional Societies	Papers published in research journals	No.	31	62	64	66	68
			Books/ Bulletins/technical reports/news letters published	No.	5	6	7	8	10
			Popular articles / Extension folders published	No.	16	17	20	22	25

Abbr. DAC= Department of Agriculture and Cooperation.