

Results Framework Document (RFD) for Central Tobacco Research Institute, Rajahmundry

Section 1: Vision, Mission, Objectives and Functions

Vision

Enhancing productivity and quality of Indian tobacco to make it more remunerative, globally competitive and promoting alternative uses to sustain the crop in the country

Mission

Developing economically viable and eco-friendly agro-technologies for enhancing productivity and quality, reducing harmful substances, developing value-added products for promoting exports and generating revenue and employment on a sustainable basis

Objectives

1. Tobacco Cultivar Improvement
2. Development of agro-technology for sustainable tobacco production and strengthening TOT
3. Identification of alternative crops and exploiting tobacco for alternative uses
4. Management of resource constraints for production efficiency and product quality
5. Development of integrated management strategies for biotic stresses

Functions

To conduct research on different types of tobacco, with greater emphasis on exportable types, on all phases of production management with a view of attaining economic advantage/ benefit to the tobacco growers through improvement in quality and quantity of tobacco; to conduct research on economically viable and sustainable cropping systems alternative to tobacco; to conduct research on diversified uses of tobacco and development of value-added products viz. phyto-chemicals; to produce and distribute quality seeds of notified varieties of tobacco; to publish and disseminate research findings and recommendations of latest technology for the benefit of the tobacco growers, scientific community, policy makers and development agencies.

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Section 2: Inter se Priorities among Key Objectives, Success Indicators and Targets

Table 1: Format of the Results-Framework Document (RFD)

| Objective | Weight | Actions | Success Indicator | Unit | Weight | Target/Criteria Value | | | | |
|------------------------------|--------|---|---|--------|--------|-----------------------|-----------|------|------|------|
| | | | | | | Excellent | Very Good | Good | Fair | Poor |
| | | | | | | 100% | 90% | 80% | 70% | 60% |
| Tobacco Cultivar Improvement | 25.0 | 1. Developing tobacco varieties/ hybrids possessing higher leaf yield and resistance to biotic and abiotic stresses to stabilize productivity | Segregating materials, promising recombinants and hybrids developed through conventional breeding | Number | 3.5 | 900 | 800 | 700 | 600 | 500 |
| | | | Improved lines in replicated evaluation trials | Number | 3.0 | 200 | 180 | 160 | 140 | 120 |
| | | | Advanced breeding lines contributed for Multilocation testing under the AINRP(T) / varieties identified or released | Number | 2.0 | 8 | 6 | 4 | 2 | 1 |

| | | | | | | | | | |
|--|--|--|--------|-----|-------|-------|-------|-------|-------|
| | | | Number | 1.5 | 100 | 90 | 80 | 70 | 60 |
| 2. Tailoring of tobacco plant type for optimizing the seed yield and phyto-chemicals | Promising germplasm accessions, advanced breeding lines/hybrids evaluated for seed yield potential/ high seed oil/high protein/ high solanesol / high nicotine contents. | | kg | 5.0 | 20000 | 18000 | 16000 | 14000 | 12000 |
| 3. Production and distribution of foundation seed of ruling tobacco varieties | Quantity produced / distributed | | | | | | | | |
| 4. Germplasm Resource Management | Germplasm accessions maintained in all forms | | Number | 2.5 | 2100 | 1800 | 1600 | 1400 | 1200 |
| | No. of lines characterized | | Number | 1.0 | 150 | 130 | 110 | 100 | 90 |
| | No. of accessions added to gene bank | | Number | 0.5 | 50 | 40 | 30 | 20 | 10 |
| 5. Biotechnology for tobacco improvement | Genotypes used for molecular characterization/ genome analysis | | Number | 3.0 | 70 | 60 | 50 | 40 | 30 |

| | | | | | | | | | | |
|---|------|---|--------|---|-----|----|----|----|----|----|
| Development of agro-technology for sustainable tobacco production and | 20.0 | 1. Healthy seedling production 2. Optimisation of water and nutrient use for | Number | 1.4 | 9 | 8 | 7 | 6 | 5 | |
| | | | | Molecular mapping populations developed with reference to traits viz., nicotine, solanesol and TSNA | | | | | | |
| | | | | Somaclones of varieties VT 1158 and Kanchan evaluated for yield and virus tolerance under field condition | 1.0 | 50 | 40 | 30 | 20 | 10 |
| | | | | Seed sterile and non-flowering tobacco clones micropropagated | 0.5 | 90 | 80 | 70 | 60 | 50 |
| | | | | Transgenics and transplastomic lines maintained and characterized | 0.1 | 6 | 5 | 4 | 3 | 2 |
| | | | | Technology interventions for production of healthy transplants | 2.0 | 3 | 2 | 1 | 0 | 0 |
| Development of agro-technology for sustainable tobacco production and | 20.0 | 1. Healthy seedling production 2. Optimisation of water and nutrient use for | Number | 5.0 | 6 | 4 | 3 | 2 | 1 | |
| | | | | Technology interventions for input use | | | | | | |

| | | | | | | | | | |
|----------------------|--|--|--------|--|---|----|----|----|----|
| strengthening TOT | productivity enhancement of different tobacco types | efficiency | Number | 4.0 | 6 | 4 | 3 | 2 | 1 |
| | | | | 3. Evolving site-specific cultural management practices in different agro-ecological sub regions | Production practices for advance breeding lines / varieties | | | | |
| | 4. Post harvest product management (PHPM) | Technology interventions developed | Number | 1.0 | 3 | 2 | 1 | 0 | 0 |
| | | | | 1. Tobacco zone-wise Resource utilization and adoption constraints | Technology interventions developed | | | | |
| | Analysis of socio-economics for stratification and to formulate appropriate strategies | 1. Tobacco zone-wise Resource utilization and adoption constraints | Number | 1.8 | 5 | 4 | 3 | 2 | 1 |
| | | | | 2. Zone-wise trends and economics of tobacco cultivation | 2. Zone-wise trends and economics of tobacco cultivation | | | | |
| | | | | 3. Farm women empowered | 3. Farm women empowered | | | | |
| | Technology outreach activities | 1. Zone-wise decision support systems | Number | 0.4 | 5 | 4 | 3 | 2 | 1 |
| | | | | 0.8 | 50 | 40 | 30 | 20 | 10 |

| | | | | | | | | | | | | |
|---|--------|-----------------------|---|--------|---|--------|------|----|----|----|---|---|
| Identification of alternative crops and exploiting tobacco for alternative uses | 20.0 | Technology assessment | for TOT | | | | | | | | | |
| | | | 2. Training | Number | 0.7 | 30 | 25 | 20 | 15 | 10 | | |
| | | | 3. FLD's | Number | 0.2 | 10 | 8 | 6 | 4 | 2 | | |
| | | | 4. Focus through print media | Number | 0.4 | 50 | 40 | 30 | 20 | 10 | | |
| | | | 5. Radio talks | Number | 0.3 | 15 | 12 | 9 | 6 | 3 | | |
| | | | 6. Group Communication methods | Number | 0.3 | 5 | 4 | 3 | 2 | 1 | | |
| | | | 7. Mass Communication methods | Number | 0.3 | 5 | 4 | 3 | 2 | 1 | | |
| | | | 1. Diagnostic Visits | Number | 0.5 | 15 | 12 | 9 | 6 | 3 | | |
| | | | 2. On Farm Trials | Number | 1.3 | 5 | 4 | 3 | 2 | 1 | | |
| | | | Alternative crops for FCV and non- FCV tobacco practices in different agro-ecological sub regions | 20.0 | Identification of crops/ cropping systems / farming systems for tobacco | Number | 12.0 | 7 | 5 | 3 | 2 | 1 |
| Technologies evaluated/ developed | Number | 4.0 | | | | 3 | 2 | 1 | 0 | 0 | | |
| Phyto-chemicals | Number | 4.0 | | | | 4 | 3 | 2 | 1 | 0 | | |

| | | | | | | | | | | | | |
|--|------|---|---|--------|-----|-----|-----|-----|-----|---|---|--|
| Management of resource constraints for production efficiency and product quality | 15.0 | potential phytochemicals | evaluated | Number | 3.0 | 2 | 1 | 0 | 0 | 0 | | |
| | | | | | | | | | | | 1. Evaluation of soil fertility, water quality and plant nutrition constraints for tobacco and their management | Diagnostic surveys made/Technology developed |
| | | | | | | | | | | | 2. Soil quality and nutrient use efficiency in relation to input management | Scientific interventions/ management options evaluated |
| | | | | | | | | | | | 3. Characterization of soil biota and use of biofertilisers | Microbial cultures evaluated as bio-fertilizers |
| | | 4. Evaluation of tobacco leaf and product quality | Genotypes /production practices evaluated for tobacco chemical /biochemical quality | Number | 2.0 | 3 | 2 | 1 | 0 | 0 | | |
| | | | | | | | | | | | Number | 3.0 |
| | | | Number | 3.0 | 500 | 400 | 300 | 200 | 100 | | | |

| | | pesticide residues | | Number | | 2.0 | 25 | 20 | 15 | 10 | 5 |
|--|------|---|---|------------------------|--------|-----|-----------|-----|-----|-----|----|
| Integrated management of biotic stresses | 15.0 | Screening for host plant resistance to insect pests and diseases | Tobacco products tested for smoke constituents | No. | | 5.0 | 600 | 400 | 250 | 150 | 50 |
| | | | Development of IPM technology | Technologies developed | Number | | 4.0 | 4 | 3 | 2 | 1 |
| | | Evaluation of new molecules and formulations of pesticides for bio-efficacy | Laboratory/ greenhouse and field trials conducted | No. | | 3.0 | 4 | 3 | 2 | 1 | 0 |
| Efficient function of RFD system | 5.0 | Monitoring of insect pests and diseases | Insect pests and diseases monitored | No. | | 3.0 | 5 | 3 | 2 | 1 | 0 |
| | | Timely submission of RFD | On time submission | Date | | 2.0 | 31.3.2011 | | | | |
| | | Timely submission of results | On time submission | Date | | 3.0 | 31.3.2012 | | | | |

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Section 3: Trend values of the success indicators

| Objective | Actions | Success Indicator | Unit | Actual value for 2009-10 | Actual Value for 2010-11 | Target Value for 2011-12 | Projected Value for 2012-13 | Projected Value for 2013-14 |
|--------------------------------|--|---|--------|--------------------------|--------------------------|--------------------------|-----------------------------|-----------------------------|
| Tobacco Cultivar Improvement | Developing tobacco varieties/ hybrids possessing higher leaf yield and resistance to biotic and abiotic stresses to stabilize productivity | Segregating materials, promising recombinants, hybrids developed through conventional breeding | Number | 800 | 1050 | 1100 | 1100 | 1100 |
| | | Improved lines in replicated evaluation trials | Number | 201 | 219 | 220 | 220 | 220 |
| | | Advanced breeding lines contributed for Multi-location testing under the AINRP(T) / varieties identified or released | Number | 10 | 12 | 8 | 12 | 10 |
| Production and distribution of | Tailoring of tobacco plant type for optimizing the seed yield and phyto-chemicals | Promising germplasm accessions, advanced breeding lines/hybrids evaluated for seed yield potential/ high seed oil/high protein/ high solanesol / high nicotine contents | Number | 143 | 100 | 100 | 100 | 120 |
| | | Quantity produced and distributed | kg | 29,000 | 18,000 | 20,000 | 20,000 | 20,000 |

| | | | | | | | | |
|---|---------------------------------------|---|--------|-------|-------|-------|-------|------|
| foundation seed of ruling tobacco varieties | Germplasm Resource Management | Germplasm accessions maintained in all forms | Number | 2,000 | 2,200 | 2,350 | 2,400 | 2450 |
| | | No. of accessions characterized. | Number | 171 | 96 | 150 | 100 | 100 |
| | Biotechnology for tobacco improvement | Number of accessions added to gene bank | Number | 96 | 150 | 50 | 50 | 50 |
| | | Genotypes used for molecular characterization/genome analysis | Number | 75 | 72 | 80 | 80 | 80 |
| | | Molecular mapping populations developed with reference to traits viz., nicotine, solanesol and TSNA | Number | 10 | 10 | 10 | 10 | 10 |
| | | Somaclones of varieties VT 1158 and Kanchan evaluated for yield and virus tolerance under field condition | Number | 100 | 100 | 50 | 40 | 30 |
| | | Seed sterile and non-flowering tobacco clones micropropagated | Number | 100 | 100 | 100 | 120 | 120 |
| | | Transgenics and transplastomic lines | Number | 6 | 6 | 6 | 6 | 6 |

| | | | | | | | | | | | | |
|---|--|--|--------|---|----|---|---|---|---|--|---|---|
| Development of agro-technology for sustainable tobacco production and strengthening TOT | maintained and characterized | | | | | | | | | | | |
| | Healthy seedling production | Technology interventions for production of healthy transplants | Number | 3 | 3 | 2 | 0 | 0 | 0 | | | |
| | Optimisation of water and nutrient use for productivity enhancement of different tobacco types | Technology interventions for input use efficiency | Number | 6 | 6 | 6 | 6 | 6 | 6 | | | |
| | Evolving site-specific cultural management practices in different agro-ecological sub regions | Production practices for advance breeding lines / varieties and cultural practices | Number | 6 | 10 | 6 | 6 | 6 | 6 | | | 6 |
| | Post-harvest product management (PHPM) | Technology interventions developed | Number | 2 | 2 | 2 | 2 | 2 | 2 | | | 2 |
| | Analysis of socio-economics for stratification and to formulate | Tobacco zone-wise Resource utilization and adoption constraints Zone-wise trends and economics of tobacco cultivation | Number | 2 | 4 | 5 | 4 | 4 | 5 | | | 5 |
| | | Number | 2 | 4 | 4 | 5 | 4 | 5 | | | 5 | |

| | | | | | | | | | | | |
|---|---|---|--------|----|----|----|----|----|----|----|----|
| Identification of alternative crops and exploiting tobacco for alternative uses | appropriate strategies | Farm women empowered | Number | 40 | 50 | 50 | 50 | 50 | 50 | 50 | |
| | Technology outreach activities | Zone-wise decision support systems for TOT | Number | - | 4 | 5 | 4 | 4 | 4 | 4 | 4 |
| | | Training | Number | 25 | 28 | 30 | 30 | 30 | 30 | 30 | 30 |
| | | FLD's | Number | 10 | 10 | 8 | 8 | 8 | 8 | 8 | 10 |
| | | Focus through print media | Number | 42 | 46 | 45 | 45 | 45 | 45 | 45 | 50 |
| | | Radio talks | Number | 12 | 12 | 15 | 15 | 15 | 15 | 15 | 15 |
| | | Group Communication methods | Number | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | | Mass Communication methods | Number | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | | Diagnostic Visits | Number | 12 | 12 | 15 | 15 | 15 | 15 | 15 | 12 |
| | | On Farm Trials | Number | 3 | 6 | 5 | 5 | 5 | 5 | 5 | 5 |
| | | Identification of crops/ cropping systems / farming systems for tobacco | Number | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 3 |
| | Agro-techniques for higher biomass and seed yield | Technologies evaluated/ developed | Number | 4 | 4 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Identification of potential phytochemicals | Chemicals/ oil evaluated for alternative uses | Number | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| | | | | | | | | | |
|--|--|--|--------|-----|------|-----|-----|-----|-----|
| Management of resource constraints for production efficiency and product quality | 1. Evaluation of soil fertility, water quality and plant nutrition constraints for tobacco and their management. | Diagnostic surveys made/Technology developed | Number | 2 | 2 | 2 | 2 | 3 | 3 |
| | 2. Soil quality and nutrient use efficiency in relation to input management | Scientific interventions/ management options evaluated | Number | 2 | 2 | 2 | 2 | 2 | 3 |
| | 3. Characterization of soil biota and use of biofertilisers | Microbial cultures evaluated as bio-fertilizers | Number | 3 | 2 | 2 | 2 | 3 | 3 |
| | 4. Evaluation of tobacco leaf and product quality. | Management practices evaluated for tobacco chemical /biochemical quality | Number | 3 | 3 | 3 | 3 | 3 | 4 |
| Integrated management of biotic | Screening for host plant resistance to | Samples tested for leaf quality and pesticide residues | Number | 500 | 500 | 500 | 500 | 600 | 600 |
| | | Tobacco products tested for smoke constituents. | Number | 25 | 25 | 25 | 30 | 35 | 35 |
| | | Genotypes/crosses screened | No. | 900 | 1000 | 600 | 600 | 600 | 600 |

| | | | | | | | | | | | | | |
|----------------------------------|---|---|--------|---|---|---------|---------|---------|---------|--|--|---------|---------|
| stresses | insect pests and diseases | | | | | | | | | | | | |
| | Development of IPM technology | Technologies developed | Number | 6 | 6 | 4 | 4 | 4 | 4 | | | 4 | 4 |
| | Evaluation of new molecules and formulations of pesticides for bio-efficacy | Laboratory/ greenhouse and field trials conducted | No. | 5 | 5 | 4 | 4 | 4 | 4 | | | 4 | 4 |
| | Monitoring of insect pests and diseases | Insect pests and diseases monitored | No. | 9 | 9 | 7 | 7 | 6 | 6 | | | 6 | 6 |
| Efficient function of RFD system | Timely submission of RFD | On time submission | Date | - | - | 31.3.11 | 31.3.11 | 31.3.12 | 31.3.12 | | | 31.3.13 | 31.3.13 |
| | Timely submission of results | On time submission | Date | - | - | 31.3.12 | 31.3.12 | 31.3.13 | 31.3.13 | | | 31.3.14 | 31.3.14 |

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Section 4: Description and Definition of Success Indicators and Proposed Measurement Methodology

Objective 1: Tobacco Cultivar Development

It is proposed to utilize both conventional and biotechnological means to develop tobacco cultivars/hybrids with higher productivity, quality and resistance to biotic and abiotic stresses. Germplasm management is aimed at acquisition, maintenance, evaluation and utilization of promising accessions in the development of improved cultivars for conventional and novel uses.

Objective 2: Development of agro-technology for sustainable tobacco production and strengthening TOT

Research is focused to produce healthy seedlings, optimisation of water and nutrient use for productivity enhancement of different tobacco types, evolving site- specific cultural management practices in different agro-ecological sub regions and post harvest crop management practices. Success indicators cover the number of technologies developed in each activity.

It is envisaged to strengthen extension through critical analysis of socio-economics, formulation of appropriate strategies, effective implementation of different technology outreach activities and evaluation & confirmation of technology performance by technology assessment. Success indicators cover tobacco zone-wise resource utilization and adoption constraints, trends and economics of tobacco cultivation, decision support systems for TOT, women empowerment, training, front-line demonstrations, print media coverage, radio talks, group and mass communication methods, diagnostic visits and on-farm trials

Objective 3: Identification of alternative crops and exploiting tobacco for alternative uses

Efforts are directed to identify alternative crops/farming systems for FCV and non- FCV tobacco and to develop package of practices in different agro-ecological sub regions and developing agro-techniques for higher biomass and seed yield.

It is envisaged to identify the potential phyto-chemicals/ seed oil and to promote their potential yield by suitable agro techniques to exploit tobacco for its non-conventional uses. Success indicators include identification of chemicals having potential for industrial /pharmaceutical applications, seed oil for edible

purpose and optimizing the agro-techniques to promote higher biomass and seed oil.

Objective 4: Management of resource constraints for production efficiency and product quality

It is envisaged to meet the objective by systematically diagnosing/characterizing the resource (soil and water) constraints in terms of soil nutrient deficiency/ depletions, nutrient imbalances and excess, heavy metal accumulation, plant nutrient status and water deficits/excesses, and evaluating and identifying situation specific management options to promote resource conservation and efficient use. The success indicators cover number of diagnostic surveys made, scientific interventions/management options evaluated for their effects on soil quality and nutrient use efficiency, microbial cultures evaluated as nutrient supplements, monitoring the leaf quality/pesticide residues/ smoke constituents in tobacco grown in different production zones.

Objective 5: Development of Integrated management strategies for biotic stresses

With respect to integrated pest management, research efforts are focused on strengthening of components of IPM like host-plant resistance, need based chemical control, identification and effective utilization of bio-control agents, identification and evaluation of novel methods of pest population regulation and synthesis and demonstration of site specific IPM packages for which the performance indicators are genotypes/crosses screened for pest resistance, laboratory and field trial conducted for evaluation of new molecules/formulations, insect pests and diseases monitored and IPM technologies developed.

Section 5:

Specific Performance Requirements from other Departments

- Information on tobacco quality requirements of leaf from tobacco traders is essential to breed varieties that suit the domestic and international demand.
- Timely information on approved area for FCV tobacco production in AP and Karnataka are essential for Forecasting the production of the required foundation seed
- Evaluation of new molecules/formulations of pesticides for bio efficacy will depend upon the development and availability of new molecules/formulations from the industry and their suitability to tobacco as per international trade requirements