

Towards Eco-Friendly
Environment and Healthy Society

Training of Facilitators on Integrated Crop Management (ICM) Practices for Sustainable Sugarcane Production through Farmer Field School Approach



A Manual



Participatory Rural Development Initiatives Society (PRDIS)
Hyderguda, Hyderabad-500 048

&



Acharya N.G.Ranga Agricultural University (ANGRAU)
Rajendranagar, Hyderabad-500 030



Sponsored by
WHO, Country Office for India, New Delhi - 110 011

**Training of Facilitators on
Integrated Crop Management (ICM) Practices
for Sustainable Sugarcane Production through
Farmer Field School Approach**

Manual

Compiled by

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FOREWORD

Sugarcane is one of the major important commercial crops in the country and Sugar Industry is the largest Agro based industry next to textiles located in Rural India. However the productivity of sugarcane is low. The average productivity in India is 61.7 MT/ ha and in Andhra Pradesh 78.00 MT/ ha.

The major constraints in sugarcane production are increase of abiotic soil problems, increased incidence of biotic stresses, incidence of insect pests and diseases and non adoption of recommended crop management practices.

In order to redress the constraints and also increase sugarcane productivity in a sustainable way, with sound ecological practices, the Participatory Rural Development Initiatives Society (PRDIS) in collaboration with the Acharya NG Ranga Agricultural University (ANGRAU) and with support from World Health Organisation (WHO) has organized a season long Training of Facilitators (ToF) programme on Integrated Crop Management (ICM) practices for sustainable sugarcane production at RARS Anakapalli, Andhra Pradesh.

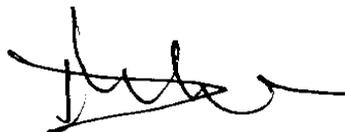
During this process, the Farmer Field Schools (FFS) were conducted to empower the small scale farmers on the skills and knowledge on crop management practices for sustainable sugarcane production. I am happy to note that the FFS data revealed an increase of 10 MT / Ac (25 tons/ha) yields with a net income of Rs. 15000 to 20000/- per acre (Rs.35000 to 50000 per ha) compared to farmer fields.

Impressed by the results, PRDIS and ANGRAU have brought out a manual entitled *“Training of Facilitators on Integrated Crop Management (ICM) Practices for*

Sugarcane Production through Farmer Field School Approach” projecting the technologies and methodologies for sustainable sugarcane production. This manual will serve as a valuable reference material and guide for scientific staff and others interested in promoting sustainable sugarcane production by enhancing the productivity and reducing the costs of cultivation.

The contribution made for this manual by Dr. N.V.Naidu, Principal Scientist, (Sugarcane), Dr. C.V. Rama Rao, Scientist, RARS, Lam, Guntur, ANGRAU; Dr. N.S.Reddy, Technical Advisor, Dr. M.R. Naidu, Consultant, Mr. M. Sudharshan Reddy, Facilitator of PRDIS, ToF participants and farmers is acknowledged.

I congratulate Prof. S.V.Reddy, President and Executive Director of PRDIS, Mr. B.V.R. Murthy, SSA (Retd) , Directorate of PP. Q & S, GoI and Dr. M.Suryamani, Professor of Agricultural Extension. ANGRAU, for taking lead in preparing and publishing this manual.



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PREFACE

Sugarcane is grown in India over an area of 4.4 million ha reaching a production level of 271 million tonnes with the productivity of 61.7 ton/ ha. Andhra Pradesh is one among the major sugarcane growing states in the country covering an area of 0.196 million ha and the production of cane is about 15.3 million tons with the productivity level of 78.00 ton/ha. Sugarcane crop forms major source for a variety of products such as sugar, jaggery, molasses, bagasse, filter cake, green top etc.

There are many biotic and abiotic constraints in Sugarcane cultivation. The major biotic stress to sugarcane crop is due to insect pests, diseases & weeds. For controlling those pests farmers have been using toxic chemical pesticides like Lindane, Carbofuran, Endosulfan and other hazardous pesticides. Besides, the use of high dose of chemical fertilizers also has contributed for deteriorating soil health and pest problems. As a result of indiscriminate use of chemicals, farmers have been experiencing serious health and environmental problems.

Keeping the above concerns in view, PRDIS in collaboration with ANGR Agricultural University with the support of WHO has organized a Season long Training of Facilitators (ToF) programme on *Integrated Pest Management Practices for Sustainable Sugarcane Production under Pesticide Free Environment* for nucleus staff of the State Departments of Agriculture, Sugarcane Research Institutes, Sugar Industries, Non Government Organizations and Progressive farmers. These facilitators have conducted practice Farmer Field Schools. (FFS) to gain hands on experience and also to empower the farmers on knowledge and skills to grow a healthy sugarcane crop, maximize yields, minimize costs on inputs and protect their health and environment from the ill effects of chemicals through sustainable Integrated Crop Management practices.

The programme was organized at Regional Agricultural Research Station (RARS) of ANGRAU at Anakapalle, Andhra Pradesh, India from January, to Dec, 2009.

This programme has shown the way for growing a healthy sugarcane crop with the application of low cost and sound ecological practices. Impressed by the results the PRDIS and ANGRAU has brought out this manual entitled *Integrated Crop Management Practices for Sustainable Sugarcane Production through Farmer Field School Approach* with the technologies and methodologies followed during this process. This manual can be viewed as a basic resource material which can be further improved based on the experiences by all stakeholders. The Health , Environment and social impacts are being worked out which will be incorporated in the revised version of the manual.

I hope it will be a valuable guide for all those interested in promoting sustainable sugarcane production through Farmer Field School Approach.

The PRDIS is grateful to ANGRAU and WHO for providing technical and financial support. Dr.P Raghva Reddy , Vice Chancellor, ANGRAU has shown special interest by providing resources and technical guidance for organization of the programme. Similarly Dr. A.K Sengupta and Dr. Alex of WHO, Dr. V. Raghunathan, Formerly Plant Protection Advisor, GoI, Dr. S. Balasubramanian, Dy. Director, NIPHM, Dr N.V. Naidu, Principal Scientist (Sugarcane), ANGRAU have rendered valuable help and support for making this programme a success. Special thanks are due to ToF participants, ToF Facilitators, Resource Persons. Dr.S.Ramakrishna Rao, Associate Director of Research and staff of RARS, Anakapalli, collaborative Farmers and Sugar Industries as well as staff of PRDIS for their help . Mr. B.V.R.Murthy, S.S.A (Retd) Directorate of PP. Q & S, GoI, and Dr. M. Suryamani, Professor of Agricultural Extension, EEI ANGRAU have worked hard for preparing the material for the manual. They deserve special acknowledgements.



Dr. S.V.Reddy

President and Executive Director, PRDIS

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I. INTRODUCTION

Sugarcane is one of the major important commercial crops in the country and sugar industry is the largest agro based industry next to textiles located in rural India. Sugarcane crop forms major source for a variety of products such as sugar, Jaggery, molasses, bagasse, filter cake, green top etc.

The major constraints in sugarcane production are:

1. Increase in abiotic soil problems
2. Incidence of insect pests and diseases
3. Inadequate crop management practices
4. Increase in input costs due to indiscriminate use of chemicals which has direct reflection on human health and environmental pollution
5. Excessive application of inorganic fertilizers resulting in deterioration of soil health

In order to redress the constraints and also increase Sugarcane Productivity in a sustainable way with sound ecological practices, the Participatory Rural Development Initiatives Society (PRDIS) in collaboration with Acharya N.G.Ranga Agricultural University (ANGRAU), Hyderabad and with financial support from World Health Organization (WHO) has organized a Training of Facilitators (ToF) programme on Integrated Pest Management (IPM) practices for Sustainable Sugarcane Production under Pesticide Free Environment. A curriculum development workshop was organized involving all stakeholders to formulate curriculum for the ToF

2. Programme objectives and strategy

As cited, with the long term developmental objective to have sustainable, profitable and environmentally sound production of sugarcane, the PRDIS – ANGRAU – WHO, have organised the “Training of Facilitators [ToF] and Farmer Field Schools” from January – December 2009 at Regional Agricultural Research Station, Anakapalle, Andhra Pradesh with *the following specific objectives*:

- To develop a cadre of sugarcane IPM / ICM facilitators from the existing staff of Regional Agricultural Research Station, Sugar Industries, NGOs, Diploma Students from Agricultural Polytechnic and Progressive Farmers.
- To promote Co-operation among various stakeholders such as State Government, Research Institutions, Developmental Agencies, Extension Services, Farmers, Sugar Industry and other Non-Governmental Organizations and to improve access for all interested parties to share information within and from outside programme area.

The general strategy to achieve these objectives is to conduct Training of Facilitators (ToF) to produce good quality, skilled facilitators and then utilize them in training farmers by organizing Farmer Field Schools (FFS) to gain hands-on experience.

3. ToF Objectives

1. To build up confidence in participants for carrying out scientific studies and to develop skills in empowering farmers through experimentation and discovery based learning.
2. To develop skills in Non-Formal education, Team building, Group Dynamics, Communication and facilitation.
3. To develop skills in helping farmers to continue field activities to manage quality FFS on their own.
4. To develop skills in organizing and facilitating season-long FFS through practice FFS
5. To impart knowledge and skills to take a right crop management decisions and to grow healthy crop.
6. To make the participants understand the Health, Ecology, Biodiversity and Environmental issues connected with indiscriminate use of chemicals to create a pest-free environment paving way for sustainable sugarcane production

4. ToF Implementation

a. **Venue:** Regional Agricultural Research Station, Anakapalle (A.P.), India.

b. **Duration:** 120 days organized in a phased manner.

Phase-I 19.01.09 to 16.03.09

Phase- II 18.05.09 to 17.06.09

Phase-III 25.08.09 to 04.09.09

Phase-IV 25.11.09 to 15.12.09

However, the Programme was continuously monitored during the breakperiod by a team of facilitators.

c. Accommodation

The programme is fully residential. All the participants and facilitators stayed in the hostel accommodation provided at Regional Agricultural Research Station, Anakapalle.

d. Field

Regional Agricultural Research Station, Anakapalle, allotted 2.08 acres of land in the campus for exclusive use of training programme.

e. Grouping of Participants

The participants were divided into 4 small groups for easy working. Each group was provided with a full time facilitator to guide them through out ToF training.

f. Host team

In order to develop managerial and organizational skills, the participants in small groups share the burden of training management (preparing the teaching and demonstration material, organization of field visits, organization of mess etc.,). Each sub group shall perform as a host team for one week period in rotation.

g. Monitoring & supervision

The training programme was organized under the overall supervision and guidance of Dr. S.Venku Reddy, President & Executive Director, and Dr.N.S.Reddi, Senior consultant of PRDIS and under valuable technical guidance from Dr.N.V.Naidu, (Principal Scientist in sugar cane and other eminent scientists from Regional Agricultural Research Station, Anakapalle, Dr M. Suryamani, Professor, ANGRAU and other resource persons from reputed organizations.

Facilitator's Profile

The following reputed and experienced facilitators were utilized for organization

	Facilitators	Qualification	Position	Affiliation
1	Mr. B.V. Rama Murthy	B.Sc(Ag)	SSA (Retired)	Directorate of PP.Q&S G.O.I.
2	Dr. M.R. Naidu	M.Sc (Ag) Ph.D	Dean of Student Affairs(Retired) Agricultural Economist	ANGRAU
3	Dr. C.V. Rama Rao	M.Sc (Ag) Ph.D	Scientist (Ento) Entomologist	ANGRAU
4	Mr. L. Sudharshan Reddy	B.Sc (BZC)	Field Co-ordinator FFS Specialist	PRDIS

6. ToF Participants Profile

The total participants are 20. The profile is given below:

	Organization	No. of Participants	Total
1	Acharya N.G. Ranga Agricultural University	2	2
2	Sugar Industry	8	8
3	NGOs	7	7
4	Progressive Farmers	3	3

Age, Gender and Educational Profile of ToF Participants

Profile	Categories	Participants	
		#	%
a) Age	20-30	5	25
	31-40	11	55
	41-50	2	10
	51-60	2	10
b) Gender	Female	2	10
	Male	18	90
c) Education	Ph.D	2	10
	P.G	2	10
	Agril. Graduate	2	10
	Graduate	7	35
	Polytechnic (Agril)	2	10
	Undergraduates	5	25

7. Curriculum and Objectives

Prior to organization of the Training of Facilitators Programme (ToF) on Integrated Pest Management Practices for sustainable sugarcane production under pesticide free environment, a curriculum development workshop was organized with different stakeholders and experts, with the following objectives:

1. To deliberate and discuss various problems associated with use of extremely hazardous pesticides viz., development of resistance in pests; pesticide related health hazards to agriculture workers, cattle and other animals; negative impact of pesticide residues on environment; development of suitable bio-intensive IPM practices as a feasible measure to eliminate use of pesticides and other chemical inputs,etc.
2. To identify sustainable management practices for increasing sugarcane productivity.
3. To develop suitable curriculum with day to day schedule for organizing the season-long ToF on IPM in sugarcane.

The following topics were identified as a outcome of the curriculum development workshop and included in the curriculum of ToF.

A. Long term experiments

1. Management practices trial
2. Varietal trial (early maturing clones)
3. Spacing trial
4. Organic farming trial
5. Moisture stress management trial

B. Short studies and crop management

- Soil sampling
- Soil analysis
- Soil texture by feel method
- Sugarcane trash composting
- Vermicomposting Vs enriched compost & FYM
- Experiment on moisture holding capacity
- Experiment on root and plant vessel
- Study on germination to seedling stage
- Study on vegetative to tillering stage
- Mulching with trash Vs no mulching
- Earthing up Vs non - earthing up operation

- Sugarcane woolly aphid
- Aschersonia against White fly
- Parasitization studies of T chilonis
- Early shoot borer
- Introduction to insect zoo
- Insect zoo studies
- Pit fall traps
- Rat population dynamics
- Coccinellids
- Host culture and Trichogramma production
- Raising of sugarcane seedling in poly bags
- Type of spider
- Spider abundance
- Monitoring of ESB with Pheromone traps
- Discussion on different traps and installation of pheromone traps (for early shoot borer monitoring)
- Sett treatment with lime / *Trichoderma veridi* / carbendazim / malathion
- Facilitating scientific methods
- Inter node borer
- TT propping
- Determination of maturity
- Agro Eco System Analysis – Concept and Practice
- Short studies on crop growth periods
- Use of Botanical pesticides
- Use of Organic Fertilizers

C. Health, Environment and Social Issues (Gender)

- Exposure of pesticides during handling (mixing and spraying)
- Sign and symptoms of pesticide poisoning

- Storage and disposal of pesticides
- Pesticide hazards on human health
- Bio magnification of pesticide poisoning
- Pesticide spray calculations at field level
- Community health and village sanitation
- Work matrix for men and women in sugarcane cultivation (Gender)
- Climate management.

E. General activities

- Introduction to IPM principles and concepts
- Introduction to FFS, concept and establishment
- ToF concept methodology curriculum and frame work
- Agro eco-system
- Expectation and norm setting
- Base line survey and analysis
- Cost of cultivation and economic analysis proforma
- Record keeping in FFS
- Agro ecosystem analysis
- Introduction to ballot box test (Pre-evaluation)
- Attending Kissan Mela at Regional Agricultural Research Station, Anakapalle
- Exposure visit of FFS farmers

F. Non Formal Education / Agricultural Extension

- Presentation skills
- Communication skills
- Host team responsibilities
- Brain storming
- Group dynamics

G. Group dynamics and ice breakers

- Pairing and chaining
- Water brigade
- Tower building
- '9' dot game
- Drawing without lifting pen
- 7 up
- Inheritance
- Super market
- Battle of sports
- Pen in bottle

H. Ice breakers

- Number game
- How many squares
- How many triangles

I. Special topics covered

1. Host culture and Trichogramma production
2. Technologies for raising short crop and varieties in sugarcane
3. Presentation & Communication Skills
4. Group and group dynamics
5. Integrated nutrient management and role of bio fertilizer in sugarcane
6. Post harvest technology and value addition in sugarcane
7. Integrated disease management in sugarcane
8. Agro techniques for higher cane and sugar yields
9. Integrated pest management in sugarcane
10. Community health and rural sanitation
11. Team building
12. Management of sugarcane under adverse soil conditions
13. Agro techniques for increasing cane productivity in ratoon
14. Climate change and management
15. New technologies for sugarcane cultivation (SRI, Pit plantation etc)

II. TECHNICAL SESSIONS

1. SOIL HEALTH AND ITS MANAGEMENT

There is a gradual decline in soil health due to inadequate soil management. This has resulted in salinity, P^H imbalance and overall decline in organic matter. To emphasize the soil health and its management in sustainable production, this aspect has been covered with the topics enclosed in the ToF.

Exercise: Classifying Soil by Feel Method “Know Your Soil”

1. Introduction

Soil management is one of the approaches that farmer adopts to grow a healthy crop and optimize yields. Before that farmer should know the type of soil in his holding. This helps to decide the crop suitability which farmer wants to grow. This exercise is aimed to introduce the importance of Integrated Soil Management in growing healthy crop.

2. Learning objective

At the end of this exercise the participants will be able to

- Identify major soil textures by feel method
- Develop skill in feeling texture of soil

3. Time required: 60 minutes

4. Materials required

Fields with various soil type, old newspapers, drawing sheets, sketch pens, water bottle, small working spade.

5. Methodology

The participants were divided into small groups and the activity was briefed to them. Each group has collected soils from fields of different types. The sample was dried on newspapers under shade. They were asked to feel the texture of the soil which is as follows

1. When dry : 25 gms of dry soil was taken into hand, carefully watch whether loose and single grained (probably sand), numerous hard lumps that are difficult to break between fingers (Probably clay), easy to break between fingers and ends up as a fine powder (Probably silt).

2. water is added drop- by- drop until the soil is mouldable. Then the soil was squeezed in between the hand then the hand was open:

6. Observations

- Fails to form a ball instead fall apart when released
: Sandy (More than 70% sand)
- Forms a ball, roll the ball between your hands to form a cylinder seen with multiple cracks
: Loam (good mix of sand, silt, clay)
- Forms a ball, roll the ball between your hands to form a cylinder with no cracks
: clay (more than 40% clay)

Observation table

Soil sample number	Character to form ball	Character to form cylinder	Results
1.			
2.			
3.			

7. Points for discussion

- 1) How will you define soil?
- 2) What are the different components?
- 3) What is importance of 'texture' in soil?
- 4) What are the crops that can be grown as per soil type?
- 5) What is the suitable soil for growing sugarcane crop?

The observations made were discussed and summarized with the above questionnaire.

2. EXERCISE ON SOIL SAMPLING

1. Introduction

The soil must be always kept in fertile condition if high yields are to be produced. Fertilizers and manures are necessary for maintaining the soil in a high state of fertility and productivity. It is essential to know the relative levels of nutrients and which nutrient is deficient in soil for correct fertilizer recommendation.

2. Objective

At the end of the exercise the participants will be able to-

- collect soil samples that will represent larger area
- develop skill to prepare soil samples for analysis.

3. Time required

3 hours

4. Materials required

Spade or hoe, knife, polythene bags, twine thread, old newspapers, white paper.

5. Methodology

The participants were divided into small groups and were briefed about the activity. Each group was assigned a plot to do sampling activity.

- The field was divided into sampling units on the basis of uniformity of slope, colour, texture, past fertilizer applied, and cropping system.
- They were asked not to collect sample near to compost pit, near bunds under shade of a tree, near to patch.
- Each group has marked 10 spots in zig-zig manner spreading over the sampling area 0.4 ha.
- Before digging the pit, soil surface was cleared for litter and vegetation
- Make a 'v' cut upto 15" depth. Remove the entire soil with a sharp instrument top to bottom (systematically in two opposite directions), collect soil from each sample and put in a bucket.
- Spread the entire soil on a polythene sheets and shade dry. Take a final sample of 500 gms soil from the composite sample by quartering method till you get a satisfactory sample size.

- Put the soil in a cloth bag with a slip bearing details
 1. Name of farmer
 2. Name of the village
 3. Plot no
 4. Previous crop
 5. Proposed crop for which recommendation is required

6. Points for discussion

1. How many samples are required in a unit area
2. Why there is need for soil sampling
3. How often soil sampling need to be collected for soil analysis
4. How soil sampling is done in a field having different elevations
5. What are the steps involved in soil sampling
6. Is it necessary to collect soil sampling for each crop.

7. Follow-up

Soil samples taken from the ToF/FFS should be kept by the participants for soil analysis. Result becomes basis for conducting Participatory Action Research (PAR) studies.

3. SOIL ANALYSIS BY SOIL TEST KIT

1. Introduction

There are three ways to determine the fertility of soil. A farmer can collect soil sample from his field and submit it to the government soil laboratory to analyse. This process usually takes time. The other method is to study plant tissue for the presence of nutrients. This requires qualified person to do the job. The last method is to study the yields of crops over season which is time consuming one. The quick method to analyse the fertility status of the soil is the use of Soil Test Kit (STK). Soil analysis involves chemical analysis that measures the amount of Nutrients in the soil that is available to the plant. Results are interpreted and used as basis in making a recommendation on the right kind and amount of fertilizer. The Soil Test Kit is handy and easy to use, where the soil test can be done in the field and results are obtained immediately.

2. Objectives

- To determine the status of soil fertility of a given field using the soil test kit.
- At the end of this, the participants / Farmers in FFS can develop the skill in soil testing at field level with STK.

3. Materials required

Soil Test Kit with colour chart of Nutrients.

4. Procedure

The soil samples collected in each village were dried under shade and pounded to the required condition and Nutrient - wise analysis was done.

a) Estimation of P^H

1. Collect 5 gms of soil sample and put in a glass beaker
2. Add 2 grains of charcoal powder
3. Add 10ml of P^H Solution – 1
4. Take a test tube and put a small funnel on the test tube arranged in a stand.
5. Put filter paper in the funnel and rinse slightly with distilled water on it so that it will fix to it.

6. Mix the solution in the beaker thoroughly with a glass rod for 5 minutes
7. Strain it through filter paper
8. Collect 2 ml of filtered solution
9. Add 3-4 drops of P^H 2 solution and shake it
10. Tally the filtrate colour with the P^H colour chart and note the reading.

b) Estimation of "Organic Carbon"

1. Collect 1 gm of soil in a test tube
2. Add 2 ml of carbon – 1 solution to the soil and mix thoroughly
3. Add 2 ml of carbon – 2 (because it is acid, handle carefully) through the edge of the test tube to add gently and cork it.
4. Shake the test tube gently and put it in the test tube stand for 5 minutes
5. Tally the filtrate colour with the carbon colour chart and record the reading.

c) Estimation of "N"

1. Collect 1 gm of soil in a test tube
2. Add 10 ml of Nitrogen solution – 1
3. Close it with a cork, shake it horizontally for 3 minutes and keep it 3 minutes, again shake it.
4. Take a test tube and put a small funnel in a test tube arranged in a stand.
5. Put filter paper in the funnel, rinse it slightly with distilled water so that it fixed to it.
6. Filter the solution into this test tube.
7. Collect 5 ml of strained solution and Nitrogen – 2 powder measuring 2 grains, and mix it thoroughly for 2 mts.
8. Keep it for 10 minutes in the stand undisturbed
9. Tally the filtrate colour with the 'N' colour chart and record the reading.

d) Estimation of P_2O_5

1. Collect 2 gm of soil in a small conical flask
2. Add 2 gram of charcoal powder to it.

3. Add 20 ml solution of P_2O_5 solution – 1 and close with a cork and shake it horizontally for 3 minutes and keep it undisturbed for 3 minutes
4. Again shake the solution for 2 minutes
5. Filter it into a test tube through funnel fitted with filter paper
6. Collect 5 ml of filtered solution, add 2 ml of P_2O_5 solution bubbles will come when you add, so keep the test tube straight and shake it for 5 minutes
7. Add 4 ml of P_2O_5 solution 3.
8. Add P_2O_5 chemical powder to it and shake it thoroughly
9. Keep it undisturbed for 10 minutes in the stand
10. Tally the filtrate colour with P_2O_5 colour chart.

e) Estimation of K_2O

1. Collect 2-3 gm of soil in a small conical flask and add 10 ml of potash – 1 solution. Put corck and shake horizontally for 2 minutes.
2. Filter it in a test tube through funnel filed with filter paper
3. Collect 5 ml filtered solution.
4. Add 3-4 drops of potash – 2 solution to the filtrate and shake it gently
5. Keep it undisturbed for 2 minutes. The filtrate changes to milky white colour
6. Tally the colour obtained K_2O colour chart and record it.

f) Estimation of Sulphur

1. Collect 2 gm of soil in a test tube
2. Add 2 grams of charcoal powder to it.
3. Add 10 ml of Sulphur solution – 1
4. Put corck and shake it horizontally for 3 mts and keep it in the stand
5. Take a test tube and put a small funnel in the test tube
6. Put filter paper in the funnel and rinse it with distilled water
7. Filter the solution

8. Collect 5 ml of filtered solution and add 3-4 drops of Sulphur solution -2 and shake it gently
9. white milky color will form
10. Tally the filtrate colour with Sulphur colour chart and note the reading.

Farmer Field School Soil Test Results

Soil test results of Farmer Field School Villages

FFS Village	Plot	P ^H	EC=(ds/m)	OC%	Available 'N' Kg/ha	P	K	S
Thimmarajupeta	ICM	7.76	0.430	0.575	564.48	L	M	M ₂
Thimmarajupeta	Organic	7.53	0.580	0.520	564.48	L	M	M ₁
Chuchukonda	ICM	7.36	0.274	0.440	407.68	L	M	M ₁
Lakkavaram	ICM	8.05	0.455	0.720	564.48	L	M	M ₂
Juttada	ICM	7.94	0.356	0.560	250.80	L	M	M ₂

The soil analysis for nutrients status was done in all the FFS villages by the farmers with soil test kit. Again, the soil analysis was done in the soil testing laboratory by the participants of ToF for P^H, EC, OC and available N to get hands on experience.

Soil analysis results of ToF plots at RARS

S.No	Particulars	Field Number		
		59	61	12C
1.	P ^H	7.28	7.79	6.92
2.	EC (ds/m)	0.112	0.130	0.101
3.	oc%	0.580	0.560	0.560
4.	Available 'N' kg / ha	232	212	238
5.	Available p ₂ O ₅ kg / ha	40.80	33.7	33.42
6.	Available K ₂ O kg/ha	269	285	246

The soil analysis of ToF Plot for P^H, EC, OC and available 'N' was done by the participants in the soil testing laboratory, RARS, Anakapalle. The P and K nutrient status results are already available in the research station.

The recommendations of manures and fertilizers by ANGRAU per hectare for North Costal Zone for sugarcane crop are :

- Farm yard manure @ 25 tonnes
Or
- Press mud cake @ 12 tonnes in the last ploughing
 - 112 kg nitrogen (by pocket application) has to be applied in two equal spilt doses at 45 and 90 DAP.
 - 100 kg P₂O₅ and 120 kg K₂O as basal application is recommended

The dose to be calculated for the nutrients tested in the soil testing laboratory is

If “Low” >25% of recommended dose

If “Moderate” as per recommended dose

If “High” <25% of recommended dose

 - For the soil nutrient analysis done by “Soil Test Kit”, the nutrient dose has to be calculated as

If “Low” > 33% of recommended dose

If “Moderate” as per recommended dose

If “High” <33% of recommended dose

Conclusions

a. For FFS Villages

The P^H value of the soils in three villages are neutral, except in Lakkavaram and Juttada which is slightly alkaline. The EC value in all the villages is normal. The available organic carbon in all the villages is moderate. The available ‘N’ in 4 villages is moderate except in Juttada which is “low”. The available phosphorus in all villages is low. The available potash and sulphur in all villages is moderate.

b. For ToF Plots at RARS, Anakapalle

The P^H value and EC value in the plots is normal status. The organic carbon and available ‘P’ is in moderate status. The available ‘N’ is in low status, whereas available ‘K’ is in high status.

Accordingly, the nutrients requirement has been calculated and applied in the respective plots i.e ToF plots at RARS and in the selected FFS villages plots for conducting crop trials.

4. ESTIMATION OF SOIL P^H

1. Introduction

P^H means “Potential Hydrogen”. This is an important soil property influencing a) availability of nutrients b) Microbial activity c) Soil structure. So it is important factor which affects soil chemistry and plant nutrition. Hence the participants did the soil analysis of samples collected in ToF / FFS to estimate the P^H.

2. Objective

At the end of this exercise the will be able to

- Know how to analyses P^H in the soil sample
- To know how to manage the P^H if it is critical

3. **Materials required:** P^H meter, soil sample distilled water, glass beaker.

4. **Time required:** 60 minutes

5. Methodology

- Take 10 gm of grounded and sieved (3 mm size sieve) dried soil sample into a 50 ml glass beaker .
- Mix with distilled water in the ratio of 1:2.5 i.e to 10 gms of soil add 25ml of distilled water and stir it for 5 minutes.
- By stirring, the Hydrogen ions in the soil will be diluted and obsorbed in the distilled water.
- Allow the solution to settle for 5 minutes
- Standardize the P^H meter to 4 & 7 P^H reading.
- Immerse the electrode of P^H meter into soil suspension and the galvanometer reading is the direct P^H of the soil sample.

6. Results

Place RARS	Plot No	59	12C	61
ToF plots	Reading	7.28	7.79	6.92

Village	Lakkavaram	Juttada	Thimmarajupeta	Juttada
Reading	8.05	7.94	7.76	7.36

7. Conclusion

The ideal P^H for sugarcane 6.0 to 8.0, but can be grown / tolerate upto 8.5 P^H. Where the P^H is towards slightly alkaline, deep ploughing is not advocated.

5. EXPERIMENT ON SOIL WATER HOLDING CAPACITY

1. Introduction

An important characteristic of a soil is the ability to hold water. One of the problems with sandy soil is that water and nutrients are rapidly leached from soil. The important qualities of soil organic matter is that it helps to retain water. It is essential to understand that adding FYM to soil is to increase the organic matter content besides improving moisture holding capacity.

2. Learning Objective

- At the end of the activity, participants will be able to find out the type of soil which can hold maximum water.
- To understand the role of organic matter in retaining water

3. Time Required

1 hour. 30 ms.

4. Materials Required

- 1) Tray
- 2) Water
- 3) Measuring Jar
- 4) Plastic funnel of medium size,
- 5) one litre capacity plastic containers
- 6) Farm yard manure (good quality)
- 7) Muslin cloth
- 8) Weighing balance

5. Methodology

The participants in group were asked to collect 1 (one) kg of sandy soil each. The soil was put in the shade to air dry.

For each group the treatment fixed are

T_1 = Sandy soil 750 gms + 250 gms FYM + 700 ml water

T_2 = Sandy soil 750 gms + 250 gms FYM + 700 ml water

T_3 = Sandy soil 1000 gms + '0' gms FYM + 700 ml water

T_4 = Sandy soil 1000 gms + '0' gms FYM + 700 ml water

Each group was supplied with one litre capacity plastic transparent container and medium sized funnel. The funnel inside was covered with muslin cloth. The Sandy soil + FYM and Sandy soil + '0' FYM as per treatment were filled in separate

funnels. The funnels were placed on one litre capacity plastic containers. Each one was kept in a separate plastic tray. 700 ml of water was added slowly to each container simultaneously. The participants recorded the water collected in each container with measuring jar after one hour in their respective groups.

6. Results

Soil type	Ratio	Qty of soil	Qty of FYM	Qty of water used	Qty of water released	Qty of water held	% of moisture holding capacity
Sandy	3:1	750 gms	250 gms	700 ml	168 ml	532 ml	76%
Sandy	3:1	750 gm	250 gms	700 ml	153 ml	547 ml	78%
Sandy	4:0	1000	'0'	700 ml	335 ml	365 ml	52%
Sandy	4:0	1000	'0'	700 ml	356 ml	344 ml	49%

7. Discussion points

1. Which type of soil holds more water.
 2. Which are the factors do you think responsible for holding more or less water.
 3. Why is water holding capacity is more important.
 4. How we can improve the water holding capacity of the soil.
8. The participants concluded that sandy soil + FYM will hold more water compared to soil without farm yard manure. Hence, it is obvious that adding farm yard manure to soil helps in the increase of organic matter and simultaneously improves the water holding capacity.

6. SUGARCANE TRASH COMPOSTING

1. Introduction

Farmers are in habit of burning sugarcane trash which contains valuable source of nutrients. The burning of crop residues *insitu* kill the soil microbes due to sudden raise in soil temperature. The recycling of crop residues if done in a scientific method, they can be converted into rich organic manures which are eco-friendly. The manure produced help to increase soil fertility and also contribute in increasing crop yields.

2. Learning objective

At the end of the exercise, the participants will be able to understand the -

- Process of converting crop residues into compost
- Enhancement of soil health and productivity

3. Time required: 90 minutes

4. Material required

Sugarcane trash, fresh cow dung, urea, super phosphate(compost culture), Trichoderma viridi, spade, small crowbar.

5. Methodology

The participants were made into small groups. They were briefed about the activity. For sugarcane trash composting -

- Select a place under shade
- Care has been taken to avoid water stagnation
- Pit measuring 6m x 2 mt x 1 mt was dug
- For one ton of sugarcane trash, 100 kg fresh cow-dung, 8 kg urea 10 kg SSP (Single super phosphate) and 1 kg Trichoderma Viridi are required.
- Spread a layer of (15-20 cm thick) of chopped sugarcane trash on bottom layer.
- Prepare cow-dung slurry by adding sufficient water and sprinkle after each layer of sugarcane trash.

- Add specified quantity of urea, super phosphate and 100 gms of trichoderma viridi to enhance decomposition to each layer.
- Repeat the process till the pit is completely filled with the material in layer to form a heap of 0.6 mt above the ground level.
- Turn it at every 15 days interval for proper decomposition.
- Compost will be ready with in 4-5 months for field use
- The compost color will be black to brown, soily in appearance without odour.
- The nutrient content in sugarcane trash compost is 38% organic matter, 0.80%N, 0.25% P₂O₅, 0.70%, K₂o, in addition micro nutrient like Ca, Mg, Fe, Manganese, Zinc etc are also available.

6. Points for discussion

1. What is composting?
2. Why composting is required?
3. What are the benefits of composting?
4. What are the other methods of sugarcane trash compositing?

7. Observation

Periodical observations were made to assess the rate of decomposition of organic matter.

8. Conclusion

- Sugar cane trash compost is ready
- It is black friable with no smell
- Collect the compost in bags and store it under shade

9. Follow –up

The participants have introduced sugarcane trash composting in their respective FFS.

7. VERMI COMPOSTING WITH SUGARCANE TRASH

1. Introduction

In farms, large quantities of crop residues / organic waste are generated regularly. These residues contain valuable plant nutrients. The earthworm converts these residues into valuable source of nutrients. The process of preparing valuable manure from all kinds of organic residues with the help of earthworms is called vermicomposting.

2. Learning objective

- At the end of the activity, the participants shall develop the skill how to prepare vermicompost.
- Enhancement of soil health and productivity.

3. Time Required: 60 minutes

4. Material Required

Sugarcane trash, fresh cow dung , urea, SSP Trichoderma, Viridi.

5. Methodology

Participants were briefed about the activity. For preparing of vermicompost the area has been selected under shade and care has been taken to avoid water stagnation.

Pit method

1. Pit measuring 3 mt x 1 mt x 30 cm each were dug side by side for continuous use to produce vermicompost.
2. For a ton of sugarcane trash 100 kg fresh cow dung, 8 kg urea 10 kg SSP and 1 kg (Trichoderma viridi) compost culture is required.
3. Spread a layer of (15-20 cm thick) of chopped sugarcane trash on the bottom layer.
4. Prepare cow dung slurry by adding sufficient water (1:5) and sprinkle after each layer.
5. Add urea, super phosphate and 200 gms of Trichoderma viridi to enhance decomposition to each layer.
6. Repeat the process till the pit is completely filled with the material in layers.

7. Cover the top layer with thin layer of compost soil and cover the heap with gunny bags and sprinkle water at regular intervals to provide moisture.
8. Allow the trash for partial decomposition upto 30 days.
9. Introduce @ 1000 Earthworms per sq mt area, when the temperature of sugarcane trash in decomposition comes to normal.
10. Provide moisture as per need.
11. Vermicompost is ready with in 90 days.

6. Points for discussion

1. What is vermicompost?
2. Why vermicompost is required?
3. What are the benefits of vermicomposting?
4. What are the other methods of vermicomposting?

7. Observations

- Periodical observations were made to assess the moisture condition
- Rate of decomposition of organic matter
- Condition of Earthworms

8. Conclusion

- Vermicompost is ready in 3 months.
- It is black and light without smell.
- When the compost is ready stop providing moisture.
- Separate the upper portion of the heap.
- Sieve the lower portion of the heap and separate the earthworms which can be used again for vermicomposting.
- Pack the compost in bags and store in a cool place.

9. Follow-up

The participants have introduced vermicompost making in their respective Farmer Field School villages.

8. GENERAL DESCRIPTION OF SUGARCANE PLANT

- Sugarcane plant belongs to family Gramineae
- It consists of root and shoot
- It is propagated through vegetative propagation “stalk cuttings”
- The sugarcane plant has long stalk made of several segments called “internodes” and between them are “nodes”
- The leaves are attached to the nodes and there is bud at each node.

The leaf consists of three parts

- The sheath (in place of leaf stalk)
- The ligule (the junction of sheath and leaf blade)
- The leaf blade (green portion)
- The branches of the sugarcane are called “tillers” as they arise from underground portion of the stem
- The roots grow from the bottom nodes of the stalk underground
- The root system consists of “Fibrous roots”
- The crop can tolerate soil with P^H from 6 to 9.0 but it thrives better in the P^H range from 7 to 8.5.

9. SEED HARDENING IN SUGARCANE

1. Introduction

Soil moisture is always a critical factor in the crop growth. To overcome this, adding organic matter is one approach to prolong the drought tolerance. Besides, seed treatment with calcium carbonate (CaCO_3) not only enhances germination but also gives crop ability to withstand drought considerably. The calcium absorbed in the seed will promote early root development also.

2. Learning Objective

- At the end of this activity, the participants shall develop the skill of doing seed hardening
- Able to compare the crop sown (treated with CaCO_3) vs untreated in the field condition.

3. Time required : 2 hrs.

4. Material required

Matured sugarcane, calcium carbonate (CaCO_3) / kiln lime big plastic drum, water

5. Methodology

The participants prepared the solution by dissolving 5 kg of CaCO_3 in 25 litres of water (Dose 80 kg lime to be dissolved in 400 litre water per ha seed treatment) in a plastic drum. Sugarcane seed free from pest and diseases was cut into 3 budded setts. The seed material was soaked in the lime solution for one hour. The water was drained and the setts (seed) was shade dried to bring down the seed moisture to original level. The participants were given a set of questions for

6. Discussions and presentation

- What is seed hardening?
- Why seed hardening is required?
- How seed hardening is done?
- Explain strategy of integrated moisture stress management in sugarcane crop?

7. Follow-up

A field experiment is low laid out in ToF plot to observe the effect of seed hardening.

10. POLYBAG RAISING OF SUGARCANE SEEDLINGS

1 Introduction

A plant crop with gaps will result in poor ratoon. After harvest from stubbles near to the gaps more of shoots will emerge out, of which only a few shoots will become millable canes. So, it is essential to maintain required plant population at regular spacing to achieve desired population.

2. Learning Objective

At the end of the exercise, the participants will be able to

- Learn how to raise sugarcane seedlings by polybag method
- Understand the importance of gap filling with the same age grown seedlings at par with crop in the field.

3. Material

Polythene bags (with desirable micron thickness and size) compost, soil, neem case, trichoderma viridac culture.

4. Methodology

- Collect soil with good texture. Add equal quantity of well rotten farm yard manure along with desirable quantity of neem cake and Trichoderma viridi culture keep the mixture under shade for 3 days.
- Take polybags with above soil mixture upto $\frac{3}{4}$ capacity and make good compaction of the soil.
- Take polythen bags of 15 X10cm and make two holes with a nail at the bottom of the polybag to drain excess water.
- Collect seed material from insect and disease-free short crop. Cut the cane into single budded setts. While cutting the single budded sett the length of the sett is kept one inch above and two inch below the bud position. Treat the setts with carbondazim 0.05% and malation (0.1%) solution for 30 minutes to eliminate pineapple disease and scale insect. Place the setts in polybags containing soil mixture by keeping the bud facing side ward and plant them one inch below soil. Provide sufficient moisture.

- The poly bags were kept under shade and provided water at regular intervals. One month old seedlings should be used for planting gap filling.

5. Conclusion and follow-up

- Seed cost is saved by raising the seedlings by polybag method
- Polybag raised seedlings can be used for transplanting in wet lands after harvest of paddy to save time by raising seedlings in advance.
- Polybag raised seedlings can be used for gap filling in main crop / ratoon crops to maintain the plant population. By this, the physiological age of the seedlings and crop in the field will be at par.
- Polybag seedlings are planted with soil by removing polyethene bag so that root system is not disturbed, which helps in quick establishment of seedlings.

11. EXPERIMENT ON GERMINATION EFFICACY OF CANE SETTS (From Different Portions of Cane)

1. Introduction

Farmers are using seed for raising the sugarcane crop by cutting setts from all portions of the cane (i.e. top, middle, bottom). But, after planting, they observed variation in germination. In order to know which portion of cane used for seed material shall perform well in respect of quick germination, the participants decided to conduct this experiment on germination efficacy.

2. Objective

At the end of the experiment, the participants will be able to know germination efficacy of setts and which portion of the cane shall perform well.

3. Material required

Mature sugarcane, polybags (15m x 10 cm size) compost soil, neem cake, *Trichoderma viridi*.

4. Methodology

T₁ = Top portion

T₂ = Middle portion

T₃ = Bottom portion

The participants were divided into 3 groups. Each group was asked to maintain one treatment.

Make 2 (two) holes at the bottom of the polythene bags to provide drainage. Fill the bags upto $\frac{3}{4}$ capacity with compost, soil neemcake, T-viridi mixture. Collect the seed material from disease and insect-free crop. Cut the cane into 3 pieces i.e. top, middle and bottom i.e. treatment wise. Then, cut the top, middle and bottom portions into single buded setts. While cutting the single buded setts, the length of the setts should be kept one inch above and two inch below the bud position. Treat the seed/setts treatment wise with carbandazim (0.05%) and malathion (0.1%) solution for 30 minutes to eliminate pineapple disease and scale insect. Place the setts in poly bags containing soil mixture by keeping the bud facing sideward and plant them one inch below soil. Sufficient moisture is provided. The polybags were kept under shade and water is provided at regular intervals to maintain moisture.

Regular observations were made treatment-wise by each group. The observations recorded parameter-wise by each group are tabulated below.

Observation table

S.No.	Particulars	Single buded Setts		
		Top portion of the cane	Middle portion of cane	Bottom portion of the cane
1.	Height of the plant in cms	56	44	44
2.	No. of leaves	4	3	3
3.	Root length (Primary)	19	17	16
4.	Age of plant (DAP)	24	24	24
5.	First germination noticed at DAP	10	13	15
6.	Germination %	98	92	82

6. Conclusions

- The single buded setts planted from 1/3 top portion of the cane (i.e T_1) gained quick germination when compared to single buded setts used for plantation from middle T_2 and Bottom T_3
- The height and primary root length is also more in T_1 when compared to T_2 of T_3 . Participants concluded that short crop seed 6-8 months is preferable for seed purpose.
- It is also concluded when 10 months old crop is used, top 1/3 should be used for seed purpose followed by middle portion of the cane.

12. STUDY ON CROP MORPHOLOGY

(Germination to Vegetative)

1. Introduction

Identification of all parts of sugarcane plant is essential to study the physiology of sugarcane at different growth stages of the crop. The accurate description of growth parameters and other factors helps to adjudge the plant health and also helps in study of plant susceptibility to pests according to growth stage. Timely management of crop at appropriate stage as per requirement can be scheduled. Hence, this study has been taken up.

2. Objective

- At the end of the exercise, the participants will be able to identify different plant parts of the crop.
- Able to understand the crop growth parameters and management practices at this stage.

3. Time Required : 2 hrs

4. Materials Required: Sugarcane plant, colour pens, drawing sheets.

5. Methodology

Each group has observed 5 plants and recorded the observations like leaves and other developing parts. Later, each group has collected one sample plant. In the class room they have drawn the typical sugarcane plant and labelled it. Each group was given a set of questions to be discussed and presented to the larger group. The questions are as follows.

Discussion and presentation

- Draw the sugarcane plant depicting from germination to seedling stage (as seen in the field)
- How many days the sugarcane setts take to germinate (Emerge)
- What are the factors responsible for germination
- Which portion leads to which part (root and shoot)
- Describe the root system in sugarcane

- What is the source of food while germinating
- What are the possible pests and diseases at this stage.
- What are the management practices to be adopted at this stage to have healthy crop
- How this study is relevant to Farmer Field School

Out put

- ❖ In sugarcane, germination starts from 15 DAP (Days after planting) and continues upto 35 DAP which is called emergence phase.
- ❖ Factors responsible for germination
 - Type of soil fertile with fine tilth
 - Optimum moisture at the time of planting
 - Healthy and early crop seed (6 to 8 month old)
 - Method of planting, depth of planting
- Root initiates at the nodes
- Shoot emergence from the buds
- Type of roots in sugarcane

In sugarcane there are two types of root initiation

First, the roots initiated from the inter node are called primordial roots or sett roots. These initial roots help in absorbing air, water nutrient for shoot initiation. These sett roots are short lived. Once plant is established, shoot roots will develop at 35 DAP, which are permanent. These roots may grow upto 30 cm deep and may vary with tilth of soil and variety.

- Initial source of food

The sugarcane setts are having natural sugars which are called reducing sugars. These sugar contents in the setts help as source of food for germinating setts. Once germination is over, primordial roots emerging from the internodes will help in drawing the air, water, nutrients for further growth of plant.
- The possible pest and diseases at this stage of crop growth are sett rot and early shoot borer
- This study gives an idea about the factors responsible at this stage of crop growth. Farmers can be educated about healthy seed material importance and crop management to have a healthy crop.

13. CROP MORPHOLOGY

(Vegetative to Tillering)

1. Introduction

Tillering ability is an important characteristic for getting more number of millable canes. As the sugarcane plant grows during the vegetative to tillering, several changes take place. There will be growth of new tillers, leaves. As tillering is an important productive phase, it is felt necessary to take up this study.

2. Objective

- To describe the growth at vegetative stage of plant in terms of tillering ability.
- Able to understand the growth parameters and management practices at this stage of crop growth.

3. Time Required : 3 hrs

4. Materials Required : Sugarcane, drawing sheet, colour pens

5. Methodology

Each group has observed 5 plants in the fields where the crop is in vegetative to tillering phase. Count the number of leaves on each tiller and no. of tillers from each plant. Each group collected a sample plant with tillering. Wash the mud from base spread the tillers apart and notice how the tillers emerge. In the class room they have drawn the sugarcane plant and depicted the pattern of tillering and labelled it. Each group has given a set of questions to be discussed and presented to the larger group and the questions are as follows:

Discussion and presentation

1. Draw the plant at this stage and label the plant
2. What is a tiller and why tillering is important?
3. Describe the pattern of tillering in sugarcane crop?
4. What are factors responsible for tillering and what will happen if a few tillers are damaged by early shoot borer?
5. What are the pest and disease that can occur at this stage of crop?
6. What are the crop management practices to be adopted at this stage?

6. Output

Define tiller; why tillering is important?

- The branches of sugarcane plant are called tillers and they arise from underground portion of the stem.
- Tillering is critical as it determines number of millable canes which is most important component of sugarcane yield.

7. Pattern of tillering

- The tillering phase in sugarcane starts from 60 DAP and active tillering period is 90-120 DAP.
- Mother shoots are the main stems which can be identified easily with relatively smaller internodes possibly due to nourishing of young tillers.
- Shoot emerging from the buds in the lower part of the main stem is primary tiller.
- The one arising from the lower buds of primary tiller is secondary tiller.
- The one arising from the lower buds of the secondary tillers are called tertiary tillers.
- A tiller becomes independent of mother shoot when it develops its own roots, but still continuity is maintained for movement of water, nutrients and assimilates.
- In a field 1st and 2nd tiller produced give canes with relatively more weight and superior juice quality than the mother shoot and also millable canes produced / developed from the tillers produced later.

8. Factor responsible for tillering

- Variety
- Cultural management (Water and Nutrient)
- Plant spacing
- Type of soil

What will happen, if few tillers are damaged by Early Shoot Borer?

Early shoot borer damage does not seem to effect yield because the tillers are easily replaced. However, the damage upto 5 to 10% level in the early vegetative to tillering shall be compensated by producing side tillers.

9. Pest and Diseases

1. Weeds
2. Early shoot borer
3. Red mite
4. White grubs
5. Rust

10. What are the crop management practices

1. Weeding
2. Timely irrigation
3. Top dressing of 'N' at 45 DAP and 90 DAP
4. Monitoring ESB through pheromone traps
5. ESB Management

14. PRE HARVEST MATURITY SURVEY (PMS) AND CROP CUTTING EXPERIMENT

1. Introduction

In sugar factory zones, it is necessary to draw up a priority test for harvest of cane depending upon their maturity. This test for harvest of cane depends upon their maturity. This can be done by drawing the average brix of the cane using a hand refractometer. In practice, the pre harvest maturity survey has been found to be extremely useful in improving recovery by at least by 0.5 to 1.0 units.

2. Objective

At the end of the exercise, the participants will be able to

- Learn how to conduct pre harvest maturity survey by using hand refractometer to record Brix at field level.
- To Judge the cane has attained maturity or not

3. Materials Required

Sugarcane crop > 9 months, hand refractometer, pouch piercer, harvesting knife, metallic tape, notebook, pen.

4. Methodology

Enter into cane field 3 ft inside from the bund. Select 6 rows in a line randomly with 5 mt length. Demarcate the area in the ICM (Integrated Crop Management) plot and F.P. (Farmer Practice plot). Count the no. of millable canes in the demarcated area. Selected 10 canes in each plot randomly from the demarcated area and harvest them and make two separate bundles. Select 5 canes from each bundle (sample drawn). Puncture the internodes at top, middle, bottom of the cane with the pouch piercer and put the juice on the screen of the hand refractometer. Record the brix reading of 5 canes in each plots samples. Record the length of the canes, girth of the cane at top, middle bottom. The observations are as follows:

Observation table

Village	Plot	Av. Brix in cms	Av. Girth in cms	Av. Length	Remarks
Lakkavaram	ICM	19.6	2.70	2.95	
	FP	18.4	2.39	2.59	
Juttada	ICM	16.0	2.73	2.73	
	FP	15.8	2.65	2.60	
Chuchukonda	ICM	20.1	2.72	3.53	
	FP	19.0	2.38	3.48	
Thimmarajupeta	ICM	18.5	2.89	3.73	
	FP	17.1	2.83	3.05	
	OF	19.0	2.89	2.83	

Remark: The Girth was measured with Vernier calipers

- ICM : Integrated crop management plot
- FP : Farmer practice
- OF : Organic farming

Conclusions:

- The brix arrived by hand refractometer is total solids in the juice at field level.
- The present brix reading shows that the crop is not yet matured.
- Whether the crop is ripe for harvest is best tested by cutting a representative sample of canes from the field and crushing the same in the mill and analyse in the laboratory for brix, pol and purity.
- The observation shows that the Av. Brix at field level is more in ICM when compared with FP plot in all villages.
- The length and girth of the cane is also more in ICM when compared with FP plot.

III. INSECT ZOO AND BIO-ECOLOGY OF INSECT PESTS

1. INTRODUCTION TO INSECT ZOO

1. Introduction

In fact, some things can only be recognized when seen living. The insect zoo is also such which will help to learn about the biology of organisms, their life cycles, egg laying, feeding, mating, growth and behaviour can be learned directly through the process of rearing insects and their natural enemies.

2. Learning Objectives

- Observe parasitization, predation habits of natural enemies
- Observe lifecycles of insects and their natural enemies
- Observe infection rate of pathogens on herbivores

3. Time Required

Spend two hours each week for insect zoo setting and half an hour for daily feeding and recording observations.

4. Materials Required

Plants grown in pots, sessiors, plastic bags, jars, small plastic bottles / vials, pet ridishes, aspirator, camel hair brush, rubber bands, absorbant cotton, tissue paper.

5. Methodology

1. With the given material set insect zoo
2. Let each group decide on what to study for the week. This should coincide with different stages of crop and support questions during AESA.
3. Each group should follow rearing procedures, observations and recording of results.
4. Results of insect zoo activities to be discussed in big group once in a week.
5. For other activities the following rearing methods may be observed.
 - Plastic bags and bottles
 - Potted plants in cages
 - Petridishes
 - Simple cages
 - Field cages

6. Follow-up activity

Each group should maintain insect zoo studies throughout during of ToF. Set up studies on herbivores and natural enemies in each week to support questions raised during field activities and AESA observations.

2. INSECT ZOO STUDIES (Study No.1)

1. Title

Life Cycle of Lady Bird Beetle

2. Objective of Study

At the end of this activity participants will be able to conclude the days taken by a lady bird beetle to complete its lifecycle.

3. Materials

Petridish, mating Lady Bird Beetle (LBB) adults, four plastic jars (small with wide mouth) S.cane leaves, camel fine brush, absorbent cotton, tissue paper.

4. Methodology

The participants collected mating lady bird beetle adult for egg laying. The fresh eggs laid are collected from the jars. In Petriplates a layer of absorbent cotton is put along with a layer of tissue paper. Few drops of water is added to maintain moisture. The eggs were placed in petridishes. On hatching the grubs were separated and kept in individual plastic bottles. Aphids were provided till grubs entered pupation.

5. Data collected and No. of days taken for development

Replications	Egg	Grub	Pupa	Adult
R ₁	3	6	4	-
R ₂	3	7	5	-
R ₃	2	7	4	-
R ₄	2	7	4	-
Average	3	7	4	-

6. Result and Analysis

The participants observed and concluded the life cycle of lady bird beetle as follows.

Egg : Yellow in colour, cigar or spindle shaped laid in clusters, mostly underneath the Sugar cane leaves. Egg period is 2-3 days.

Grub: Dark in colour with bright markings and body covered with spine like structures, elongate and tapering at posterior end. Grub period is 6-7 days.

Pupa : Grub attached to the leaf with the help of its skin. Pupal period is 4-5 days.

Adult : The pupae developed into semihemispherical shape and emerged as adult.

7. Conclusion and lessons learned

Strength of this study is that, this defender is available in good number in S.cane ecosystem. The life cycle study helped in knowing their stages and their development closely. Handling of eggs and grubs needs utmost care while studying the life cycle.

8. Follow-up

To repeat similar study in FFS villages, by the farmer participants.

Study No.2

1. Title of study

Feeding potential of Lady Bird Beetle (LBB)

2. Learning Objective

At the end of the study participants will conclude the feeding potential of the LBB grub and adult.

3. Materials Required

LBB (Grub & Adult), petridish, absorbent cotton, tissue paper, aphids.

4. Methodology

The participants have collected mating lady bird beetle adults and kept for egg laying in small plastic bottles. The freshly laid eggs are collected from the containers. In petridish a layer of absorbent cotton is put along with a layer of tissue paper. Few drops of water is added to maintain moisture. The eggs were placed in petridishes. On hatching the grubs were separated and kept in individual small plastic bottles. Likewise the adults are also kept in separate containers. Make minute hole on the lid for aeration. Each group has collected aphids from the fields and known number of aphids given as feed to grub and adult simultaneously. Aphids were added as per requirement. Daily observations will be made up to one week.

5. Data Collected

Replication	No. of aphids maintained/ day	No. of aphids eaten/ day	
		Grub	Adult
R ₁	100	28	30
R ₂	100	26	26
R ₃	100	40	22
R ₄	100	60	32
Total	400	154	110
AV/day	100	38	27

6. Result and Analysis

Feeding potential of Lady bird beetle Grub and adult on aphids is 38 and 27 per day respectively.

7. Conclusion and lesson learned

Participants concluded that Lady Bird Beetle is the efficient predator on aphids especially grub is a good predator.

Study No. 3

1. Title of study

Feeding potential of Syrphid maggots against sugarcane woolly aphid.

2. Learning Objective

At the end of the study participants will conclude the feeding potential of the Syrphid maggots.

3. Materials Required

Syrphid maggot, Sugarcane Woolly Aphid (S.W.A) along with leaf, petriplate, tissue paper, absor-bant cotton.

4. Methodology

The participants collected early instars of Syrphid maggot. S.W.A. were collected along with leaf. In a petriplate layer of cotton along with tissue paper is placed and slight moisture is added to the cotton. The leaf with known number of S.W.A was kept in each petriplate. The study was continued upto one week. S.W.A. were added as per requirement. Daily observations were made and recorded as follows.

5. Data Collected

Replication	No. of S.W.A maintained /day	No. of S.W.A eaten/day
R ₁	100	41
R ₂	100	46
R ₃	100	43
R ₄	100	48
Total	400	178
AV/day	100	44

6. Result and Analysis

Feeding potential of syrphid maggot is 44 S.W.A per day.

7. Conclusion and lesson learned

The participants concluded that syrphid maggot is the efficient predator on S.W.A. hence conservation of natural enemies will help in management of S.W.A.

3. MULTIPLICATION OF CORCYRA CEPHALONICA

1. Introduction

Trichogramma Spp are minute wasps which parasitize the eggs of several lepidopteron species. Because of their importance as biological control agents, those wasps can be multiplied for augmentation on the eggs of sugar cane borers.

2. Learning Objectives

At the end of the exercise, the participants will be able to produce host culture to rear Trichogramma.

3. Materials Required

Broken corn grain, plastic containers, Corcyra eggs, broken ground nut kernels (made into 2 to 3 pieces), yeast powder, vitamin 'E' capsules, streptomycin powder, soyabean powder, muslin cloth, biscuit tins, wiremesh (type 100), brush, plastic tray.

4. Time required 30 minutes for establishment

5. Methodology

Participants in small groups kept 2.5kgs of half broken corn grains (i.e made into 2-3 pieces) in the plastic containers. In each container 100gms ground nut kernel (made into 2-3pieces), 5gms of yeast powder, one vitamin 'E' capsule, 0.5gms streptomycin powder, 5gms of soyabean powder is added and mixed thoroughly. 0.5cc of corcyra cephalonica fresh eggs were inoculated in each container. Then the containers were covered with muslin cloth and kept undisturbed for development of host culture.

The participants made weekly observations and recharged with feed (broken corn) whenever required. Egg laying cages were prepared using biscuit-tins with two sides fully wire meshed. When adult start emerging, the participants collected them using plastic vials and put them in egg laying cages. The egg laying cages are kept on the plastic tray in such a way that the wire meshed side of the cages faces downwards. Corcyra eggs were colleted by brushing the wire meshed sides every day, for 5 days from the biscuit tins. The eggs are cleaned and used for preparing Trichogramma cards. Thick white cards measuring 6 X 1" were taken and applied synthetic transparent gum uniformly and corcyra eggs are spread with out overlapping on the card. The cards were allowed to dry. The cards are exposed to

UV Lamp for 30 minutes and put it to glass tubes where adults of Trichogramma are available for parasitization. After 24 hours these cards were removed from the glass tubes and kept in new glass tube for parasite emergence.

6. Out put

Participants have collected adults after 45-60 days of inoculation and collected the eggs and prepared the corcyra egg cards for multiplying Trichogramma culture.

4. TRAPPING OF LOCAL STRAIN OF TRICHOGRAMMA

1. Introduction

Trichogramma spp is a potential egg parasite which is used to manage many Lepidopteron pests especially moth borers of Sugar cane. The participants know the mass multiplication of Trichogramma and the Laboratory multiplied Trichogramma is utilized for field release. But the participants wish to study the availability of egg parasites in the sugar cane ecosystem which is naturally occurring and such local strains of trichogramma is effective if multiplied and augmented. So they want to trap the local strain.

2. Learning objective

At the end participants will be able to

1. Identify the potential indigenous egg parasites
2. Collect the nucleus culture from the field for mass multiplication

3. Time Required

45 minutes (for establishment)

4. Materials Required

Fresh Corcyra eggs, Gum (Arabica), thread, white drawing sheets.

5. Methodology

Each group was given 150 eggs of fresh Corcyra eggs to prepare 3 cards of 1" X 1" size (each card contains 50 eggs) with the help of white drawing sheet and gum (Arabica). They tied these cards in sugar cane crop maintained a distance of 20ft between two cards for parasitization. Each group has tied 3 cards each containing 50 corcyra eggs glued on 1" X1" size card. They collected back these cards after 48 hours and kept them in plastic vials for observation.

The observations are under.

Group	No.of Corcyra eggs exposed	No.of eggs turned black	% of parasitism after 2 days
Spider	150	26	17.30
LBB	150	38	25.30
Earthwarm	150	42	28
Wasp	150	40	26.60

6. Conclusion

This method is very effective to trap local strain of Trichogramma Spp.in the field.

7. Follow Up

The field collected trichogramma was used for further multiplication using corcyra eggs.

5. PIT FALL TRAP

1. Introduction

There are several soil dwelling insects that play a vital role in the sugarcane ecosystem. The knowledge of these insects and their role helps in decision making. Hence this activity is taken upto study the soil dwelling insects.

2. Learning Objective

At the end of activity the participants will be able to identify ground dwelling nocturnal insects and their role in the ecosystem.

3. Materials Required

Plastic jars, water, Detergent, Small spade

4. Methodology

Each group has dug pit at two random spots and buried 2 (two) plastic Jars of one litre capacity in the assigned fields upto brim at the ground level. The jars were half filled with water and few drops of liquid detergent was added to avoid, the escape of insects form the jars. The Jars were collected after 48 hours. The trapped insects were saperated by filtering the water through strainer. The collected insects treatment wise were spread on a drawing sheet and were grouped species wise and tabulated as follows.

Treatments	Ground beetles	Ear higs	Crickets	Tiger beetle	Spiders	Decomposers	Other	Total
Non cropped areas	6	0	0	0	9	0	5	20
Ratoon crop	8	3	3	1	11	4	11	41
S.cane crop (2 months old)	3	1	0	0	8	3	8	23
S-cane crop (8 months old)	6	3	1	2	12	3	11	38

5. Conclusions

After the activity participants concluded that

- In the ecosystem ground dwelling nocturnal insects are there which are beneficial.
- Ground dwelling nocturnal insects are more in ratoon crop as compared to other ecosystem.

6. SPIDER ABUNDANCE

1. Introduction

Spiders are one of the most important beneficial organisms found in all ecosystems. Hence, this study was taken upto to know the habit and habitat.

2. Learning objectives

At the end of the exercise, participants will be able to conclude that spiders are present everywhere.

3. Materials Required

Vials, polythene bags, rubber bands.

4. Methodology

Four ecosystems were selected for the study as treatments. Replications were maintained across the group. Each group has observed one sq. meter area in each ecosystem and the population was worked out to 1 acre to discuss the role of spider population in managing the pests. The participants were asked to collect representative sample from each ecosystem as per its morphological character. Later the participants were given a set of following questions to support their study.

1. Draw the typical spider and label it? (common question)
2. What is the difference between spider and insect?
3. How to conserve spiders in the ecosystem?
4. What are the natural enemies of spiders?
5. What is the difference between male and female spiders?
6. Identify topics for insect Zoo (common question).

5. Out Put: Differencebetween spider Vs Insect.

Character	Spider	Insect
Body	2 segmented	3 segmented
Legs	4 pairs	3 pairs
Digestion	External	Internal
Mouth parts	Piercing and sucking	All types
Feed habits	Carnivorous	Harbivorous and carnivorous
Use	Beneficial	Beneficial and harmful
Eyes	4 pairs	1 pair

- **Conservation**

1. Grow inter crop (Pulse crop)
2. Avoid spraying of synthetic pesticides
3. During the off season keep the bunds moist by spreading paddy straw or chopped s.cane trash and sprinkle water on it.

- **Natural enemies of spider**

Birds, Egg Parasitoids, Jumping spiders, Lizards

- Difference between male and female

Male

Female

1. Pedipalp is bulged

Padipalp is normal

5. Observations

The results of the field observations is given below

* Spider population in different Ecosystems.

Treatments	Replications per meter ²				Total	Average	Popn / 0.4 ha (1 ac)
	R ₁	R ₂	R ₃	R ₄			
Field Bund	4	3	5	3	15	3.75	14000
Barren land	4	3	3	3	13	3.25	13000
Near water source	6	5	7	6	22	5.50	22000
Cropped area	4	6	4	5	19	4.75	19000

6. Conclusions

- At the end, participants concluded that spiders are present in large numbers everywhere.
- The highest number of spiders was found near water source due to moist and humid conditions.
- Participants concluded that if one spider consumes one or two pests per day that will be sufficient to manage the pest. Hence, conservation of spiders is important.

7. BIO ECOLOGY OF SUGAR CANE WOOLLY APHID

1. Introduction

Sugarcane Woolly Aphid(S.W.A.) has become pest of economic importance causing significant reduction in yield up to 25% and reduction of 0.5 % in sugar recovery. All stages of sugarcane are susceptible to this pest. To understand the biology and ecology of the pest the field exercise was undertaken which will help in taking management decisions.

2. Learning Objective

- Identify different morphological forms of sugarcane woolly aphid
- Identify the damage symptoms of S.W.A
- Observe the habitate and defenders associated with S.W.A

3. Materials Required

Sugarcane field with infestation,lens, vials, polythenebags,scissors, charts, marker pens.

4. Methodology

The participants in small groups observed 5 plants at random. They have observed top 2, middle 2, bottom 1(totally 5 leaves) for woolly aphid and associated defenders for whole plant and soil surface near to base of the plant. After the activity, the participants had questions to be presented group wise in support of their field activity. The answers to the questions are as follows.

1. Draw the stage of the woolly aphid
2. Describe the damage symptoms caused by woollyaphid
3. Explain the life cycle of the pest
4. What are the factors responsible for development of S.W.A
5. List out the natural enemies of S.W.A
6. List out the management practices for S.W.A

5. Out Put

Ceratovacuna lanigera

Order : Hemiptera

Family : Aphididae

Life Cycle

Biology:

- Multiplies both sexually and Asexually (Parthenogenesis)
- Passes through 4 instars
- Winged and wingless forms are there
- Fecundity of adult female varies from 15-43 young one/day
- New born nymphs are naked gradually develop the white woolly coating
- 3rd and 4th instar show more profuse woolly coating
- Total instar period is 22 days.

Ecology

- Cool and humid climate and temperature between 19 to 35^o C
- '↑"N"' increases population
- Migration by air. Adult travel 1.5 to 2km/hour
- Heavy rainfall reduces population

Damage Symptoms

- Suck the sap from leaf (from under surface)
- The under surface of infected leaves exhibit snow white appearance
- Honey due secreted by woolly aphid attracts ants, the aphids are protected from natural enemies.
- Affected canes are shortened and loose vigour
- Affected canesets have less sprouting result in poor germination

Bio agents of S.W.A

Predators

- Chrysoperla carnea (Greenlace wings) Chrysopidae.
- Micromus igorotus (Brown lace wings) Hemerobiidac
- Syrphid fly (Hover flies: Syrphidae)
- Dipha aphidivora (order: Lepidoptera)

Lady bird beetle

1. Menochilus sexmaculatus
2. Coccinella septumpunctata
3. Schymnus coccivora

Fungal Pathogens

- Metarrhizium anisopilae
- Aspergillus spp.
- Fusarium moniliformae

6. Management Practices

- Grow cultivars with narrow leaf
- Monitoring through yellow sticky traps
- Destroy alternate hosts like maize, cynodan dactylon, Napier grass
- Destruction of ant-nests
- Conserve natural enemies/release
- Avoid transportation of S.W.A infested leaves
- Avoid infested cane for seed purpose
- Water spray in the initial infestation level
- Adoption of paired rows/wider row planting
- Removal and burning of infested leaves
- Judicious use of Nitrogen fertilizer
- Irrigation water and proper drainage
- Twist propping of cane at 6-7 months crop
- Spray chemicals pesticides as a last resort if severity is more

S.W.A	Plant part	Number of S.W.A/leaf		Total	AV
		R1	R2		
Adult and Nymphs	Top 2 leaves	22	32	54	27
	Middle 2 leaves	42	52	9	47
	Bottom 1 leaf	18	16	34	17
	Defenders plant	2	4	6	3

7. Summary and Conclusion

Sugarcane woolly aphid population found on all leaves but more on the middle portion leaves and the population is mostly underside of the leaf portions.

8. EARLY SHOOT BORER

1 . Introduction

Early shoot borer is an important pest of sugarcane and it cause extensive damage to the crop at early stage damaging young shoots. In severe cases the economic loss may be upto 30% yield. Hence, the study has been taken up in ToF by the participants.

2. Objectives

At the end of the exercise the participants will be able to

- Identify different stages of early shoot borer
- Identify the damage symptoms of early shoot borer
- Observe the habitat and defenders associated with Early shoot Borer.

3. Materials Required

Sugarcane field (with infestation), lens, vials, Polythene bags, sessions, charts, marker pens.

4. Methodology

The participants in small groups were asked to observe randomly selected 25 shoots and record the different stages of the pest presence (Early shoot borer) and the associated defenders along with its damage symptoms. After the field activity the participants' were given a set of questions to be presented group wise in support of the field activity.

1. Draw all the stages of early shoot borer and describe
2. What are the factors responsible for its development?
3. Explain the damage symptoms
4. List out the natural enemies
5. What are the management practices for early shoot borer?

5. Output

Chito infuscatellus

Order : Lepidoptera

Family : Pyralidae

6. Life Cycle

Egg : Straw coloured, scale like, overlapping, usually laid on leaf sheath or underside of leaf blade. Egg period 3-5 days.

Larvae : Dirty white in colour with dark brown head full grown larvae is around 3 cm long with 5 (five) brown stripes along the body. There are 5 (five) instars in Larval stage. Larval period is 25-30 days.

Pupa : Pupates inside stem and takes about 7-10 days for emergence.

Adult : Small, pale greyish brown or straw coloured / wing span – 30 mm. Forwings bear a row of white dots along the outer margin.

Total life cycle 35-40 days 5-7 generations in a year

1. Ecology

- Late planting Feb-April / May
- Continuous ratoons
- High temperature and low humidity
- Moisture stress in early stages of crop growth

2. Damage symptoms

- After hatching the larvae feed on epidermis of leaf sheath for a day or two, then reach the base of the shoot makes a hole.
- Feeds on the soft tissue
- The upper portion of the leaf whole is cut off
- Then it dries up turning yellow and forms a dead heart which can be pulled out easily
- Economic loss: 22 to 33% cane yield in case of severe incidence.

3. Natural Enemies

- *Apanteles Flavipes* (braconid)
- *Goniozus Indicus* (Bethylidac)
- *Isotema Javensis* (Hymenoptera)
- *Stenobracon Nicevillei* (Braconidac)

- *Sturmiopsis Inferens* (Diptera)
- *Telonomus beneficiens* (Hymenoptera)
- *Tetrasticus Ayyari* (Hymenoptera)
- *Euborellia annulipes* (Dermaptera)
- *Trichogramma Chilonis* (Hymenoptera)

4. Management

- Deep ploughing
 - Early season planting (Dec-Jan)
 - Planting setts in deep furrows
 - Ear thing up
 - Irrigation at frequent intervals in the formative phase of crop
 - Trash mulching in early stage @ 3 t / ha at 3 DAP
- or
- Inter cropping with green gram or black gram.
 - Monitoring of pest through sex phermones
 - Removal of infested plants and destructions
 - Field Release of *Trichogramma Chilonis* at 35 DAP at 7 days interval for 4 times.
 - Chemical control as a last resort if incidence is more than 15% .

Group (participant)	No.of Shoots observed	Early shoot borer stages				No.of Damaged shoots	% of damage	Defenders per plant
		Egg	Larva	Pupa	Adult			
Spider	25	-	2	-	-	2	8	3.7
LBB	25	1	1	-	-	1	4	3.2
Earth warms	25		2	-	-	2	8	2.9
Wasp	25	-	1	-	-	2	8	3.8
Total	100	1	6	-	-	7	7	3.4

8. Conclusion: participants concluded that the incidence level and the damage caused is very low. Frequent irrigation at short intervals and release of *Trichogramma Chilonis* is advised.

9. BIO ECOLOGY OF INTER-NODE BORER

1. Introduction

Internode borer is important pest of Sugarcane and it occurs with the formation of internode in Sugar cane. It causes extensive damage to the crop and in server cases the economic loss maybe as high as 26% in cane yield. Hence the study has been taken up in ToF by the participants to know its bioecology.

2. Learning objective

At the end of the exercise the participants will be able to;

- Identify the different stages of internode borer
- Identify the damage symptoms of internode borer
- Observe the habitat and defenders associated with internode borer

3. Materials Required

Sugar cane field (with infestation),lens, vials, polythenebags, scissors, chart, pen.

4. Methodology

The participants in small groups were asked to observe randomly selected 20 shoots and record different stages of the pest presence and the associated defenders along with its damage symptoms. After the field activity the participants were given a set of questions to be presented group wise in support of the field activity.

1. Draw all the stages of the internode borer and describe
2. What are the factors responsible for its development
3. Explain the damage symptoms
4. List out the natural enemies
5. What are the management practices for internode borer

5. Out put

Order : Lepidoptera

Family : Pyralidae

Life cycle:

Egg : Laid in batches on the sheathing leaves, lower side of leaf near to midribs egg period; 3.5 days

Larva – white in colour with dark spots on the body with brown head 5 instars in larval stage (30-35 days).

Pupa : in a month the full grown larvae pupates in leaf sheath (7-10 days emergence).

Adult : small, straw coloured, fore wings have a marginal darkline and hind wings are white

Total life cycle 35-42 days

1. Ecology

- Humid climate with temperature ranging 25°C-30°C
- Moisture stress in initial stage of crop growth.

2. Damage Symptoms

- Caterpillar bore at the nodel region and enter the stem.
- Feeding on inter tissue makes the tissue red
- Entry hole is plugged with excreta
- A single larvae may attack a number of nodes
- The larvae infest the soft internodes. 80% attack is being noticed generally on the first internodes

3. Natural enemies

- *Stenobracon* spp
- *Goniozus indicus*
- *Apanteles flavipes*
- *Xanthopimpha* spp
- *Trichogramma Chilonis*

4. Management

- Judicious use of 'N' fertilizer and avoid late 'N' application (N= Nitrogenous)
- Removal of water shoots as when they appear

- Field release of *Trichogramma chilonis* @50000/ha at fortnightly intervals from 120 DAP. Total 4 (Four) releases.
- Detrash lower leaves
- Spray chemicals if the incidence is noticed more than 15%.

6. Observation Table

Group (Participant)	No.of canes observed	Internode borer				No.of damaged cane	Defenders/ plant
		Egg	larva	pupa	adult		
Spiders	20	-	5	-	-	2	2.5
LBB	20	-	2	-	-	1	2.0
Earth warms	20	-	3	-	-	2	3.7
Wasp	20	-	2	-	-	1	3.0
Toral	80	-	12	-	-	6	-
Average	20						2.8

7. Conclusion

Only larva presence is noticed

The damage percentage is 7.5 %

Removal water shoots and release of *Trichogramma chilonis*.

10. EXERCISE ON RAT POPULATION DYNAMICS

1. Introduction

In nature there are checks on the living organisms in its population growth. The check may be intra species competition for food and/ or shelter. Understanding this phenomena will help to understand the ecosystem better.

2. Objective

At the end, the participants will understand that there are many checks in the ecosystem which keep the population at constant level and one of the key-limiting factors is natural enemies

3. Time required : 2 hours

4. Material required

Cow pea/Bengal gram seeds, glue gum, charts

5. Methodology

The participants in small groups were asked to solve the following problem. The rats having the litter size of 6 with 1:1 sex ratio; one month old is sexually mature with a gestation of 3 months and the rats life span is 12 months what will be population after 13 months; if we have one pair of rat at the beginning of the season?. The participants used the Bengalgram seeds for calculation and pasted them for presentation to the large group.

6. Results

After discussion they concluded that after 13 months, the rat population will be 2046 without the influence of any mortality factors. But in nature it does not happen.

	1 st Month	4 th month	7 th month	10 th month	13 th month	Total
2	6	24	96	384	1536	2046

Later raising the following questions, which the participants have answered, concluded the session.

1. What is the rat population at 13th month

2. There are many pairs of rats in the nature. If one pair could produce 2046, how much all others should produce.
3. Are we observing the population according to multiplication of rats.
4. What are the natural enemies for rats.
5. How the nature is acting to keep the over population under check.
6. Can we relate this exercise to field condition and the pests.

The rat population at the 13th month was 2046. if all the rats produce like this; entire world should be covered with only rats. But we are not observing that much population in nature, because their are many natural enemies for rats like snakes, cats, vulture, kites, floods etc. The nature is working to keep the population under check through natural enemies. This exercise can be related to our field condition because there are many natural enemies to take care of the pest build up and out break.

7. Conclusion

Participants understood that in nature there are several mortality factors which keep the population of any organism under check.

AGRO-ECOSYSTEM CONCEPT

1. Introduction

Ecosystem comprise of many factors such as plants, soil, climate, pests, defenders etc and these components are interdependent on each other. Hence, it is essential to understand the ecosystem and the different factors.

2. Learning Objective

At the end of the exercise participants will understand the different components in ecosystem and their interdependency.

3. Time Required

2 hours

4. Materials Required

Vials, thread, Polythene bags, Metre scale, small pegs

5. Process

Three different ecosystems were selected viz grassy land, barren land, cropped land ecosystems. Each group was assigned one ecosystem. Observations were made in one sq.mt area and replicated thrice. The participants counted the number of producers, primary consumers, secondary consumers, decomposers and collected sample specimens. All the groups classified the collected specimens into tropic levels i.e. producers, primary consumers, secondary consumers, decomposers and pasted on the drawing sheet according to tropic levels, and energy flow was indicated between all the components.

a. Points for discussion

1. What are different components of ecosystem?
2. What is the source of energy for living organisms?
3. How is the flow of energy?
4. What happens if one of the components is removed from the ecosystem?
5. Why the different tropic levels look like inverted pyramids?
6. What happens if primary consumers are eradicated by interference of man especially by pesticide spray?
7. How we can maintain the stable ecosystem and biodiversity?

b. Outcome of discussions

Producers, primary consumers, secondary consumers, decomposers are the different component of ecosystem.

- The source of energy for all living organisms is 'sun'
- The flow of energy starts from sun to producers. The energy flows from tropic level to another level. The inverted pyramid shape of tropic level is due to energy in transmission from one tropic level to another.
- If any component is removed the ecosystem will be imbalanced.
- If the primary consumers are eradicated by interference of man especially by pesticide spray, there will be no food for secondary consumers, there by secondary consumers will die due to starvation and they will be eliminated and disappear from the ecosystem. The ecosystem will be imbalanced.
- So we can maintain the stable ecosystem and biodiversity by avoiding targeting the only primary consumer by pesticide spray.

6. Summary

After the exercise, the participants clearly understood the different components and their interrelationship. They concluded that all the components should exist in the ecosystem.

12. SUGARCANE AGRO-ECOSYSTEM ANALYSIS

1. Introduction

Agro-ecosystem analysis (AESA) is the heart of IPM programme and it stipulates weekly field observations on plant health and its compensation abilities, population fluctuations of pests and defenders, soil conditions, climatic factors, agronomic practices etc. and analysis of situation taking into consideration the interrelationship among the factors. The analysis leads to taking a quality decision on appropriate management practices.

2. Learning Objective

The objective of the AESA is to make decision for the management of the crop, based on observation of field situation, drawing, discussion and analysis.

3. Time Required

Three hours

4. Materials Required

Polythene bags, note book, plastic vials, aspirator, pencil, sketch pen, drawing sheet, eraser brush, foreceps, measuring scale, rubber bands, magnifying lens.

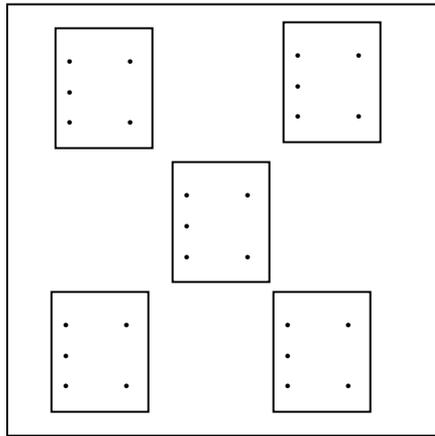
5. Procudure

There are four steps involved

A) Field observation B) Drawing C) Analysis and discussion in small groups
D) Presentation and discussion in a large group and conclusion of management practices.

A. Field observation

Enter the field at least one to two meters away from the bund to avoid boarder effect on sampling. A total of 25 plants per field have to be sampled. In order to select these 5 plants select a site with a dimension of one (1) sq.mt area randomy at five (5) spots as shown in the figure.



Now select five (5) plants at each spot. Of these 25 plants mark 2 plants in each sq.meter sample with permanent labels for recording the plant growth parameters.

1. Count the flying insect in and around plant conopy without disturbing the plant.
2. Select top two, middle two and bottom one leave, randomly and record the number of sucking pests and associated defenders on upper and lower side of the leaves. Note down the stage of the organism. Workout the average per leaf and also observe the cane internodes.
3. Observe the whole plant for type and number of other pests and associate defenders present. Note down the stage of the organism and workout the average perplant.
4. observe the soil surface and by scrapping the soil about 2 to 3" deep around the plant, for the ground / soil dwelling organisms such as ground beetles / rove beetles / earwings /spiders / neutrals and any pupae and record their number, collect pupae for rearing and recording percentage of pupal parasitism.
5. Collect **egg masses** if any for rearing and recording percentage of egg parasitism.
6. Collect dead, inactive, abnormal larvae for recording microbial organisms.
7. Collect healthy and inactive larvae/pupae for earning and recording parasitism.
8. To observe damage to leaves, count the total number of leaves and number of damaged leaves and calculate the percentage defoliation leaves with less than 25% leaf area damage may be ignored. Record the type and number.

9. Record the percentage of damage of shoots by counting total number of shoots/canes, due to borers.
10. Record the diseases, by observing leaves and stem for any discoloration or any abnormality. Estimate the percentage and its intensity
11. Record the type of weeds around the plant in one square metre area their size and population density in relation to crop plant.
12. Observe and record the rodent damage and presence of live burrows and mention the percentage of damage and number of live burrows in unit area (0.4 /1 ha)
13. Record soil condition viz flooded, wet or dry
14. Record the climate factors viz sunny, partially sunny, cloudy the preceeding week.
15. Collect the information on variety / Date of planting / manures and fertilities applied/other crop management practices adopted.
16. Collect live specimens of insect, pest and diseases for preservation and discussion.

B. Drawing

- Make the drawing on the white chart. Use live specimens as models for drawing. Top two third portion of the sheet is used for drawing and the remaining on third portion for writing conclusions and recommendations.
- Draw the plant with correct average number of shoots and leaves and write the average number at appropriate place.
- For weeds write approximate density and size for the weed in relation to the size of the plant. Draw the kind of weeds (Broad leaf or grass type) at appropriate place on the chart.
- For the pest population intensity, draw the pest as found in the field on the right side of the plant. Write the average number for sucking pests and per plant for others) and local name next to the insect.
- For defender population abundance, draw the organisms as found in the field on the leaf side of the plant. Write the average number of plant and their local name next to the drawing.
- Record the total number of pests, defenders and neutrals.
- For rats write the average number of shoots / canes damaged by showing the damage type and mention no of live burrows noticed in the unit area

- Use natural colour for all organisms. For instance draw green for healthy plant and draw yellow for diseased plant or deficient symptom. Draw pests and defenders, neutral nearer to the plant where usually they are seen.
- If fertilizer applied, place a picture of hand throwing N,P and K depending on the type used.
- If insecticide are used in the field show sprays with a nozzle and type of chemical coming out of the nozzle.
- If the preceding week was mostly sunny, draw a sun, just above the plant, if the plant was partially sunny and partially cloudy draw the sun but half covered with dark clouds. If the week was cloudy all day for the most of the week, put just dark cloud.

C. Discussion in small groups

Now the group discusses about the field situation by raising many questions. For this purpose referring the pervious weeks charts are essential to note the population fluctuation of pests and defenders. Discussion points should include the following.

- Stage of the field, its health and compensation abilities
- Changes in pest population in comparision to previous week.
- Corresponding changes in defender population
- Diseases: presence of innoculum, favorable climate, availability of susceptible varieties
- Climatic factors: temperature, rainfall, humidity, wind velocity and their influence on pest defenders, crop growth etc
- Weeds-suceptible stage of crop alternate host for pests, shelter for defenders etc.
- Agronomic practices: Irrigation, fertilizer application, weeding, cultivation etc.
- After considering all related factors, the group member arrive at a conclusion and recommendation written in the lower part of the chart

D. Presentation to the larger group

One representative from each group presents their analysis report before the larger group and invites discussions and interactions. The decision on management practices are finalized and implemented in the field.

IV. HEALTH AND SOCIAL ISSUES

1. SIGNS AND SYMPTOMS

1. Introduction

Farmers spray indiscriminately pesticides which are hazardous to their health. This activity is carried out to bring awareness about pesticide poisoning.

2. Objective

- a. To train farmers to identify signs and symptoms of pesticide poisoning
- b. To introduce alternative to chemical control

3. Time required: 90 minutes

4. Materials required: Drawing sheets, marker pens, body map of signs and symptoms

5. Methodology

Each group has identified a person to lie down on charts that are taped together. The other person from the group has drawn the outline of body map of lied down person. The group brainstormed the signs and symptoms that they have been experienced seen in others by pesticide poisoning and asked to write down the signs and symptoms at appropriate place of body map with green colour pen. After that each group has been supplied with the recognized, known signs and symptoms of body map for self correction. They were asked to delete un-recognized signs and symptoms with blue colour pen and add unknown signs and symptoms in red colour. Later, the charts were presented in front of the larger group then sings and symptoms identified were discussed such as headache etc.

6. Discussions

1. Do you think pesticides are harmful for human being or not?
2. Do you think all pesticide are poisonous?
3. What are the symptoms you experience after spraying?
4. Which part of the body shows the maximum symptoms?
5. How many days these symptoms persist after spraying?
6. Do you know about the chronic effect of pesticides?
7. What is the difference between signs and symptoms?

8. What do you do when you experience pesticide poisoning?
9. Why do you think these symptoms are due to pesticide spraying?
10. How many cases of pesticides poisoning occurred in your village last year?
11. What is the difference between signs and symptoms?
12. What are the different signs and symptoms of pesticides poisoning?

Follow-up:

Use this exercise as a entry point exercise where pesticide poisoning is more or consumption in crop ecosystem in the village where farmer field schools are organized.

2. STORAGE AND DISPOSAL OF PESTICIDE

1. Introduction:

Farmers purchase pesticides well in advance and store in their houses, then use in the season. Even after the use, the disposal of containers is not proper. Containers are disposed in the field and in the surroundings, which is hazardous to human beings as well as to the cattle. But, no place is safe for storage of pesticides as they are poisons.

2. Objective

To create awareness on unsafe storage and disposal of pesticides

3. Time Required

1 hrs 30 minutes

4. Materials Required

Drawing charts, colour marker pens

5. Methodology / Process

Each group has drawn one model farmer house on a chart and indicated where the farmer store his/her pesticides, and spray tank, where the food is prepared, stored, water source, where it is consumed, and also where her/his pet animals and children move. Later facilitators prepared one chart showing the following items.

Safe *Unsafe #	Storage	Disposal
Child		
Food		
Water		
Animals		

The participants have presented the prepared model house of farmer in group wise to big group; asked to represent on the chart whether the storage and disposal of pesticide is 'safe' with green , "unsafe" by red round circle indicating that in storage and disposal of pesticide are 80% unsafe and 20% in safe to all.

The discussions were initiated by following questions

1. How much pesticide do you purchase at the beginning of the season.
2. Do you think any part of the house is safe for storage
3. What might happen if children and / or livestock come in contact with pesticides
4. What do you do with the pesticide containers, once the product is finished
What happens if the empty containers are thrown in wells, water channels or fields.
5. How do you dispose left over pesticides
6. How do you clean the equipment used for spraying
7. Have you noticed any bird or fish died during spraying in peak season.

6. Conclusion

Participants have concluded that there is no place safe in the house to store and dispose the pesticides.

3. HEALTH MODULE

Exposure of Pesticides during Handling (mixing and spraying)

1. Introduction

Pesticides are most dangerous chemicals to human beings especially to the farmers who directly come in contact with them causing health hazards. Hence this activity is taken up to show the different ways of exposure of pesticides during handling.

2. Objective

To visualize body contamination during handling and mixing of pesticides

3. Time Required

2 hours

4. Material Required

White dress, sprayer, water, vegetable red colour dye.

5. Methodology / Process

Two participants role played as farmers doing the act of spraying. They sported white dress for this activity. Vegetable red colour dye is mixed in the water, considering the red dye as pesticide. After mixing, one farmer sprayed in dense foliage of sugarcane field against the wind. While spraying they have done all the activities like, smoking, eating, rubbing eyes, sneezing of nose, cleaning the face with pesticide contaminated hands and cloths etc. All the participants observed this activity. After the activity, some questions related to this activity were given and discussed at length which are as follows.

1. What are the ways in which the pesticide enter into body
2. What is the most common and critical way of pesticides entering into body during spraying
3. Which step of operation is most dangerous and why
4. Is it possible to escape from contamination of pesticides by wearing protective measures

6. Conclusion

At the end, participants agreed that there is no way to escape from pesticide contamination, even if farmers wear protective clothing. This is an entry activity for FFS to stimulate discussion with farmers on health hazards of pesticides and the need for alternative pest management method.

4. GENDER DIVISION OF LABOUR AND DECISION MAKING MATRIX

1. Introduction

Women play an active role in agriculture. Even then, they are not always recognized as farmers. The gender awareness exercises highlight roles, responsibilities between men and women in society in general and in agriculture in particular. Carrying out the exercises gives the opportunity to discuss about these roles, responsibilities, relations and about the capabilities of women.

2. Objectives

To investigate women and men involvement in sugarcane cultivation

To value the role of women in sugarcane cultivation

To identify training beneficiaries

3. Materials Required

Charts, markers of different colours, tape.

4. Methodology/ Process

1. Participants listed the operations involved in sugarcane cultivation on a chart.
2. Besides in each operation, the gender involved in the operation is indicated
3. Third Column is filled with the time necessary to complete the operation per unit of land.
4. A column is reserved to indicate who takes decision related to the operations.
5. Facilitator discusses with the group who is responsible for what and consequently to whom the training should address.

5. Result

Participants performed the exercise in the ToF's classroom according to their knowledge and pesticides.

Group	% of work done		% decision taken	
	Male	Female	Male	Female
LBB	55	45	68	32
Earthwarm	46	54	90	10
Spiders	46	53	85	15
Wasp	60	40	82	18
Average				

1. Conclusion

At the end of the training after having conducted mixed or women FFS only, participants were asked to revise the results of the exercise against the field experience gained. They all agreed that the percentage of work provided in the cultivation of sugarcane by female farmers is at par with that of male farmers. However the gender contribution to decisions appeared more complex than one stated in the table. The responsibilities of women in farm and sugarcane management remarkably differed in socio economic groups. In any case, considering the work done by women, there is a need to train female farmers in the FFS and enable them to take quality decisions.

VI. EXPERIMENTS IN ToF

1. Experiment on Integrated Crop Management

1. Introduction

Sugarcane is an important commercial crop. The constraints in production and productivity is depletion of soil fertility and lack of appropriate agronomic practices and pest incidence resulted in increase cost of cultivation and low productivity. So the participants decided to conduct an experiment by integrating eco-friendly crop management practices for sustainable crop production.

2. a. General objectives

At the end of this experiment the participant will be able to

1. Improve their abilities and skill in design and layout of experiment in ToF / FFS.
2. Develop confidence on improved management practices

b. Specific Objectives

1. To compare the improved management practices vs farmer practice in respect of yield and cost of production.
2. To use Agro ecosystem, analysis as a tool (for decision-making)
3. To develop skill of decision making on management practices

3 . Methodology

No. of treatments – 4 (Four)

Spacing

T₁ = Integrated Crop Management Practices

T₁ 80cm row –row

T₂ = University Recommendations

T₂ 80 cm row – row

T₃ = Absolute control

T₃ 80cm row- row

T₄ = Farmers practice

T₄ 60 cm row - row

Design and layout = Dimension of subplot 360 sq.mts

= Area of plot 1700 sq.mts

Date of plantation 14.02.09

Variety 93A145

4. Results

a) Economics of Sugarcane cultivation(One Acre)

Sl No.	Particulars	ICM		UR		FP	
		Cost	%	Cost	%	Cost	%
1	Ploughing	1,450	3.26	1,450	3.34	1,450	3.71
2	Forming of ridges and furrows	450	1.01	450	1.03	450	1.15
3	Seed material and planting	6,800	15.29	6,800	15.71	7,400	18.95
4	Fertilizers	2,000	4.50	2,000	4.61	2,000	5.12
5	FYM and Trichoderma and application	1,500	3.38	1,500	3.47	750	1.92
6	Weeding	2,200	4.94	1,700	3.93	2,400	6.15
7	Irrigation	4,500	10.11	4,500	10.39	4,000	10.24
8	Intercultivation	700	1.57	700	1.61	700	1.80
9	Earthing up	1,650	3.70	1,650	3.80	1,650	4.23
10	Tricho cards or PP measures	140	0.31	140	0.33	1,000	2.56
11	TT propping	6,900	15.50	6,900	15.93	4,600	11.80
12	Harvesting @ Rs 400 per ton	16,200	36.41	15,520	35.83	12,640	32.37
13	Operational cost	44,490	100.00	43,310	100.00	39,040	100.00
14	Interest on operational cost	2669		2599		2342	
	Total cost	47,159		45908		41,382	
	Total yield	41.4		38.74		31.73	
	Total revenue @ Rs 1800 per ton	74,520		69730		57,114	
	Net revenue	27,361		23824		15,732	
	BC ratio	0.65		0.52		0.38	

b)Quality parameters of Sugarcane in Integrated Crop Management Trial

	ICM	UR	% increase	FP	% increase
Total No of millable canes/ha	83333	78271	6.47	72.333	15.21
Length (m)	2.66	2.63	1.14	2.25	18.22
Girth (cm)	2.47	2.38	3.78	2.38	3.78
Juice sucrose (%)	15.81	15.13	4.49	13.90	13.74
CCS %	11.38	10.69	6.45	13.90	13.74
Purity (%)	87.93	87.79	0.16	88.08	-0.17
Cane yield (t/ha)	102.94	96.86	6.28	79.33	29.76
Sugar yield (t/ha)	11.71	10.35	13.14	8.12	44.21
Brix % (Refractometer)	17.16	15.33		17.50	
Sugarcane (kgs)	1.26	1.54		1.28	

2. EXPERIMENT ON SPACING TRIAL

1. Introduction

Optimum spacing is based on several factors such as soil fertility, cultivars, season, climate etc. Farmers adopt closer spacing and high seed rate due to lack of awareness. This leads to high seed cost and weak cane due to more population by close spacing. Hence, an experiment has been laid out by the ToF participants on spacing with different treatments to observe the influence on pest population and yield.

2. Objectives

- At the end of the experiment the participants shall improve their ability and skill to

Design and layout of the experiment in ToF/ FFS

- Will understand the influence of spacing on sugarcane yield and input cost.

3. Methodology

- **Design**

- **No of the treatments = 3**

T1 = 60cm (Space between rows) = 15 rows (check)

T2 = 80cm (Space between rows) = 10 rows

T3 60/120 Paired row (5 paired rows) = 10 rows

Variety 93A145

D.O.P 9.2.09

Each plot = 216m²

Total area = 648m²

c) Results

Yield and quality parameters of sugarcane in spacing trial

	80CM	60CM	% increase	60/120 cm	% increase	% increase
Total no of mill able canes/ha	77419	63842	21.26	75000	3.22	17.47
Length (m)	3.73	3.05	22.29	2.83	31.80	5.90
Girth (cm)	2.89	2.83	2.12	2.84	1.76	3.50
Juice sucrose (%)	16.90	15.80	6.96	16.07	5.16	8.03
CCS %	12.07	11.25	2.79	10.87	11.04	0
Purity (%)	89.41	88.76	0.73	89.27	0.16	0.57
Cane yield (t/ha)	105.80	86.50	22.31	102.09	3.63	18.02
Sugar yield (t/ha)	12.77	9.73	31.24	11.09	15.15	
Brix % (HR)	19.43	21.16		18.80		
Cane wt	1.806	1.670		1.686		

3. EXPERIMENT ON VARIETAL TRIAL

1 Introduction

Due to continuous cultivation of same variety in the same land the performance of the cultivars in terms of yield and quality of the cane may likely to deteriorate. It is necessary to go for new improved variety with yield potential and quality cane. Hence, the participants decided to conduct varietal trail.

2 Objective

At the end of this experiments the participants

- Shall improve their abilities and skill in design and layout of experiment in ToF /FFS
- Find out suitable variety which has yield potential and quality

3. Methodology

Design

No of the treatments-3

T1 = 97A85

No of the Replications -3

T2 = 2001A83

Gross plot area 612 sq.mt- 3

T3 = 87A298 (check)

Area of sub plot = 68 sq.mt

DOP 14.2.09

Spacing . 80cm (Row to Row)

4. Results

Quality parameters of sugarcane in varietal trial

	97A 85	% increase over control	20001A63	% increase	87A298 (check)
Total no of mill able canes/ha	75177		88333		85763
Length (m)	2.79		3.73		2.83
Girth (cm)	2.89	15.6	2.40		2.50
Juice sucrose (%)	16.86		18.00	2.85	17.50
CCS %	12.27		12.87	3.13	12.46
Purity (%)	93.14	4.82	89.55	0.81	88.83
Cane yield (t/ha)	125.12		139.32	1.23	137.62
Sugar yield (t/ha)	15.35		17.93	4.60	17.14
Brix % (HR)	16.50		17.50		17.50
Cane wt	1.30		1.60		1.69

4. INTEGRATED STRESS MANAGEMENT TRIAL

1. Introduction

Sugarcane being a long duration crop requires more water for its growth and development frequent recurrence of drought in crucial periods of growth , high temperature coupled with low humidity at formative phase of crop (April-june) leads to high transpiration loss causes high soil moisture tension. The imbalance of water in plant tissue reduces the growth yield quality of cane under stress. So the participants in the ToF decided to conduct an experiments on moisture stress management.

2. Objectives

At the end of this experiment the participants

- Improve their abilities and skills in design and layout of experiments in ToF & FFS.
- Understand the effect of mulching and other stress management approaches and evaluate the same

3. Methodology

Design

No of Treatments - 3 T1 = Integrated stress management

No of Replications - 3 T2 = Farmer practice

T3 = control

Total Plot Area = 1632 sq.mt. Spacing 60 cm (Row to Row)

T1 - Integrated stress management

- Use of matured seed cane 45000 setts per acre (3 buded setts)
- Sett treatment with lime solution
Dose/ha 80 kg lime / 400 lit. water Dipsetts for one hour.
- Sugarcane trash mulching on 3 DAP
- Spraying urea + potash(2.5 %) during dry spell
- Apply of Potash as basal and on cesstation of Mansoon.

- Fertilizer as per university recommended dose
- Spacing 60 cm (row to row)

T2 – Trash mulching only

T3 – Do nothing

4. Results

Yield and Quality Parameter of Sugarcane in Integrated Stress Management

	ISM	FP	% increase	Control	% increase
Total no. of millable canes / ha	72500	67867	6.83	52187	38.92
Length (M)	2.28	2.07	10.14	2.27	0.44
Girth (CM)	2.79	2.73	2.20	2.16	6.90
Juice Sucrase (%)	15.10	14.80	2.03	13.09	15.35
CCS (%)	10.69	10.47	2.10	9.24	1.57
Purity (%)	87.79	87.57	0.25	87.26	0.61
Cane yield (t/ha)	90.24	82.99	8.74	62.15	45.20
Sugar yield (t/ha)	9.65	8.68	11.17	5.74	68.12

5. EXPERIMENT ON ORGANIC FARMING

1. Introduction

Organic farming is gaining importance towards achieving sustainability in crop production. It helps in high diversity of soil organisms to improve soil health by improving chemical, physical, biological contents of soils and improves soil environment also facilitate the growth of micro-organisms to find out the effect of organics on the productivity of sugarcane and their effect on soil properties, the participants of ToF decided to layout an experiment.

2. Objective

General objective

At the end of the experiment the participants will be able to

- a) Develop confidence on organic farming practice in sugarcane.
- b) Develop skill in design and layout of experiment in ToF & FFS

Specific Objective

To study the efficacy among the different organics manures and their importance in sustainable sugarcane production

3. Methodology

Treatment = 5

Design

T1 Vermicompost with sugarcane trash @5.6 t/ha

T2 Press mud cake @ 7.0 t/ha

T3 compost (FYM) @ 22.4 t/ha

T4 Biotech Fertilizers Bio phos 75Kg/ha + 75kg Bio potash & 50kgs Iswarya manure as basal and organic NPK megacal & Bio potash @ 625ml/ha each at 45,60 and 90 DAP respectively

Source : Prathista Industries , Hyderabad

T5 Control

In T1, T2, & T3 100% 'N' applied as per recommendation through organic sources

Variety 93A145

Total area 2600 Sq.mt

Treatment = 5

Sub plot size: 450m²

4. Results

Organic Farming at RARS, Anakapalle

Treatment	Cane Yield (t/ha)	Sugar Yield (t/ha)
Vermicompost	86.12	10.73
Pressmud cake	72.17	9.01
Farm yard manure	85.17	10.39
100% RDF	102.41	13.48
Control	55.46	6.39

VI. EXPERIMENTS IN FARMER FIELD SCHOOLS

1. INTEGRATED CROP MANAGEMENT

The ToF participants have conducted practice Farmer Field Schools as part of their curriculum in four villages. The following data shows the yield, quality, benefit cost ratio of the Farmer Field School plots Vs Farmers Practice Plots.

Integrated Crop Management vs Farmers Practice

Village	Treatment	NMC Per ha	Cane yield in tones	CCS percent per ha	Sugar yield per ha (tones)	B.C. Ratio (ha)
Chuchukonda	ICM	85920	12.0	12.95	15.50	1.70:1
	FP	77730	97.50	12.96	12.65	1.30:1
Thimmarajupeta	ICM	82082	130	13.20	17.09	1.97:1
	FP	73500	105	12.96	13.57	1.47:1
Juttada	ICM	80405	106.50	12.46	13.25	2.27:1
	F.P	77150	89.62	12.96	11.57	1.12:1
Lakkavaram	ICM	81530	112.50	12.95	14.80	1.85:1
	F.P	77600	97.50	12.34	12.00	1.22:1

Result and Discussions

1. N.M.C.(Number of Millable Canes)

The difference in the NMC among the treatment i.e. ICM vs Farmers practices is significant. In all the ICM plots the NMC is more compared to Farmer practice. The % of increase in NMC in ICM varied from 4.21% to 11.67% over the Farmers' Practice.

2. Cane yield

The cane yield is higher in all ICM plots. In Thimmarajupeta and Chuchukonda highest cane yield was obtained in ICM plots. The percentage of increase of cane yield in ICM plot varied from 15.38% to 23.80% which is quite significant per ha.

3. Commercial cane sugar (CCS) percent and sugar yield

There is no significant difference was recorded incase of CCS when compared both treatment in all villages. However as far as sugar yield is concerned the highest

sugar yield, was recorded at Thimmarajupeta in (ICM plot). In other cases also sugar yield / ha is more in ICM plots when compared with F.P. The percentage of increases varied from 14.52 to 25.93%

4. Benefit cost Ratio (B.C Ratio)

From the above table it can be seen the highest benefit cost ratio of 2.27 was recorded in Juthada village because Moong was sown as a inter crop in ICM plot contributed the increases in benefit cost ratio followed by Thimmarajupeta where Bhendi was sown as boarder crop in the ICM plot.

However, the benefit cost ratio is more in all ICM plot than Farmers practice plots in all villages.

Conclusion:

In the ICM plots the increase in cane yield over Farmers practice is more due to the following reason.

- Application of organic and inorganic manures as per soil test.
- Method of planting
- Maintenance of required spacing between rows and other Crop Management Practices.
- Pest & Disease Management through Eco- friendly technologies.

1. Village: Chuchukonda,

Sugarcane variety 93A145

Quality and Yield of Sugarcane as Influenced by different Management Practices

Parameter	ICM	F.P	% increase
Total no of millable cane/ha	85920	77730	10.53
Length (M)	3.53	3.48	1.44
Girth (cm)	2.72	2.38	14.28
Juice sucrose (%)	18.60	18.10	2.76
CCS (%)	12.95	12.96	-
Purity (%)	88.40	87.30	1.26
Cane yield (t/ha)	120	97.50	23.07
Sugar yield (t/ha)	15.50	12.65	22.52

- ICM – Integrated Crop Management
- FP – Farmers Practice
- (%) of increase over Farmers practice

Economics of Sugarcane cultivation Area 1 acre (0.4 ha)							
Plot	Total cost of cultivation	Total yield of sugar cane	Value of cane	Revenue from border / intercrop	Total revenue	Net Revenue	BC Ratio
ICM	51368/-	48 tons	Rs. 86400/-	-	86400	35032	0.68
F.P	Rs. 45796/-	39 tons	Rs.70200/-	-	70200	24408	0.53

2.Village: Thimmarajupeta

Sugarcane variety:93A145

Quality and Yield of Sugarcane as influenced by Different Management Practices

Parameter	*ICM	*F.P	% Increase	* O F	% increase
Total no. of millable canes / ha	82082	735500	11.67	76500	4.08
Cane Length (M)	3.73	3.05	22.29	2.83	7.21
Girth (CM)	2.89	2.83	2.12	2.89	-
Juice Sucrase (%)	18.90	18.10	4.41	19.10	5.52
CCS (%)	13.20	12.96	1.85	13.44	3.70
Purity (%)	89.60	85.30	5.04	90.30	5.86
Cane yield (t/ha)	130	105	23.80	105.50	0.47
Sugar yield (t/ha)	17.09	13.57	25.93	14.05	3.53

- ICM –Integrated Crop Management
- OF – Organic Farming (with Biotech manures)
- FP – Farmers practice
- (%) Increase over farmers practice

Economics of Sugarcane Cultivation Area / Acre (0.4 ha) BC Ratio							
Plot	Total cost of cultivation	Total yield of sugar cane	Value of cane	Revenue from border / intercrop	Total revenue	Net Revenue	BC Ratio
ICM	Rs. 53772/-	52 tons	93600	3000	96600	42828	0.79
FP	Rs. 47647/-	42 tons	75600	-	75600	28353	0.59

3.Village: Juttada

Sugarcane variety:93A145

Quality and Yield of Sugarcane as influenced by Different Management Practices

Parameter	*ICM	F.P	% Increase
Total no. of millable canes / ha	80405	77150	4.21
Length (M)	2.73	2.60	5.00
Girth (CM)	2.73	2.65	3.12
Juice Sucrase (%)	18.18	18.10	0.44
CCS (%)	12.46	12.96	(-) 3.85
Purity (%)	86.10	89.30	(-) 3.58
Cane yield (t/ha)	106.50	89.62	18.83
Sugar yield (t/ha)	13.25	11.57	14.52

- ICM –Integrated Crop Management
- OF – Organic Farming (with Biotech manures)
- FP – Farmers practice
- (%) Increase over farmers practice

Economics of Sugarcane Cultivation Area / Acre (0.4 ha) BC Ratio							
Plot	Total cost of cultivation	Total yield of sugar cane	Value of cane	Revenue from border / intercrop	Total revenue	Net Revenue	BC Ratio
ICM	Rs. 42550/-	42.60 t	Rs 76680	4800	Rs. 81480/-	Rs. 38930	0.91
FP	Rs. 44589/-	35.85 t	Rs. 64530	-	Rs. 64530/-	Rs. 19941/-	0.45

4. Village: Lakkavaram

Sugarcane variety:93A145

Quality and Yield of Sugarcane as influenced by Different Management Practices

Parameter	*ICM	F.P	% Increase
Total no. of millable canes / ha	81530	77600	5.06
Length (M)	2.95	2.59	13.89
Girth (CM)	2.70	2.39	12.97
Juice Sucrase (%)	18.66	17.78	4.94
CCS (%)	12.95	12.34	4.94
Purity (%)	88.7	87.0	0.80
Cane yield (t/ha)	112.50	97.50	15.38
Sugar yield (t/ha)	14.80	12.00	23.33

- ICM –Integrated Crop Management
- OF – Organic Farming (with Biotech manures)
- FP – Farmers practice
- (%) Increase over farmers practice

Economics of Sugarcane Cultivation Area / Acre (0.4 ha) BC Ratio							
Plot	Total cost of cultivation	Total yield of sugar cane	Value of cane	Revenue from border / intercrop	Total revenue	Net Revenue	BC Ratio
ICM	Rs. 46523/-	45 t	Rs 81000	-	Rs. 81000/-	Rs. 34477/-	0.74
FP	Rs. 47011/-	39 t	Rs. 70200	-	Rs. 70200/-	Rs. 23189/-	0.49

ECONOMICS OF SUGARCANE CULTIVATION

Area : 1 Acre
 Variety : 93 A 145
 Year : 2009-10
 Village : Chuchukond

S.No.	Particulars	ICM		FP	
		Cost	%	Cost	%
1.	Ploughing	1,450	2.85	1000	2.17
2.	Forming of ridges and furrows	350	0.70	350	0.76
3.	Seed material and planting	7,000	13.76	8000	17.40
4.	Fertilizers	2,000	3.93	2500	5.44
5.	FYM and Trichoderma and application	1,600	3.15	1000	2.17
6.	Weeding	2,000	3.93	200	4.34
7.	Irrigation	4,500	8.85	4500	9.78
8.	Intercultivation	7,00	1.38	450	0.98
9.	Earthing up	2,000	4.91	2500	5.41
10.	Trico cards or PP measures	160	0.31	800	1.74
11.	TT propping (three times)	7,000	13.76	4500	9.78
12.	Harvesting @ Rs 400 per ton	19200	42.47	15600	40.00
13.	Operational cost	48460	100.00	43200	100.00
14.	Interest on operational cost(6%)	2908		2592	
	Total cost	51368		45792	
	Total yield	48		39	
	Total revenue @ Rs 1800 per ton	86400		70200	
	Net revenue	35032		24408	
	BC ratio	0.68		0.53	

ECONOMICS OF SUGARCANE CULTIVATION

Area : 1 Acre
 Variety : 93 A 145
 Year : 2009-10
 Village : Juttada

S.No.	Particulars	ICM		FP	
		Cost	%	Cost	%
1.	Land preparation and manures	3000	7. 61	3000	7. 17
2.	Seed material and planting	7,000	17.80	8500	20.33
3.	Fertilizers	1,500	3. 80	2500	5. 98
4.	FYM and Trichoderma and application	1,000	2. 55		
5.	Weeding	2,000	5. 01	4500	10. 76
6.	Irrigation	4,500	11. 45	4505	10. 77
7.					
8.	Inter cultivation (Mulching and detrashing)	7,50	1. 90		
9.	Earthing up	1,500	3. 80	2500	5. 98
10.	Tricho cards or PP mearsures	140	0. 55	800	1. 91
11.	TT propping	1,500	3. 80	1500	3. 60
12.	Harvesting @ Rs 400 per ton	17040	41. 73	14260	33. 50
13.	Operational cost	39,930	100.00	42065	100.00
14.	Interest on operational cost	2396		2524	
	Total cost(Sugarcane)	42326		44589	
	Total cost(greengram)	244			
	Total cost(Sugarcane+ greengram)	42550			
	Total yield	42.60		35.85	
	Revenue from sugarcane @ Rs 1800 per ton	76680		64530	
	Revenue from greengram	4800			
	Revenue from sugarcane and greengram	81480		64530	
	Net revenue	38930		19941	
	BC ratio	0. 91		0.45	

ECONOMICS OF SUGARCANE CULTIVATION

Area : 1 Acre
 Variety : 93 A 145
 Year : 2009-10
 Village : Timmarajupeta

S.No.	Particulars	ICM		FP	
		Cost	%	Cost	%
1.	Ploughing	1,500	2. 88	1000	2. 17
2.	Forming of ridges and furrows	500	0. 96	350	0. 76
3.	Seed material and planting	7,000	13. 42	8000	17. 40
4.	Fertilizers	2,500	4. 79	2500	5. 44
5.	FYM and Trichoderma and application	1,600	3. 07	1000	2. 17
6.	Weeding	2,500	4. 79	2000	4. 34
7.	Irrigation	4,500	8. 63	4500	9. 78
8.	Intercultivation	500	0. 96	1350	0. 98
9.	Earthing up	2,000	3. 84	2000	5. 41
10.	Tricho cards or PP mearsures	140	0. 28	800	1. 74
11.	TT propping (three times)	7,000	13. 42	4500	9. 78
12.	Harvesting @ Rs 400 per ton	20800	42. 96	16800	40. 00
13.	Operational cost	50540	100. 00	44950	100. 00
14.	Interest on operational cost	3032		2697	
	Total cost	53572		47647	
	Total cost on boarder crop (Bhendi)	200			-
	Total cost on sugarcane and bhendi	53,772		47647	
	Total yield	52		42	
	Revenue from sugarcane @ Rs 1800 per ton	93600		75,600	
	Revenue from bhendi @ Rs 1800	3,000			
	Total revenue	96600		75600	
	Net revenue	42828		28353	
	BC ratio	0. 79		0.59	

ECONOMICS OF SUGARCANE CULTIVATION

Area : 1 Acre
 Variety : 93 A 145
 Year : 2009-10
 Village : Lakkavaram

S.No.	Particulars	ICM		FP	
		Cost	%	Cost	%
1.	Land preparation	3,000	6. 89	3000	6. 80
2.	Seed material and planting	7,000	16.10	8500	19.16
3.	Fertilizers	1,500	3. 44	2500	5. 63
4.	FYM and Trichoderma and application	1,000	2. 30		
5.	Weeding	2,000	4. 60	4,500	10. 14
6.	Irrigation	4,500	10. 34	4,500	10. 14
7.	Intercultivation	750	1. 72	450	0. 98
8.	Earthing up	1,500	3. 44		
9.	Tricho cards or PP mearsures	140	0. 32	800	1. 01
10.	TT propping	4,500	10. 34	4,500	10. 14
11.	Harvesting @ Rs 400 per ton	18,000	40. 46	15,600	35. 18
12.	Operational cost	43,890	100.00	44,350	100.00
13.	Interest on operational cost	2633		2661	
14.	Total cost	46,523	47011	47011	
	Total yield	45		39	
	Total revenue @ Rs 1800 per ton	81000		70200	
	Net revenue	34477		23189	
	BC ratio	0. 74		0.49	

2. ORGANIC FARMING TRIAL

1. Introduction

It helps in improving soil physical and chemical parameters which promotes in increasing and stabilizing the soil health: The organic casbow content and water holding capacity of the soil are improved due to continuous application of organic fertilizers. Microorganisms number and activity is highly enhanced due to the adoption of organic farming which ultimately results in higher yield with good quality of the end product.

2. Learning Objective

To study the efficacy of Biotech manures(organics) Vs Farmers Practice.

3. Methodology / Process

a) Design

T1 = Organic Plot

T2= Farmers Practice

b) Layout

Village : Thimmarajupeta

F.P – 0.10 acre (400 sq.mt)

O.F- 0.20 acre (800 sq.mt)

In farms plot all the practices were followed as done by the farmers. In organic farming only organic manures applied as basal and top dressing.

Dose per acre of the organics

Basal Application -	30 Kgs - Bio phos
	30 Kgs- Bio photosh
	50kgs - Ishwarya
Foliar Application -	Organic NPK- 250 ml/ac @ 40 DAP
	Megacal 250ml @ 60 DAP
	Biopotash 250ml @ 90DAP

(Organic fertilizers manufactured by **Prathista Industries Ltd.**, Secunderabad.)

4. Results and Conclusion

Quality and yield of sugarcane in organic Farming Vs Farmers Practice

Village: Thimmarajupeta

S.No		Farmers practice (F.P)	Organic Practice(O.F)	% Increase Over F.P
1	Total No of millable canes/ ha (NMC)	73500	76500	4.08
2.	Cane Length(m)	3.05	2.83	(- 7.21)
3.	Girth (cm)	2.83	2.89	-
4.	Juice Sucorse (%)	18.10	19.10	5.52
5.	Commercial Cane Sugar (CCS)	12.96	13.44	3.70
6.	Purity (%)	85.30	90.30	5.86
7.	Cane yield (t/ha)	105	105.30	0.47
8.	Sugar yield (t/ha)	13.57	14.05	3.53

F.P Farmers Practice

O.F Organic Farming

5. Discussions and Conclusions

In the organic farming experiment Vs Farmers Practice

There is increase in case of NMC (4.08%) Juice sucrose (5.52 %) CCS (3.70%) Purity (5.86%) cane yield (t/ha) (0.47 %) and sugar yield (t/ha) (3.53 %) compared to farmers practice.

6. Conclusion

The cane yield obtained in organic farming is at par with farmers practice. The purity and sugar yield in the organic farming is the highest when compared with farmers practice.

VII. NON-FORMAL / AGRICULTURAL EXTENSION

1. Concept and Principles

Essentially Non Formal Education (NFE) is a participatory educational process based on the assumption of adult learning. When adult learners decide to participate in any learning activity, they bring along a wealth of experience, knowledge and skills. They are armed with their own beliefs, values and convictions. They have their own perceptions, basis and feelings. With such a background, the adult learner is the rich resource in learning process.

Non formal education methods and approaches encourage participants to see themselves as source of information and knowledge about the real world. When they are encouraged to work with the knowledge, they have from their own experience, they can develop strategies together to change their immediate situations. The learning experience takes place in several ways.

- ❖ Existing popular knowledge is recognized and valued
- ❖ New know is built on the existing knowledge
- ❖ Participants learn to exercise control
- ❖ Learning becomes a collective process
- ❖ Learning creates informed options
- ❖ Actions emerge out of this analysis

Non formal education method and approaches, as knowledge management strategies, brings about sharing of knowledge and the creation of new knowledge, and in the process empowers the participants. Activities focus on allowing participants to observe, discuss, interact, brainstorm as well as perform analysis, make decisions and solve problems.

● **Methods and Approaches**

- ❖ Sharing
- ❖ Role play
- ❖ Case study
- ❖ Panel discussion

- ❖ Problem solving exercise
- ❖ Small and big group discussions
- ❖ Debate
- ❖ Brain Storming
- ❖ Simulation game / exercise
- ❖ Observing by field walk
- ❖ Learning from field trip
- ❖ Conducting mini workshop
- ❖ Flok media presentation
- ❖ Conducting field day
- ❖ Follow-up programmes
- ❖ Farmer to farmer training through organizing communities
- ❖ Participatory Technologies Development

2. TRANSACT WALK

1. Introduction

A transact walk is a kind of exploratory walk which is undertaken to observe and gather minute details of a particular area by systematic travel from North to South or East to West from the highest to lower point.

2. Learning Objective

To get an idea about physical layout and cross section view of a farm / village and resources of the place.

3. Time Required

3 hours

4. Materials Required

Note book, pen, colored crayons, drawing sheets, polythene bag / carry bag to collect specimen.

5. Process

The participants were divided into groups. The procedure was explained briefly. The transact walk was undertaken in the Regional Agricultural Research Station (RARS) farm accompanied by facilitators.

- Observed everything came across in minute detail
- Recorded everything they saw and rough sketch was drawn
- All important aspects were recorded and specimens were collected
- The entire farm area was covered by the participants group

On return from the transact walk, the participants draw charts / transect axis and presented by each group before large group what they observed in systematic way.

6. Follow-up

This activity is useful in FFS can be used as a prerequisite for mapping of landuse, productivity, local indigenous technologies and cropping pattern, resources available etc. in the village.

3. SESSION GUIDE PREPARATION

1. Introduction

Session guide is a blue print of a given topic. Writing session guide is one of the important key activity in ToF / FFS. It helps the facilitator to conduct field activities in a proper way.

2. Learning Objectives

After this activity the participants will be able to prepare session guide for the topic which they will conduct in FFS.

3. Materials.

Markers and Charts

4. Time : 1 ½ hour

5. Process

Through discussions the following format of session guide was finalized

The session guide should have

A. Introduction

This section briefly states the problem and the importance of conducting the learning activity.

B. Objective

States the skills that learners should acquire at the end of the activity

C. Material needed

List of material that you need to carry out the learning activity

D. Procedure

Writing the activity to be conducted in a logical sequence

6. Observation to be taken

7. Discussion point

8. Conclusion

9. Follow-up activity

Quality indicators

5 things to be kept in mind

1. Be clear about the topic of the session
2. Find out expectations of the participants
3. Plan the activity and structure it properly
4. Identify the venue and material
5. List down indicators about the change among the participants.

4. HOST TEAM FUNCTIONS

1. Introduction

As a part of Participatory approach of the training management responsibilities has to be shared from the facilitators by the participants. So to attain the objectives of host team functions will be assigned during the training to the participants.

2. Objective

- To build a core group of field trainers (Facilitators who will be able to plan, organize, implement, manage, document, administer and evaluate).
- To know what are host team functions.

3. Time Required: 2 hours.

4. Materials Required

Charts, pens

5. Methodology / Process

The participants were divided into small groups. They were asked to list out host team functions which they feel to perform during the course of training. Each group has presented their ideas which have been discussed before large group and the host team functions have been listed out.

Discussion and presentation

1. What is host team and why it is need in a training programme
2. When it should be assigned the duties in a ToF programme?
3. What are its functions?

6. Out put

How Host team function?

1. Participate in daily and weekly planning meeting. Two participants from the host team group (day facilitator cum material manager) will participate in daily meetings and all host team members in weekly planning meeting.
2. Prepare and give briefing on Day's activities. The host team will also conduct days and weekly evaluation.

3. Assist facilitator in conducting topics.
4. Maintain ToF visitor book.
5. Assist in coordinating, organizing visit to ToF / FFS field activities.
6. Provide group dynamics / Energizers / Ice breakers.
7. Ensure facilities in class room / training room.
8. Assist facilitators in preparing materials audio visuals, field, others for Resource persons during discussions on topics.
9. Distribute handouts and maintenance of handout, on technical, allied matters.
10. Assist in maintenance of attendance.
11. Ensure that all participants report to classroom and field activities on time.
12. Inform the training staff or coordinator, the needs of co-participants (diatery restrictions and other training related concerns).
13. Assist facilitator (material co-coordinator) in distributing materials for class room and field activities.
14. Assist in transport arrangement in ToF activities.
15. Assist in daily activities documentation and preparation.

At the end the schedule for allotment to groups was made to share responsibilities during the ToF Programme.

Week	Group (Participants)
1	Spider
2	Earth worm
3	Wasp
4	LBB

7. Follow-up

- Host team functions/responsibilities assigned to participants from the 2nd week of ToF Programme.
- In FFS on group formation i.e from 3rd or 4th week from the commencement of weekly FFS.

5. BALLOT BOX TEST

1. Introduction

Ballot box test is a test done in the field using the specimens it creates curiosity to learn among participants and illiterates can also participate.

2. Learning Objectives

- To measure the trainees knowledge and experiences
- To assess the need of the farmers and in turn to decide the curriculum of the FFS
- To motivate farmers to get interested in attending FFS sessions.

3. **Time Required** : 3 hours (2 hours for Ballot box preparation and 1 hour for conducting **BBT**)

4. Materials Required

Thick drawing sheet, scissors, vials, rubber bands, polythenebags markers, thread, bamboo sticks.

5. Process

Take half chart drawing sheet fold it one third from bottom and make 3 (three) pockets using scissors and tape. Prepare 20 ballot boxes. Usually 20 ballot boxes are used in FFS. Prepare 20 ballots for each participant with the same serial number for all 20 ballots. Collect live specimen from field based on the specimens collected, set the questions. For each question there should be three options. But only one answer must be the correct one.

Question Matrix for preparation Ballot Box test

Topics Skills	Identification	Life cycle	Damage symptoms	Management	Decision making
Fertilizers	-	-	-	1	
Seeds	-	-	-	1	
Pests	1	1	2	2	1
Disease	1	-	1	1	
Weed	-	-	-	1	
Cultivation practices	-	-	-	-	1
Crop defenders	1	1	1	1	1
Crop growth	-	-	-	-	1

- The numbers in the table indicates the number of questions you plan to ask in each topic.
- Topic questions can be modified as per the crop/situations

Guidelines for development BBT questions were discussed

- Questions are based on specimens available
- Questions need to be written to encourage farmers to think and observe
- Yes and No answer should be avoided
- Multiple choice of answers are best, always with samples to observe
- Relate pest and disease to actual damage in the field
- Find as many growth stages of organisms as possible

8. Result analysis follow-up

Participants number	Question Number									Score total %
	A	B	C	A	B	C	A	B	C	
1										
2										
3										
No of responses	10	3	17							

- The above table indicates the number of responses in each of three possible correct answer in each of item.
- For example in question number 1 only 10 out of 30 participants gave correct answer
- With the process the facilitator will not only get total correct answer in each question but also be able to evaluate strong and weak points of the participants, which helps in curriculum planning for FFS.

6. COMMUNICATION SKILLS

1. Introduction

Communication is transactional process between two or more people where by meaning is exchanged through use of symbols. Communication skills are the basic requirement for the facilitator to conduct FFS / ToF. In this context this topic was very important.

2. Learning Objectives

At the end of this exercise participants able to

1. Understand the meaning of effective communication, elements and methods of communication, barrier for effective communication.
2. Improve their communication skills

3. Time required: 1 ½ hours

4. Materials Required

Drawing sheets, marker pens

5. Process

Topic was introduced through whisper game to understood distortion i.e. participants were asked to stand in circle. First person was given brief message and he was asked to convey the same to the person standing next to him. The process continues upto last person. The first person and the last person were asked to write the message they received on the white board and then group was asked to discuss on how message was distorted.

Then following questions were given to the small group for discussion and presentation.

What is communication?

- A process of passing information between individuals / organizations using agreed symbols.

Elements of Communication

- Sender
- Message
- Receiver
- Channel
- Encoding
- Decoding

- Feedback
- Environment

Importance of Effective Communication

- Avoid distortion of information
- Attract attention and win confidence
- Elicit / stimulate desired response
- Pass information

Methods of Communication

- Verbal / oral
- Written
- Gestures
- Audio visual
- Silence
- Body contact
- Proximity

Barriers to effective communication

- Lack of confidence of the sender
- Cultural / Social norms
- Prejudice e.g. on gender
- Unclear message e.g. over loaded
- Use of inappropriate channel
- Distracting Body language
- Appearance

Techniques to Effective Communication

- Know your audience
- Be coherent
- Be cautious
- Avoid Monotony
- Prepare your audience
- Be brief and to the point
- Maintain eye contact
- Observe and respect social norms

7. PRESENTATION SKILLS

Introduction

In the FFS, one of the skills that facilitator should have in presentation and chart writing skill

Objective

At the end of this exercise participants should improve their presentation and chart writing skill

Materials

Drawing sheet, marker pens

Time: 90 minutes

Process

This activity was conducted through role play. The following roles were identified. They were briefed in advance and were asked to act accordingly. The subject identified for the role play was "How to apply Gypsum and its advantages".

- First person will present to audience with low voice.
- Second person presents to audience by seeing only one participant
- Third person presents with unusual body language
- Fourth person presents the same topic with shyness and nervousness
- The last person presents without any movements and body language.

The above persons were asked to write charts with one or two defects like using very small sized letters, continues running matters, using red colour marker to write on red colour charts and using too many colours or only one colour marker.

Finally, one person was asked to present in a proper way by over coming all above weaknesses. Then groups were asked to write about each character of the role play and their charts and about how best they can improve their presentation and chart writing skills.

Conclusions

The following conclusions were drawn from group discussions.

1. Presenter should

- Have loud voice
- Face audience
- Have good eye contact
- Have good body language
- Avoid shyness and nervousness
- Maintain voice pitch

2. Charts should be

- Legible with bold letters
- With highlight points only
- With some creativity
- Use contrasting colour markers for chart writing.
- Preferably should not have more than three colours.

8. SMALL GROUP DISCUSSION

1. Introduction

In this method the learners are divided into groups and given real life situations or relevant subject matter or a question to discuss. The learners based on their past experiences, attitudes and values carry on this discussion. They arrive at new knowledge and new insights.

2. Learning Objectives

By the end of the sessions participants able to

- Understand basic characteristics of small group discussion methods.
- Known different techniques of SGDs and skills in conducting the techniques.

3. Time Required : 1 ½ hrs

4. Materials Required

Bulletin board, charts, pens, scribbling pad, Flip chart etc.

5. Process

Introduce the concept of small group discussion by dividing into different groups and ask them to take up decision making issues, problem solving, conflict resolution, etc.,

Conduct SGD

- Clarify group task by writing on board / flip chart and each member should be clear about their role. Handover, stationery, scribbling pad pen to each group. Some body from the group should act as leader.
- Let the group discuss attentively without any distractions.
- Ten minutes prior to time-up, remind the group about time limit. Group leader has to make a note of all points and opinion expressed by the member and key issues encouraged should be noted down.
- Let one or two individuals from each group present their discussion to the large group.

- The facilitator/trainer has to add relevant points that have been not covered by the group.

Presentations

Facilitate group member to identify basic characteristics of SGD method allow them to write it on a chart. The characteristics includes

- Emphasis on active participation unlike large groups.
- Usually run by group leader.
- It should have title, theme or goal.
- They gather a range of ideas, opinions and concerns.
- In a breakout group, a small group task reflects the larger group agenda.
- Breakout groups report back to the larger group.
- They can be applied to either planning or project development.
- Further groups also discuss on advantages and limitations of SGD and ask them to write on a chalk board.

Advantage	Limitations
Helps members to recognize what they knew and do not know.	Requires active facilitators.
Provide opportunity for shy members.	It can be time consuming.
Participant experience sense of ownership.	Flow of discussion may get influenced by active members.
Pooling of ideas.	More space is required.
Group help to build group cohesiveness.	Over use of this method may make the group functioning stereo typed.

9. SMALL GROUP DISCUSSION TECHNIQUES

There are different techniques for conducting small group discussions based in the objective / goal – we can use different techniques. The following are some of the techniques and for each techniques fix the time.

Clarify participation about different techniques used for SGDs

a) Brain storming

A means of getting a large number of ideas from a group of people in a short time

When to use brain storming?

- To generate alternative solutions to a problem
- When participants represent from many different back grounds
- To encourage all group members to speak
- Brain storming is more effective with group of 8-12 people

Conducting brain storming

- Define the problem/issues.
- Given yourself time limit
- Ask every participant to participate
- Keep going around till the exhaustion of ideas
- Look for the wildest ideas
- Record all ideas
- Use voting to prioritize the ideas
- Move to action planning once the top 2-3 ideas are identified

b. Buzz sessions

With a large group when there is limited time for discussion the audience may be divided in to smaller units for a short period. This is called bizz session or huddle system. A buzz session consists of dividing an audience into small groups (3-6) to discuss an issues or carryout a task. The group work simultaneously in the small room. The world buzz is from the resulting noise. The task is brief and relatively simple.

The session is incorporated into a large group and fix the time.

Process

- Group may be setup in advance or on the spot.
- Describe the processes
- Specify each group task
- Ask participants to introduce themselves
- Let the group discuss for no more than 20 minutes
- Warm them two minutes before the end
- Gather the results of the discussion and secretary of each group will report the findings or questions to the entire audience when they reassembled.

c. Symposium

Is a short series of lectures, usually by 2-5 speakers. Each speaker given a definite amount of time and discussion by speakers.

The basic characteristics

- The topic should be large enough or general enough to permit two or more sub divisions that are sufficiently significant to justify separate discussion by speakers
- The subject may or may not be controversial
- It is important that speakers are approximately equal ability
- The speaker may be followed by farmers to facilitate mastery of information

The advantage of symposium different phases of the topic will be known.

d. Panel Technique

It is an informal conversation put on for the benefit of the audience by a small group of speakers (2-8) under a moderator. It is excellent method for presenting controversial sub topics and verifying point to view.

Process:

- The panel member are usually seated round a table in a semi-circle facing the audience.

- The leader introduces the members of the panel to the audience and announces the topic.
- Leader has the responsibility to see the conversation keep going, by asking questions or making brief comments.
- Encourage less talkative members.

There are three types of panels

- (i) *Questions –Answer panel* in which the presentation is actually a series of questions by the leader.
- (ii) *Set – speech panel*
Each speaker making a prepared speech
- (iii) *Conversational panel* – in which members hold a conversation among themselves on the topic with question and comments going from one member to another.

10. CASE STUDY METHOD

1. Introduction

The case study method is an excellent medium for developing analytical skill. This method is a narrative account of series of events or situations around a specific problem or problems. The main focus of the case study should be on thinking, talking and deciding about the many ways of solving the problem.

A case study has a beginning, middle and end. The following questions listed under different sections when administered or answered would be useful while writing case studies

2. Learning Objectives

- To enable trainees to develop analytical skill
- To improve participants skills in problem analysis and decision making

3. Time Required : 2 hours

4. Materials Required: Colour charts, marker pens, chalk board etc.,

5. Process

a) Beginning of the process

- i) where is the situation occurring and in what context?
- ii) Who are the major characters and what is their relationship
- iii) What is the situation of these characters at the beginning of the case; what issues do they face, and what are their thoughts and feelings about these issues.

b) Middle of the case study

- i) What problems, situations are developing
- ii) What events and factors are contributing to this problem?
- iii) Where are the major characters and what are they doing?
- iv) Are there minor characters that are not entering into the picture? Who are they and what connection do they have with the situations?
- v) What systematic problems are being addressed and how are they being developed?

c) End of the case study

- i) What is the status of the problem now?
- ii) What are the major / minor characters doing and what are their thoughts and feelings
- iii) What has happened to the relationships between the major character?
- iv) How can the ending occur in such a way as to allow for differing interpretations?

d) Applying case study:

The case study provides a learning which depends on involvement and participation in group discussion for its success.

e) Characteristics / uses of case study

- Problem identification and solving
- Developing alternative approaches and strategies
- Decision making
- Portraying field experiences

f) Ingredients

- Rich in fact –close to reality
- Dramatic interests
- Carefully chosen cut-off points
- Expository – structure
- Should have an issue
- Balance of qualitative facts with qualitative figures

“It is **everything of some thing**” not something of every thing” and is the real life sample”

11. ROLE PLAY METHOD

1. Introduction

Active participation rather than passive reception facilitate learning and this is achieved in role play technique. In the absence of real situations, certain artificial situations many have to be created to suit the instructional needs so that the trainees would be feeling that they are experiencing life-like situations.

Role play is a technique, in which some problem is presented, then spontaneously acted out. The learners assume a role and are led to make decisions in a life –like situation.

2. Learning Objective

- To determine how the problem could be handled better
- To explore personal feelings and also learn about others

3. Time Required: 2 hours

4. Materials Required

Chalk board and pen / flip chart space for conducting role play, furniture setup etc.

5. Process

- (A) Set the climate and give the participant statement about topic and explain goals clearly.

Experience

- Describe the situation: Tell about the characters, who they are and what they will be doing; where, why, what. Background information
- Select the role players: All trainees to select voluntarily
- Give tasks to observes: Assign something that observers look in during role – play
- Brief the role players: Work with each role player separately to make sure that he / she understand the role. Do not tell them what to say or do.
- Set the stage: Remained every one of the situation and set up the furniture
- Begin the role play: Let the role play run for a fixed time.

(B) Sum up and learning

Thank the role players

- Keep role play up front
- First as group what strategy did they use?
- Secondly ask how role player strategy works?
- Ask the role player and participants what they learned
- Record their responses on flip chart or chalk board

Closing: Wrap up

12. FACILITATION SKILLS

1. Introduction

Facilitation skills are essential for anyone seeking to guide a group of people through a process of learning or change in a way that encourages all members of the group to participate. Each person has a unique viewpoint and valuable knowledge to share without their contribution, the group's ability to understand or respond to a situation is reduced.

The facilitators role is to draw out knowledge and ideas from different members of a group. Facilitation involves letting go of control over the outcome of a process and giving that responsibility to the group.

2. Learning Objectives

- To highlight the difference between teaching and facilitation.
- To discuss the role of a facilitators and identify qualities and skills of a good facilitation.
- To gain skills in facilitating different process while working with small group.

3. Time Required: 2hrs.

4. Materials Required

Charts, pens, handout, bulletin board, etc

5. Process

(a) Differences between teaching and facilitation

- Ask participants to think back to their experience of being at school/ collage. What methods were used to teach new ideas? Ask participants to brainstorm in pairs for about ten minutes on the following question: What is the difference between school teaching and facilitation?" Ask them to note down their ideas.
- Divide a piece of flip chart paper into two columns headed 'School teaching and 'Facilitation'. Then bring the group back together and ask each pair to write up two ideas under each column. Using Chart add any points that have not already been raised.

School teaching	Facilitation
Teacher starts from their own knowledge	Facilitator starts from the knowledge of the group
Teacher follows a pre-set curriculum	Facilitator addresses issues identified by the group or their community and adopts new ideas to the needs and culture of the group.
Teacher presents new information from the front	Facilitator uses practical, participatory methods, eg: group discussion and activities in which all members of the group participate.
Information flows in just one direction, from teacher to students	Information flows in many different direction between the facilitator and individual group members – a genuine exchange of ideas.
Teacher brings extensive knowledge of the subject.	Facilitator draws out and builds on the knowledge of the group and knows where to find further information on the subject.
Teacher is concerned with students understanding the right answer.	Facilitator encourages and values different views.
Teacher works for the community and may come from outside the community.	Facilitator works with the community and may come from within the community.
Teacher has a formal relationship with the students, based on their status as a teacher.	Facilitator is considered as an equal, and has relationships based on trust, respect and a desire to serve.

(b) What makes a good facilitator?

A good facilitator has certain personal characteristics and skills that encourage group members to participate in a discussion or activity.

- Divide participants into groups of four or five. Give each group a piece of flipchart paper, and ask them to draw the characteristics of a group facilitators. For example. They might draw an ear to symbolize a good listener on the board/chart so that all participants can look at them and compare their ideas.
- Ask each group to stick their drawings.
- Participants identify certain characteristics.
- Consolidate all characteristics presented by the groups.

(c) Characteristics of a good facilitators.

A good facilitator should be

- Humble
- Generous
- Patient
- Understanding
- Accepting
- Inclusive
- An encourager
- An enabler
- Affirming of everyone's knowledge
- Sensitive to the needs of others.
- Willing to learn from mistakes
- Dynamic, a motivator
- A good listener
- Good at summarizing others' ideas
- Confident
- A good communicator

Emphasize that facilitation is about getting a balance between these different characteristics- for example, between being a good listener and a good communicator, between being patient and dynamic. Although certain skills and techniques can be learnt and applied, the most important thing is the facilitator's ability to relate to individual group members in a way that makes them feel valued and encouraged. This will affect the way the whole group works together and what it will achieve.

13. LEADERSHIP AND DEVELOPING LEADERSHIP SKILLS

1. Introduction

Leadership is the art of influencing people so that they will strive willingly and enthusiastically towards the achievement of group goals.

Leadership is an important aspect of managing people. People tend to follow those who, in their view, offer them as means of satisfying their own personal goals.

2. Learning Objectives

- To understand the concept and importance of leadership.
- To describe different styles of leadership
- To acquire leadership skills for managing various tasks.

3. Time Required: 1 ½ hours

4. Materials Required

Colour cards / pens, chalk board, exercises on leadership, self assessment schedules etc.

5. Process

(a) Instructions followed during the conduct of the game.

- Divide the participants into three groups, select three volunteers to represent each group.
- Instruct them that one should act as democratic (benevolent) leader who involves in getting things done.
- Second one acts as laissez faire leader i.e. he will not participate and simply sets target for his group members and not involved in activity.
- Third volunteer should act as autocratic (critical) i.e. each time he changes the direction of activity, so that work will not be accomplished. He takes decision without consulting his group members.
- Volunteers will be told not to disclose their roles. Then all three groups were asked to build a 'house' under the leadership of their group. This activity should be completed using local available materials.

Leadership is an important process that has two prime functions one is of course taking out work effectively from different people available in the organization and the other is of developing the second line in command.

(b) Leadership styles

Benevolent or paternalistic leadership style

- Believes that all his employees should constantly be guided
- Treats them with affection (Relationship oriented)
- Assigns tasks on the basis of his own likes and dislikes
- Constantly guides them and protects them
- Understands their needs, salvages, crisis situations.
- Distributes rewards to loyal and obedient
- Shares information with those who are close to him etc.

Critical leadership style (Autocratic)

- Believes that employees should be closely and constantly supervised.
- Directed and reminded of their duties and responsibilities.
- Concentrates on short term goals.
- Cannot tolerate mistakes or conflict of employees.
- Relies on personal power.
- Keeps all information to himself.
- Works strictly according to norms and rules and regulations and highly disciplined.

Development leadership (Participatory) style

- Believes in developing the competencies.
- Treats them like mature adults.
- Focuses on long-term goals.
- Shares information with all to build their competencies.
- Facilitates the resolution of conflicts and mistakes.

You can also assess the leadership styles by administering the schedules.

(c) There are suggested qualities that people often associate with leader. Those are

- Technical - specific skills at some task at hand
- Charismatic-inspiration
- Preoccupation with a role – a dedication / service to cause
- A clean sense of purpose – clean goals focus
- Results – orientation – directing every action towards mission
- Cooperation – work well with others
- Optimism – very few pessimists become leaders
- Belief in one’s ability to make a difference
- Ability to encourage and nurture those that report to them - delegate in such a way as people will grow.
- Role models - lead by example
- Self awareness / self knowledge
- Awareness of environment – ability to understand the environment and how it affects
- The ability to choose winners
- Empathy of integrity and sense of humor

(d) Facilitating to acquire leadership skills through

- Provide a concrete vision of future.
- Believe in the ability of follower / Sub-ordinates to achieve on aim
- Set ambitious goals and motivate to meet them.
- Treat all people equally
- Development relationship with people regardless of social strategies
- Stand courageously in the face of great adversity.
- Stand for morality but do not engage in judgmental position
- Lead by example not by coercion
- Empower people
- Build credibility by living according to cherished values

A leader is one individual within an organization / society, who is able to influence the attitude and opinions of others.

14. TEAM BUILDING

1. Introduction

Team building has become an important component of managing activities/ programmes in different sectors. Unless the members of any organization / programme are well acquainted with the characteristics of an effective team, the goals cannot be achieved properly. Therefore, there is need to develop understanding of the characteristics of an effective team not only by the training institutions but also by the other organizations which involve team work in their production programmes.

2. Learning Objectives

- To understand the importance of team building in process of achieving goals.
- To describe process of team building and development
- To encourage sound working and decision making

3. Time Required : 2 hrs

4. Materials Required

Team building exercises (broken squares) / flip chart / chalk board marker pen etc.

5. Process

Team building is extremely necessary within a group and across groups to attain common goals and objectives by joining with others, working together pool each others skills and abilities. A team can accomplish much more than the sum of its individual members.

Concept

Team is a collection of people working together to achieve common objectives with commitment and willing to forego individual autonomy to the extent necessary to achieve those objectives.

How to work in teams

Assign good team building exercise (broken squares exercise) for achieving high quality and quantity of the results processes and discuss based on the results attained by a team. Team must have some specific / characteristics.

- Truly and carefully listen to each other in order to understand and emphasizes, rather than to defend, explain or counteract
- Have a good coordination arrangements
- Have a sense of team spirit and we feeling

Overcoming obstacles to team building

It has been found that even when efforts are made to build effective teams. During the process from immature to maturity they often degenerate. This happens because of blockages that hinder team building. Therefore it is necessary to identify these obstacles to resolve the problem. Those are

- 1) Clear objectives and agreed goals
- 2) Openness and conformation
- 3) Support and trust
- 4) Cooperation and conflict
- 5) Sound procedures
- 6) Appropriate leadership
- 7) Regular review
- 8) Individual development
- 9) Sound intergroup relations

Team work is about individuals working together to accomplish more than what they can do individually. But more than that, it can be exciting, satisfying and enjoyable.

Facilitate participants to acquire team building skills. Here are few team building skills.

- Speak openly, honestly and spontaneously about the ways, in which their interaction is or is not fulfilling organistional objectives.
- Deal with specific organizational goal and task related behaviour and not only with personal goal.
- Openly inquire the ways, in which they might improve their work together as a team

- Are always focused on achieving work objectives
- Always respect each other
- Support and build on ideas / views of the other members of the team
- Co-operate with and help each other
- Are highly time conscious
- Identify and use each others skills and strengths
- Help in improving each others, upon their weaknesses
- Skilled in proper observation
- Provide constructive feed back on each others performance
- Have insight to initiate work
- Feel responsible and answerable for the results. Decide method of working by common consensus
- Do proper division of work based on group members skills
- Put all efforts for achieving high quality results.

15. GIVING & RECEIVING FEED BACK

1. Introduction

Feedback is a type of communication that we give or get. Some times feedback is called 'criticism' but this seriously limits its meaning.

Feedback is a way to let people know how effective they are in what they are trying to accomplish, or how they affect you. It provides a way for people to learn how they affect the world around them, and it helps us to become more effective. If we know how other people see us, we can overcome problems in how we communicate and interact with them.

2. Learning Objectives

- To learn how to give and receive feedback
- To describe how feedback should be
- To acquire tips for giving feedback.

3. Time Required : 1 ½ hours

4. Materials Required

Colour cards, marker pens etc.

5. Process

Feedback is information about performance or behavior that leads to action to affirm or develop that performance or behavior.

(a) When you give feed back it should be

- | | | |
|-------------|---|---|
| Timely | ➤ | Give feed back as close to the extent as possible (taking account of the persons readiness etc) |
| Selective | ➤ | Addressing one or two key issues rather than too many at once |
| Balanced | ➤ | Good and the bad |
| Descriptive | ➤ | Non Judgmental, based on behavior not personality |
| Directed | ➤ | Towards behavior that can be changed |

(b) But Before you give feedback always ask yourself

- What is my intension behind giving this person feedback?.
- How am I feeling about giving it?
- How is the other person feeling, if they have had a stressfully day, might be best left to another occasion. It is important that they are in right frame of mind to accept it.

(c) Receiving Feedback

While receiving feedback one should be

- Listen carefully to what is being said.
- People should be receptive to feedback and see it is helpful
- Do not reject it
 - ❖ Accept positive feedback do not reject it.
 - ❖ Accept negative feedback..... do not reject
 - ❖ Avoid arguing or being defensive
- Ask questions to clarify fully and seek examples is useful.
- Acknowledge the givers of feedback and show his or her appreciation. The feedback may not have been easy to give
- Involve mutual good will
 - ❖ Receiver should feel that the giver is not their enemy.
 - ❖ Giver needs to want to help receiver to develop

(d) How to give and receive feedback

- Always offer feedback on observed behavior, not on perceived attitudes
- Descriptions of what you saw and how you felt , rather than judgments
- Focus on behavior that can be changed
- Choose the aspects which are most important, and limit yourself to these
- Ask questions rather than make statements
- Set the ground rules in advance

- Comment on things that an individual did well, as well as areas where they might improve
- Be specific, give concrete examples do not waffle
- Observe everyone's personal limits
- Before starting, consider the potential value to the receiver

(e) Tips for giving feedback

- Present perceptions, reactions and opinions as such not as facts
- Feedback should refer to relevant performance behavior or outcomes
- Feedback should be in terms of specific observable behavior
- It should be in terms of established criteria
- Established procedures or solutions, suggestions should be given
- Feedback should avoid emotion –raising
- It should deal with things, which the individual can control
- When encountering emotional reactions try to convince by logic of facts rather than arguing
- Feedback should be given in a way to show acceptance of the receiver

Feedback is a must for people who want to have honest relationships: A powerful and important means for communication, feedback connects us, and our behavior to the world around us.

16. SWOT-A TOOL FOR FIELD ANALYSIS

1. Introduction

The SWOT analysis provides information that is helpful in matching the firms resources and capabilities to the competitive environment in which it operates. As such it is instrument in strategy formulation.

The SWOT analysis is an extremely useful tool for understanding and decision making for all sorts of situations in programmes and organizations. SWOT is an acronym for strengthen(S) weakness(w) , Opportunities(O) and Treats(T)

2. Learning Objectives

- To understand the concept and importance of SWOT as tool for field analysis.
- To acquire skills in doing SWOT

3. Time Required: 2 hours

4. Materials Required

Colour cards, Markerpens, white board marker etc

5. Process

What is SWOT?

SWOT is a process which generates information that is helpful in matching group goals and capacities to the social environmental in which it operates

Strengths

- Positive tangible and intangible attributes, internal to the project / organization
- They are with in the control of project or organization.

Weakness

- Factors which are in control and that distract from its ability to all in the designed goals.
- Areas need improvement

Opportunities

External attractive factors and should represent reasons for development

Threats

External factors beyond project/ organisational control and which could be risk.

How to do a SWOT

Irrespective of area /situation /work/ project the SWOT analysis process is the same

Step I: Information collection

- List all strengths that exist now. Then in turn, list all weaknesses as that exists now. Be realistic but avoid modesty.
- You can conduct one on one interview or get a group together to brainstorm. A bit of both is frequently best.
- First initiate with preparative questions that relate to specific situation for analysis
- When facilitating a SWOT- Search for insights through intelligent questioning and probing

Step 2: what might be.....

List all opportunities that exist in the future. Opportunities are potential future, and potential future strengths. Then in turn list all threats that exists in the future. Threats are potential future weaknesses.

Step3: Plan of action

Review SWOT matrix with a view to creating an action plan to address each of the four areas

A SWOT Analysis provides information about where you are strong and vulnerable where you should defend and attack . The result of the process is a plan of action.

A SWOT analysis can be very subjective, and two people rarely come up with the same final version of SWOT, Its is an excellent tool however for looking at the negative factors first in order to turn them into positive factors. Use SWOT as a guide and not a prescription.

VII. GROUP DYNAMICS SIMULATED EXERCISES AND GAMES

A simulation is an abstraction or simplification of some real life situation or process. In simulation, participants usually play a role that involves them in interactions with other people and / or with elements of the simulated environment.

A simulation game combines the attributes of a simulation role playing, a model of reality) with the attributes of a game (striving towards a goal, specific rules). Like a simulation, it may be relatively high or low in modeling of reality. Like an ordinary game, it may or may not entail competition.

Simulated Method

This method is a suitable way for participants to learn the effects of their behavior on other people and other people's behavior on them. It increases participants knowledge of how and why people at work behave as they do. It increases skills in working with other people and in getting work done through other people. This method is valuable in learning the skill of negotiation.

Points to watch

Simulations can vary greatly in the extent to which they can fully reflect the realities of the situation they are intended to model. A simulation that incorporates too many details of a complex situation becomes complicated and time consuming for the intended audience. On the other hand, if the model is over-simplified it may fail completely to communicate its intended point. A well-designed simulation provides a faithful model of those elements that are most salient to the immediate completely.

1. GETTING TO KNOW EACH OTHER (DYADS)

Purpose : Establish rapport participants develop cohesive working groups

Materials: Envelope, drawings of objects cut into halves, pencils / ball pens, sheets of paper (suggestion: draw objects that are IPM related like pests and natural enemies, plows and yoke, etc.,)

Procedure: Place one cut drawing of half an object inside each envelope.

Give the following instructions

Enclosed in this envelope are drawing of halves of objects. Try to locate the person who has the other half of the object you picked. When you find her, sit with her and get the following information, name, occupation, job-related information like specialized skill, previous job experience, training attended, other abilities, and personal information.

Give sufficient time for partners to interview each other. Ask each on to introduce her new friend to the rest of the group. Give a time limit of two to three minutes to each participants to introduce her new friend.

When activity is most appropriate:

Use this activity during the earlier sessions of a training activity. Use it during the session on getting to know each other. The activity helps build immediate rapport between the interviewed and the interviewer. It should help form cohesive working teams through establishment of trust and confidence with a co-participant. Use the activity with agriculture extension workers community organizers as well as farmers.

2. BLOCK OF ICE

Purpose: Illustrate how people change in any development for progress.

Materials: Chalkboard and chalk or newsprint and markers for use in illustrating a block of ice measuring 8 cubic feet or 2' x 2' x 2'.

Procedure: Draw on the board a block of ice with the above-mentioned dimensions. Divide the participants into four small groups and give the following directions.

Imagine that you are given a block of ice measuring 2' x 2' x 2'. Or 8 cubic feet. Reshape or alter the shape of the block of ice to one measuring 2' x 1' x 4'. Group together and plan out how the group should go about it. List down the steps that you should follow in altering the shape of the block of ice.

When activity is most appropriate:

This activity is most appropriate when tied up with discussions on people and situations in development process. People in any development activity or programm are like a block of ice. To change, they need to be "liquefied" and moved to a new situation and later on made to stay in that situation of change.

3. LONGEST LINE

Purpose: Develop sharing and cooperation among participants

Materials: Articles found on the bodies of participants

Procedure: Divide participants into five groups. Give the following instructions

Make a line out of articles found on the body of each group member within five minutes after completing the line, group members should form a straight line and clap their hand three times to announce that they have completed their task. The group with the longest line wins.

What happened during the activity? How did each group come up with their lines?

What behaviors / attitudes did the group members show?

Abstraction:

Team members will be able to come up with successful program or activity results when they cooperatively work, voluntarily share their efforts, resources, ideas, and talents and actively participate in the undertaking.

When activity is most appropriate:

This game is appropriate with a group of 20-25 participants. Use it as a starter for a session on “ working with others”. Use it for sessions on how to go about group activities and carry out objectives successfully.

4. LIST AS MANY AS YOU CAN

Purpose : Demonstrate the advantage of working in groups

Materials : Pieces of paper, ball pens

Procedure : The facilitator invites the whole group to listen while she reads a list of twenty wholly unrelated items such as

Pin	chair	blanket	Medicine
Juice	door	line	cake
Phone	spoon	car	bulb
Sea	cat	globe	watch
Ship	carpet	light	flower

After reading the list ONCE, participants are asked to write the items they can recall. At the end of three minutes, ask who among the participants was able to list twenty items nineteen, and eighteen. Then ask them to work in pairs and give three minutes more for the task. After three minutes, ask again which pair has listed twenty items, nineteen, and eighteen. Next, ask them to group into fours to do the same task in one minute. When the time is up, ask which group was able to list all twenty items.

Process the activity when everyone has settled. Ask the following questions: where you able to list more items when you worked alone or when you worked in pairs? Did working with a bigger group result in your being able to list more items? Why was this so Parallel the exercise with working in the community? Ask the participants if they think more will be accomplished in the community particularly with farmers if they work in teams rather than working alone. Find out why they think so.

When activity is more appropriate?

The activity will be most appropriate if the participants are asked to reflect on their experiments' in implementing community projects. Ask them to parallel implementation of ICM with the exercise, i.e. completing the list of 20 items. If a person works alone, she might not complete the list. This is true of community projects. More things are achieved by working together. Members need to cooperate and contribute their share or perform their roles to get more things done.

5. ANIMAL SOUNDS

Purpose: Illustrate Individual's need to belong i.e. need to be accepted.

Materials: 25 small pieces of paper of pencil or ball pen.

Procedure: Think of five different kinds of animals. These may be: dog, cat, duck, pig, cock. Write down one kind of animal on each piece of papers. Make sure to have the same number paper for all kinds of animals.

After writing on the pieces of paper. Fold each one. Mix the folded pieces of paper together. Then ask each participants to pick one but not to open the paper that he picked.

When each one has picked a piece of paper, ask them to look at the kind of animal written. Nobody should let anyone else know what was written on his paper. Nobody should speak to any one else. Nobody should make any sound at all. Participants can only do the action of the animal that they picked and find their group by looking at the action made by the other members. Process the activity when each participant has found his group.

Ask the following questions of everyone: Did you enjoy the game? How did you feel when you could not find group? Do you think farmers will want to come back to the Farmers 'Field School if they feel they do not belong? How can we make farmers fell accepted in the Field School? Accept all answers.

When activity is most appropriate

The exercise is most appropriate as an icebreaker in the morning or before the start of the afternoon sessions with a group of 20-25 agriculture extension workers. Community organizers and farmers. Use it any time of the day when the group needs to be some perk up activity.

6. NINE – DOT GAME

Approach and Concept

When this is exercise most appropriate?

- At the first Polam badi (FFS) meetings

How long will this exercise take?

- 1-2 hours of the Polam badi (FFS) meetings

Learning objectives

- To become aware of the concepts, objectives and approach of the Polam badi program.
- To relate the Polam badi concept, objectives and approach to the problems and issues of farmers in the local areas.
- To compare Polam badi with out past experiences of IPM

Step

1. Draw 9 dots up on a piece of chart paper like this.

Ask the participants to try to join all of the 9 dots with only 4 straight lines, and without lifting the pen from the paper.

2. Ask the farmers to share their results. The solution will be something like this.
3. Ask the farmers. Why was it difficult to find the way to do this at first? How did we overcome the problem? Discuss how this relates to solving other problems – very often we need to look outside the things that we think are the problem, to understand the real causes before we can go about solving them. In this game we had to look outside the square to find the solution.

Discussion:

(a) Tell the farmers that the 9 dots can represent the 9 most important problems of farmers in this area. All of the problems begin with 'P'. Ask them to help you list them. Adapt what is discussed to fit it into 9 categories beginning with 'P' that are something like this:

- Pests and diseases
- Poverty (Profit are low)

- Pesticides (Poisoning)
 - Programme (that are no good)
 - Politicians (do not help us)
 - Public health
 - Pollution
 - Provision of water
 - Protection of forests
- (b) The facilitators then use each of the 9 problems to lead into an explanation of some of the central concepts and approaches of Polam badi. Here are some of the ideas that we talked about in our design session.
- In the Farmers Field School we explore ways to solve the problems of pests and diseases, low profits, pesticide resistance and pesticides poisoning.
 - The programme is based on what farmers need and want to learn – farmers decide what we will do in the Farmers Field School.
 - The field school is based in farmer’s fields and so looks at the real problems that are happening now.
 - We learn by exploring the problems together as a group. By working together we can discover how to start to work on problems that are too big for 1 person the group can do much more than one.
 - By becoming a strong group we will be able to get more support and attention from the government or other organizations that we may want to influence
 - The fields are a part of the local environment land the community, so we also look at the effects our actions have on things that are outside our fields.
- (c) The facilitators guide is a discussion on how this Polam badi differs from our past experience and ideas.
- (d) Some suggestions for the processing discussion
- Do you think that these ideas about Farmers Field School are different from our past experience and ideas about ICM ? How ? Why?
 - Which things in the Farmers Field School do you think are not about crop management?

Why is this? Which things about ICM do you think are missing in the Farmers Field School way? Why is this?

7. TITANIC

Purpose: Illustrate individual's need to belong, i.e. need to be accepted.

Materials: None

Procedure: One person, perhaps a volunteer, should serve as the captain

The captain calls out

The boat is sinking. Group yourselves into.....”(The captain may select whatever number he wants to call out)

As a number is called out, the participants group themselves accordingly, Eliminate persons who do not find groups to join. The game ends when there are only one or two people left.

At the end of the game, ask the following questions of everyone. Did you enjoy the game? How did you feel when you could not be accommodated in any group? Do you think farmers will want to come back to the Farmers Field School if they do not feel accepted? How. Emphasize individuals need to belong or the need to be accepted. Can we make farmer feel they accepted in the Field School? Accept all answers. Accepting all answers will encourage participants to share in the discussion as well as give them the feeling of respect.

When activity is most appropriate

The exercise is most appropriate as an ice-breaker in the morning or before the start of the afternoon sessions with a group of 20-25 agriculture extension workers, community organizers and farmers. Use it, however, any time of the day when the group needs to do some perk up activity.

8. BUILDING TOWERS

Purpose: State behaviors / attitudes which contribute to and which hinder team building.

Materials: 30 pieces of plastic straw for each group, masking tape and scissors (put these on a table for everyone to see but not distributed to the groups).

Procedure: Ask participants to group themselves into five smaller groups. Give each group 30 pieces of plastic straw. Tell them that they are given 20 minutes to build a tower. Do not given any elaboration about the tower they are to build. The groups have to discuss among themselves how to go about building their towers.

As each group finishes its tower, write down the time in terms of minutes it took to complete their output. After 20 minutes, announce that the time is up. Ask all the groups to put their towers in the center of the room so that everyone gets a good view of all the outputs. Process the activity.

Parallel the towers to teams or groups. Certain behaviors / attitudes of groups members contribute to make a strong team or group. Ask participants what factors contributed so that they completed their towers. Ask them what behaviors / characteristics among group members hindered the completion of the groups outputs. After discussing weaknesses of the groups, they might want to suggest things to do to overcome weaknesses..

To add fund to the discussion, the towers may all be lined up and an electric fan turned on to see which one would fall down first. It follows that the tower with a winder base will fall last, if it falls at all. Like this, team with individual members providing strong support to their respective groups.

Another point to process is how group used resources, i.e. masking tape and roll of scissors, which were made available. It is interesting to discuss how some groups did not want to share, some groups were very generous and some groups grabbed the materials from other groups. Discuss sharing of resources / materials in terms of establishing linkages between and among groups to maximized resources.

When activity is most appropriate

The activity is appropriate for a session focusing on behaviors that contribute to an which hinder team building. Because participants talk about their teams in terms of the towers they built, it does not become threatening to talk about behaviors / attitudes that normally may not be comfortable to discuss.

9. PEN IN BOTTLE

Purpose: Demonstration the advantage of working in groups.

Materials: Empty cool drink bottles, nylon threads, pen with coop.

Procedure: the groups members consisting of 5-6 members tie the open end of the nylon thread to their waist. The other open end, which is to their back, is tied to one single pen. All the open ends are tied to the pen. A empty cool drink bottle is placed on the ground. Now the target is to place the pen in the bottle. All the group members have to cooperate and coordinate to achieve the objective. The group that finishes first is the winner.

Process the activity when everyone has achieved the objective. Ask the following questions.

What is the objective of this exercise?

What is the secret of success of the winning group?

How was the communication in the group?

When activity is most appropriate

This activity is more appropriate at the initial sessions of the FFS to encourage group coordination and cooperation.

10. NO LIFTING OF “PEN” DRAWING

Purpose : Develop cohesion and cooperation among group members.

Materials: Chalk and chalkboard or pen and newsprint.

Procedure: Group participants into fives before giving the following instructions

For five minutes, draw a farmer without lifting the pen. Give each participant one (1) minute to do his share in the drawing activity.

After giving the instructions, start the game. When the groups have implemented the first set of instructions, give the next set of directions.

This time, give each group five minutes to plan together on how to come up with an illustration of a farmer where each group member has a part in completing the drawing. Give each group five minutes more to work on their drawings as planned.

Evaluate each group’s drawings after five minutes. Ask the following questions.

How did your first drawing look? How does your drawing look this time? Why was this so? How did you come up with your second drawing? What attitudes or behaviors did each member exhibit? Are you happy with the result of your first drawing? Your second drawing.

Abstraction

The first drawing activity showed how each group can work together without a clear plan and direction. However, result of the activity may not really show the figure being asked for. If each group has planned cooperatively on how the activity should be undertaken and each member has an assignment to perform and guidelines to follow, results certainly are better if not best.

When activity is more appropriate

This game is appropriate for a group of 20-50 participants. Use this as an icebreaker or as a starter for sessions on planning, problem solving, and leadership, community organizing or group work.

VIII. PRACTICE FFS HIGHLIGHTS

The ToF participants in four small groups conducted four practice FFS. Five (5) participants and one facilitator are involved in organizing each FFS. All the selected villages are nearby to ToF venue i.e RARS, Anakapalle and sugarcane is grown intensively. In three (3), villages the crop is grown under assured irrigation and in Juttada crop is grown under protective irrigation.

a) Details of 4 (four) practice FFS villages

S. No	Participant group	FFS village	Distance from ToF venue in kms	# Farmers		# Sessions field	Mean attendance
				Men	Women		
1.	Spider	Thimmarajupeta	18	25	5	22	85
2.	LBB	Chuchukonda	20	25	5	22	84
3.	Earthwarm	Juttada	13	31	2	22	85
4.	Wasp	Lakkavaram	15	30	-	22	82

In each FFS, 22 sessions were conducted. The 1st session has started before planting of sugarcane crop. This helped the participants to select suitable farmers. In three (3) FFS villages, there is participation of women farmers (except in Lakkavaram). The education profile of the FFS farmers is given below.

a) Education Profile of FFS Farmers

Village	No. of farmers	Illiterate	1-5	6-10	Inter-Degree
Thimmarajupeta	30	10	4	15	1
Chuchukonda	30	10	14	4	2
Juttada	34	3	9	18	4
Lakkavaram	30	7	6	10	7
Total	124	30	33	47	14

a) Age profile of Farmers

Age of the participant farmers	Chuchukonda No. of farmers		Thimmarajupeta No. of farmers		Lakkavaram No. of farmers		Juthada No. of farmers	
	Male	Female	Male	Female	Male	Female	Male	Female
< 20 years	-	-	-	-	-	-	-	-
20-30 years	4	2	4	-	1	-	2	-
30-40 years	9	1	5	2	9	-	10	2
40-50 years	10	-	10	-	7	-	7	-
>50 years	3	-	9	-	13	-	13	-
Total	26	3	28	2	30	-	32	2

In the FARMERS FIELD SCHOOLS the key principles to be brought to life are:

- Grow healthy crop
- Conserve natural enemies
- Monitor field weekly
- Make farmers experts in their own field.

After the selection of farmers in each village one collaborator was also selected in each village who voluntarily gave land for planting sugarcane crop and to do weekly FFS activities. The name of the collaborator village wise is as follows:

D) Details of collaborator

Sl. No.	Village	Name of collaborator
1.	Lakkavaram	Sri. B. Simhachalam Naidu
2.	Juttada	Sri. D. Sanjeeva Rao
3.	Thimmarajupeta	Sri. K. Ramana and S.S.Musilinaidu
4.	Chuchukonda	Sri. K. Satyanarayanan

On completion of selection of interested farmers and collaborator in each village, soil samples were collected from the collaborators fields and the soils were analysed with the soil test kit at village level before the farmers. The farmers have experienced by doing the analysis by themselves. The analysis of P^H, EC=(ds/m), OC, 'N' though done with the kits, again it was analyzed in the laboratory at RARS, Anakapalle.

e. The nutrient status of the soil samples are as follows:

Group	Village	P ^H	Ec= (ds/m)	OC% In kgs	'N'	'P'	'K'	'S'
Spider	Thimmarajupeta							
	ICM	7.76	0.430	0.575	564.48	L	M	M ₂
	Organic farming	7.53	0.580	0.520	564.48	L	M	M ₁
LBB	Chuchukonda	7.36	0.274	0.440	407.68	L	M	M ₁
Earth worm	Juttada	7.94	0.356	0.560	250.80	L	M	M ₂
Wasp	Lakkavaram	8.15	0.455	0.605	564.48	L	M	M ₂

Interpretation of results

- P^H 7.6 to 8.00 slightly alkaline; 8.0 to 8.50 medium alkaline,
- Ec below "1" – normal; 0.3 to 0.5 – Low; 0.5 to 1.0-moderate;
- N`250-400 kg/ha Moderate 400-500 kg/ha- moderate P₂O₅ – low K₂O-Moderate Sulphur M₁-M₂ 10-15 PPM = Moderate

Ratings: L – Low, M-Moderate, H- High

- Low 33% Extra than recommended dose
Moderate – Recommended dose
High 33% less than recommended dose if done with soil test kit
- Low – 25% Extra than recommended dose
Moderate – Recommended dose
If the soil analyze is done in the laboratory
High- 25% less than recommended dose

In each FFS the farmer participants were divided into four (4) small groups. In the four FFS villages, participants laid out experiments as per the requirement and local problem. The details of experiments laid out are given in the table form as follows:

F) Details of area and experiments conducted

S.No	Village	ICM	FP	Organic farming	Date of sowing
1.	Lakkavaram	0.40 ac	0.40 ac	-	25.2.09
2.	Juttada	0.28 ac Moong inter- crop	0.28 ac	-	23.2.09
3.	Thim ac	0.11 ac	0.20	26.2.09	
4.	Chuchukonda	0.27 ac	0.27 ac	-	22.2.09

Critical inputs like seed and inorganic fertilizers were supplied by PRDIS to the extent of ICM plot only. The participants prepare a facilitator guide one day before going to villages for smooth conduct of FFS on each Friday in a week. The group of ToF participants visits their assigned villages to organize FFS in the morning and there will be a feed back session in the after-noon of respective FFS villages.

Break period activities

During the break period of the training between the spells, a core group was constituted to carry on the FFS sessions and the ToF participants were given assignments to be carried out in their area of operation like conducting Agro ecosystem analysis in sugarcane and other crop as per availability.

- The following activities were carried out by the core team in the FFS / ToF plots at Anakapalle.
 - ❖ Agro-ecosystem analysis
 - ❖ Release of trichogramma spp against ESB
 - ❖ Weed management
 - ❖ Fertilizer management
 - ❖ Irrigation management
 - ❖ T.T.Propping

The farmer participants in small groups conducted agro-ecosystem analysis in the ICM plot and farmers practice plot and compared the observation. The weekly agro-ecosystem analysis observations were analyzed and the decision on the management practices were adopted in ICM plot and in the farmer practice plot management decision were adopted as per the base line data collected of the respective village.

In all four (4) Farmer Field School Villages, the farmer participants have taken up insect zoo activities to gain confidence about the role of insects in sugarcane ecosystem. Group dynamics exercises were conducted by the farmer participants in the FFS sessions who took active participation.

The list of some group dynamics conducted are

1. Tower building
2. Grouping by animal sound
3. Water brigade
4. Pen in bottle
5. Drawing without lifting pen
6. Super market
7. '9' dot game
8. '7' up etc

These exercise have given confidence to work in team and harmony in working in small groups. Pre-evaluation test was conducted in the form of ballot box. The questions covered on all aspects of crop management. Simultaneous application of technologies learnt by farmers in FFS were adopted by FFS farmers and neighbouring farmers in the village.

Exposure visit to FFS plots

- The farmers from Chuchukonda, Thimmarajupeta visited Juthada to see the intercrop moong in sugarcane ICM plot and had interactive session with the farmers. Likewise, farmers from Lakkavaram, Juthada visited chuchukonda and Timmarajupeta and had interaction session with the farmers.

- The FFS farmers from four (4) villages had visited ToF experimental plots at RARS Anakapalle and observed the ongoing experiments and also seen different experiments conducted at RARS Anakapalle and interacted with scientist of RARS Anakapalle.

There is a good response from the farmers on the following issues

1. Soil health (soil sampling, soil testing with soil test kits at village level)
2. Introduction to promising variety
3. Method of planting setts
4. Maintenance of required spacing between rows
5. Trash mulching at 3 DAP (moisture conservation and management of ESB)
6. Raising intercrop (moong) in sugarcane at Juttada
7. Agro-ecosystem analysis (at weekly intervals)
8. Monitoring of early shoot borer by installing pheromone traps
9. Releasing of *Trichogramma chilonis* for management of ESB and INB
10. Vermicomposting etc.

IX. PROGRAMME IMPACT

i) Increase on Human Capital (Knowledge and Skills)

A quick study was conducted with ToF participants & FFS farmers. Before launching of ToF a pre evaluation test was carried out with ToF participants and a ballet box test was carried out with FFS farmers. The study findings revealed that there was significant gain in knowledge about pests, natural enemies, eco- system, health hazards, pest management and some of the crop management practices such as sett treatment, soil analysis, planting techniques, spacing, mulching, balanced use of fertilizers, weed and water management and TT propping. The participants and farmers were also able to explain during focused group discussion both the “how” and why aspects of technologies. Besides, the participants and farmers were also able to learn both simple and complex skills such as AESA, experiments, diagnostic, communication and facilitation skills. The improved skills enabled the farmers to make cost effective and environmentally friendly decisions. This demonstrated the potential of FFS as an extension tool to impart complex skills thus contributing towards increase in human capital development.

ii) Increase in Economic Capital

The economic analysis of the yield and net income obtained from FFS fields (estimated yield data on crop cutting) was significantly higher than the yields obtained in the plots with farmers practices and also with non FFS farmers fields. While the yield per acre in FFS plots were ranged form 42-52 t/ac, in the farmers practice fields (control) was 35-39 t/ac. The yield estimate from other farmers (non FFS farmers) was about 25-35 t/ac when compared to A.P average of about 30 t/ ac. The increase yield in FFS plots was due to simple non monitory management practices and use of bio agents. Besides, the results of organic farming plots also shown similar trend of 50 t/ac.

Further, the net income obtained from FFS plots was ranging from Rs 34,000 to Rs.43,000/acre where as in the plots with farmers practices it was Rs 19,000 to 28,000/acre. Regarding the benefit cost ratio in the FFS plots, it was ranging from 0.72 to 0.93 whereas in the farmers practice fields it was ranging 0.14 to 0.63. The highest BC ratio was recorded with organic farming field i.e 0.59 percentage increase.

This has demonstrated the potentiality of the simple management practices adopted in farmer field school plots. In fact the yield data from the plots with farmer practices could have been considerably less but due to simultaneous adoption of some of the practices contributed higher than the non FFS farmer's fields.

iii) Social Capital (Social Recognition)

Social capital in terms of increased ability and willingness to cooperate and work together for achieving common goals and sustaining and developing norms and networks for collective action is crucial for successive uptake, diffusion and impact of innovation. There was a significant difference in the participation, Leadership qualities and ability to manage group activities was noticed in FFS farmers. In addition, the collaborative farmers are recognized by their neighbours, thus improving their social status. Besides, FFS farmers were also identified by their technical skills and team work abilities. They have been socially recognized in their community and seeking for their advice and guidance.

iv) Environment Concerns

There were positive changes in the awareness of farmers on environment conservative issues as related to pesticide usage. Many farmers expressed that pesticide application contaminates air, water, soil and food products. Majority of the FFS farmers were having favorable attitude towards environmental protection and realized that the present climate changes could be attributed towards adoption of environmental pollution practices.

v) Health Issues

Awareness and Sensitization on use of Toxic Chemicals

Farmers in the sugarcane area were using some of the banned pesticides like Lindane and also using highly toxic pesticides like Parathion, Endosulfan, Quinol phos etc., The programme has taken up an awareness campaign to sensitize the farmers on the ill effects of use of banned and toxic pesticides and the safety precautions to be taken while using the pesticides. Further, in FFS plots use of organic fertilizers, pesticides, bioagent and traps created lot of impact on the mindset of farmers. They have shown keen interest to use organic components even for preparation of jiggery also. This has created considerable impact among not only farmers but the government agencies and factories keen to take necessary action on the promoters of banned hazardous pesticides and voiced to adopt IPM technologies.

This has been amply demonstrated in the Farmer Field Schools. Furthermore, the attitude of the majority of the FFS farmers was favorable towards health and safety issues.

The Stakeholders Workshop

The stake holders workshop was organized on 9th Dec 2009 to discuss the pros and cons of the practices and technologies contributed for increasing the Sugarcane productivity and to formulate strategies for follow –up and up - scaling in order to realize multiplier effect of Farmer Field School (FFS) approach. The workshop was attended by more than 100 participants comprising of Managing Directors and staff of sugarcane industries, scientists of RARS, Anakapalle and ANGRAU, staff of Department of Agricultural, representatives of NGOs, Input agencies, participants and facilitators of ToF and progressive farmers.

Recommendations

1. The group identified the following critical inputs contributed for increasing the productivity such as Farm machinery, Trichograma, organic fertilizers and pheromone traps, varieties and clean treated planting material. It is recommended that farmers managed (with alumini groups) seed banks, vermicompost units and Trichograma production units be encouraged with support of Sugar Industry, ANGRAU and PRDIS.
2. Similarly, the group identified the impact practices and technologies for Sustainable Sugar Production such as optimum spacing, sett treatment, intercropping, organic farming, soil test based INM strategies, AESA based management strategies, monitoring ESB with pheromones traps and control of ESB by trichocard, Earthing up, intercultivation, water management, water shoot removal etc to be promoted by the FFS and other farmers by demonstrating in their own fields.
3. Group also felt the need for organizing more ToF with the help of PRDIS – ANGRAU, WHO, FAO, Commissionerate of Sugar and Cane, Sugar Industry by utilizing the trained staff. The university trainees have come forward to organize ToF to their colleagues and others by sending a suitable proposal for funding agencies.
4. The Group felt that for Up-scaling of ToF and FFS there is need for involvement of Adarsharythulu, (Progressive farmers), Sugar Industry, Collaborators and FFS farmers.

5. In this connection, the group suggested to create public awareness by involving ATMA, Sugar Factories, DAATT centre, KVKs, ANGRAU input agencies, NGOs and FFS farmers.
6. Success stories can be documented by printing leaflets, CDs and also development of ICT modules on technologies. The expenditure can be met by the sugar industries or from existing schemes of the departments.
7. To begin with the group felt the need for immediate follow-up around the FFS villages by utilizing trained staff and farmers. A plan has been worked out and being implement with support from ANGRAU and Sugar industries.
8. Finally both the groups voiced for constitution of core committee with ANGRAU, WHO, FAO, PRDIS, Sugarcane Industries representatives, Representation from Planning Commission, Commissioner of Sugars and Cane Commissioner, and Commissioner of Agriculture, Government of Andhra Pradesh and Ministry of Environment to prepare an action plan for follow-up and scaling up operations of this initiative in not only sugarcane but also in other crops.

Mahatma Gandhi stated, recall the face of the poorest and the weakest man you have seen, and ask yourself, if the steps you contemplate are going to be of any use to him. Will he gain anything by it? Will it restore to him control over his own life and destiny?. The powerful statement by one of the greatest human beings the world has seen and produced must remain embedded in our memory and be a guiding force in applying ICM for the benefit of mankind and sustainability of agriculture.

ANNEXURES

ANNEX – I

TRAINING OF FACILITATORS ON INTEGRATED CROP MANAGEMENT (ICM) PRACTICES FOR SUSTAINABLE SUGARCANE PRODUCTION THROUGH FARMER FIELD SCHOOL APPROACH

(CURRICULUM AND DAY TO DAY BREAK UP IMPLEMENTED FOR TOF)

1ST WEEK (19-01-09 TO 25-01-09)

Day /date	Forenoon	Afternoon
Monday 19-01-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Registration of participants Bio-data preparation Inauguration 	<ul style="list-style-type: none"> Grouping of participants Sugarcane cultivation and problems Constraint in sugarcane cultivation and analysis (Small group discussion and presentation) Review of day's activity and planning for next day activities
Tuesday 21-01-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Transect walk and preparation of field map and presentation by groups 	<ul style="list-style-type: none"> Concept, principals, metho-dology and curriculum frame work of TOF FFS concept Review of day's activity and planning for next day activities
Wednesday 22-01-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Discussion on soil sampling soil sampling (Field exercise 	<ul style="list-style-type: none"> Group dynamics – Chaining Visit to State Soil Testing Lab Know your soil by feel method Review of day's activity and planning for next day activities
Thursday 23-01-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Introduction to FFS Baseline survey Proforma preparation and Presentation 	<ul style="list-style-type: none"> Introduction to use of soil sampling Analysis of PH, Organic carbon and Nitrogen with SS Kit Preparation for FFS Review of day's activity and planning for next day activities
Friday 24-01-09	<ul style="list-style-type: none"> Visit to FFS villages FFS Preliminary meeting 	<ul style="list-style-type: none"> FFS feed back
Saturday 25-01-09	<ul style="list-style-type: none"> Recap and briefing of day's activities Introduction to facilitating scientific methods 	<ul style="list-style-type: none"> Introduction to IPM principals and concepts FFS establishment Review of day's and weekly activity and planning for next day activities
Sunday 26-01-09	<ul style="list-style-type: none"> Planning for next week 	

Day /date	Forenoon	Afternoon
2nd week (26-01-09 to 1-02-09)		
Monday 26-01-09	<ul style="list-style-type: none"> • Holiday 	
Tuesday 27-01-09	<ul style="list-style-type: none"> • Recap and briefing of day's activity • Field activity identification of plots for Experiments and measurements • Preparation of FSM for long term experiments 	<ul style="list-style-type: none"> • Group dynamics- listing out • Preparation of FSM for long term experiments-continue • Review of day's activity and planning for next day activities
Wednesday 28-01-09	<ul style="list-style-type: none"> • Recap and briefing of day's activity • Preparation of FSM for long term experiments - continue 	<ul style="list-style-type: none"> • Presentation of FSM by groups • Discussion on need based management • Analysis of soil samples with SS kit • Review of day's activity and planning for next day activities
Thursday 29-01-09	<ul style="list-style-type: none"> • Recap and briefing of day's activity • Design and lay out of experiments plot(field activity) 	<ul style="list-style-type: none"> • Calculation of inputs for Experiments • Preparation for FFS • Review of day's activity and planning for next day activities
Friday 30-01-09	<ul style="list-style-type: none"> • Visit to FFS villages • FFS general meeting 	<ul style="list-style-type: none"> • FFS feed back
Saturday 31-01-09	<ul style="list-style-type: none"> • Participation in Kisaan Mela at RARS Anakapalle • Observation of demonstration of Mechanisation of Sugarcane planting 	<ul style="list-style-type: none"> • Discussion on nutrient value of Sugarcane trash and Press mud • Discussion of alkali soils • Review of day's and weekly activity and planning for next day activities
Sunday 1-02-09	<ul style="list-style-type: none"> • Interaction with Dr P Raghava Reddy Hon'ble vice Chancellor ANGRAU • Participation in Kisaan Mela at RARS Anakapalle 	<ul style="list-style-type: none"> • Planning for next week
3rd week (2-02-09 to 8-02-09)		
Monday 2-02-09	<ul style="list-style-type: none"> • Recap and briefing of day's activity • Input calculation for long term experiments 	<ul style="list-style-type: none"> • Input calculation for long term experiments • Presentation of Input calculations for long term experiments and discussions • Review of day's activity and planning for next day activities
Tuesday 3-02-09	<ul style="list-style-type: none"> • Recap and briefing of day's activity • Sugarcane trash compost making • Collection of soil samples from experimental plots 	<ul style="list-style-type: none"> • Preparation of session guide on trash compost making • Discussion on Vermi compost • Review of day's activity and planning for next day activities
Wednesday 4-02-09	<ul style="list-style-type: none"> • Recap and briefing of day's activity • AES concept (field activity) 	<ul style="list-style-type: none"> • Analysis of soil samples of experimental plots in laboratory • Review of day's activity and planning for next day activities

Day /date	Forenoon	Afternoon
Thursday 5-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field preparation for Experiments (Spacing trial) 	<ul style="list-style-type: none"> Discussion of production of <i>Trichogramma</i> Preparation for FFS Review of day's activity and planning for next day activities
Friday 6-02-09	<ul style="list-style-type: none"> Visit to FFS villages FFS planning meeting 	<ul style="list-style-type: none"> FFS feed back
Saturday 7-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Evaluation of proforma for cost of cultivation by groups 	<ul style="list-style-type: none"> Presentation of proforma for cost of cultivation and finalisation Soil analysis For OC of experimental plots in Laboratory Review of day's and weekly activity and planning for next day activities
Sunday 8-02-09	<ul style="list-style-type: none"> Planning for next week 	
4th week (9-02-09 to 15-02-09)		
Monday 9-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Plantation of Experiments (organic farming) 	<ul style="list-style-type: none"> Set treatment Plantation of Experiments (Spacing trial) Review of day's activity and planning for next day activities
Tuesday 10-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Preparation and presentation of Expectations and Norms 	<ul style="list-style-type: none"> Group dynamics - tower building Structure of TOF Short study on Sugarcane wooly aphid Review of day's activity and planning for next day activities
Wednesday 11-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field visit to experimental plots Field collection of insects and predators Introduction to insect zoo 	<ul style="list-style-type: none"> Establishment of Insect zoo Hosting responsibility Review of day's activity and planning for next day activities
Thursday 12-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Planting in varietal trial Trash mulching in organic farming trial 	<ul style="list-style-type: none"> Insect zoo observation and presentation of results Preparation for FFS Review of day's activity and planning for next day activities
Friday 13-02-09	<ul style="list-style-type: none"> Visit to FFS villages 	<ul style="list-style-type: none"> FFS feed back
Saturday 14-02-09	<ul style="list-style-type: none"> Planting of Management experiments 	<ul style="list-style-type: none"> Group Dynamics – water brigade Introduction to AESA Review of day's and weekly activity and planning for next day activities
Sunday 15-02-09	<ul style="list-style-type: none"> Planning for next week 	

Day /date	Forenoon	Afternoon
5th week (16-02-09 to 23-02-09)		
Monday 16-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Observation of experimental trials Selection of seed for FFS 	<ul style="list-style-type: none"> FFS Soil sample analysis in lab Review of day's activity and planning for next day activities
Tuesday 17-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Sowing of intercrop Assigning of host team responsibility FFS Soil sample analysis in lab 	<ul style="list-style-type: none"> Signs and symptoms Biological magnification of pesticide residues Interpretation of soil analysis Review of day's activity and planning for next day activities
Wednesday 18-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field visit Host culture inoculation for Trichogramma 	<ul style="list-style-type: none"> P,K,S analysis with SS Kit Special topic on Sugarcane varieties and agro-techniques for raising of short crop Review of day's activity and planning for next day activities
Thursday 19-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field collection of insects for insect zoo Experiment on seedling raising in poly bags(single and two buds/ Top, middle and bottom buds) 	<ul style="list-style-type: none"> Group dynamics- problem solving (9 Dots) Short study on spiders and their classification Session guide preparation Preparation for FFS Review of day's activity and planning for next day activities
Friday 20-02-09	<ul style="list-style-type: none"> Visit to FFS villages 	<ul style="list-style-type: none"> FFS feed back
Saturday 21-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Discussion on insect traps Field activity- Pit fall trap installation Experiment on water holding capacity 	<ul style="list-style-type: none"> Observations on water holding capacity Presentation of experiment results Discussion on role of organic matter in water holding Review of day's and weekly activity and planning for next day activities
Sunday 22-02-09	<ul style="list-style-type: none"> Planning for next week 	
6th week (23-02-09 to 1-03-09)		
Monday 23-02-09	<ul style="list-style-type: none"> Holiday 	
Tuesday 24-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field activity –observation of germination in experimental plots Collection of pit fall traps Processing and identification of insects 	<ul style="list-style-type: none"> Presentation and discussion on pit fall traps Population dynamics of rodents Review of day's activity and planning for next day activities

Day /date	Forenoon	Afternoon
Wednesday 25-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field activity- AESA Processing of AESA observations and presentation 	<ul style="list-style-type: none"> Introduction to ballot box Why pre-evaluation test in FFS Ballot box preparation for FFS Review of day's activity and planning for next day activities
Thursday 26-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field activity – observation of seedling raising in poly bags A day in FFS 	<ul style="list-style-type: none"> Facilitator guide Preparation for FFS Review of day's activity and planning for next day activities
Friday 27-02-09	<ul style="list-style-type: none"> Visit to FFS villages 	<ul style="list-style-type: none"> FFS feed back
Saturday 28-02-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Observation of host culture of <i>Trichogramma</i> Evaluation test for participants 	<ul style="list-style-type: none"> Special topic on Coccinellids Review of day's and weekly activity and planning for next day activities
7th week (2-03-09 to 8-03-09)		
Monday 2-03-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field visit to experiments plot to assess the field condition and management forecast Establishment of root and plant vessel experiment Study of morphology of sugarcane at seedling stage 	<ul style="list-style-type: none"> Processing and discussion on sugarcane morphology Importance of communication skills in transfer of technology Trapping of local strain of <i>Trichogramma</i> Review of day's activity and planning for next day activities
Tuesday 3-03-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field activity Spider abundance Processing and presentation of field activity Presentation skills 	<ul style="list-style-type: none"> Pesticides hazards to human beings Special topic on Group dynamics Observation of root and plant vessel experiment Review of day's activity and planning for next day activities
Wednesday 4-03-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field activity AESA AESA analysis and presentation Special topic on integrated nutrient management and role of bio-fertilizers in sugarcane Discussion on Group dynamics 	<ul style="list-style-type: none"> Group dynamics – squares Review of TOF by Dr S Venku Reddy Collection of exposed cards for <i>Trichogramma</i> from field Review of day's activity and planning for next day activities
Thursday 5-03-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Special topic on post harvest technology and value addition in sugarcane and demonstration on jagary making 	<ul style="list-style-type: none"> Preparation of facilitators guide and session guide for FFS Review of day's activity and planning for next day activities

Day /date	Forenoon	Afternoon
Friday 6-03-09	<ul style="list-style-type: none"> ● Visit to FFS villages 	<ul style="list-style-type: none"> ● FFS feed back
Saturday 7-03-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Field study of Bio-ecology of Early shoot borer ● Processing and presentation on ESB 	<ul style="list-style-type: none"> ● Record keeping in FFS ● Quality Matrix ● Review of day's and weekly activity and planning for next day activities
Sunday 8-03-09	<ul style="list-style-type: none"> ● Planning for next week 	
8th week (9-3-09 to 15-03-09)		
Monday 9-03-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Introduction to pheromone traps ● Field activity – installation of pheromone traps ● Collection ESB infestation data in varietal trial 	<ul style="list-style-type: none"> ● Biology of <i>Trichogramma</i> ● Presentation of field data on ESB ● Discussion on preparation of activities for break period in TOF experiments (Individual trials) ● Review of day's activity and planning for next day activities
Tuesday 10-03-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Presentaion and Discussion on activities for break period in TOF experiments (Individual trials) 	<ul style="list-style-type: none"> ● Discussion on preparation of activities for break period in TOF experiments (Management trials) ● Review of day's activity and planning for next day activities
Wednesday 11-03-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Field activity -AESA ● Processing and presentation of AESA 	<ul style="list-style-type: none"> ● Discussion on preparation of activities for break period in FFS ● Review of day's activity and planning for next day activities
Thursday 12-03-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Presentation and Discussion on activities for break period in FFS ● Preparation of lay out for stress management plot 	<ul style="list-style-type: none"> ● Discussion and finalization of field activities for the break period ● Preparation of facilitators guide and session guide for FFS ● Review of day's activity and planning for next day activities
Friday 13-03-09	<ul style="list-style-type: none"> ● Visit to FFS villages ● Planting of stress management plot 	<ul style="list-style-type: none"> ● FFS feed back
Saturday 14-03-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Observations of poly bag experiment ● Processing and presentation of data on poly bag experiment 	<ul style="list-style-type: none"> ● Arrangements for management of TOF and FFS during break period ● Planning for presentation of TOF and FFS activities to Director of Research , ANGRAU
Sunday 15-03-09	<ul style="list-style-type: none"> ● Visit to field experiments in TOF by Dr G Lakshmikantha Reddy , Director of Research, ANGRAU 	<ul style="list-style-type: none"> ● Presentation of TOF and FFS activities to the Guests ● FFS visit to Timmarajpet by Dr G Lakshmikantha Reddy , Director of Research, ANGRAU ● Conclusion of 1st session and holiday assignment

**ANGRAU-PRIDS-WHO TRAINING OF FACILITATORS OF
INTEGRATED PEST MANAGEMENT FOR SUSTAINABLE
SUGARCANE PRODUCTION
II Phase (18-05-09 to 17-06-09)**

Activities conducted day vice

1st week (18-05-09 to 24-05-09)

Day /date	Forenoon	Afternoon
Monday 18-05-09	<ul style="list-style-type: none"> ● Briefing of day's activity ● Field observation of experiments and discussion ● Discussion on field aspects Scientists and Facilitators 	<ul style="list-style-type: none"> ● Break period assignment presentation by participants ● Interaction with participants by Dr S Venkureddy on II spell activities ● Review of day's activity and planning for next day activities
Tuesday 19-05-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Observation on long term experiments ● Preparation and presentation of the data on long term experiments 	<ul style="list-style-type: none"> ● GD – Inheritance ● Feed back on FFS activities during break period by care taker team ● Feed back on experimental plots ● Review of day's activity and planning for next day activities
Wednesday 20-05-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● AESA ● Drawing ,discussion and presentation of AESA 	<ul style="list-style-type: none"> ● GD – pen in bottle ● Special topic on “Integrated Disease Management in sugarcane” by Dr M Achuta Rama Rao, Pr Scientist (PI Patho) ● Review of day's activity and planning for next day activities
Thursday 21-05-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Storage and disposal of pesticides ● Special topic on Agro-techniques for sugarcane production by Dr M Bharatha Lakshmi, P S (Agro) 	<ul style="list-style-type: none"> ● Briefing of activities under taken in FFS villages during break period by joint monitoring care taker team ● GD- 7up ● Preparation and presentation of facilitator and session guide ● Review of day's activity and planning for next day activities
Friday 22-05-09	<ul style="list-style-type: none"> ● Visit to FFS villages 	<ul style="list-style-type: none"> ● FFS feed back
Saturday 23-05-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activities ● Storage and disposal of pesticides – presentation ● <i>Corcyra cephalonica</i> culture observation 	<ul style="list-style-type: none"> ● Preparation of Tricho cards ● Review of day's and weekly activity and planning for next day activities
Sunday 24-05-09	<ul style="list-style-type: none"> ● Planning for next week 	

2nd week (25-05-09 to 31-05-09)		
Monday 25-05-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Observation of germination in pit method sugarcane plantation Exposure to pesticides during spraying and handling (field activity) 	<ul style="list-style-type: none"> Exposure visit to Juttada village and RARS by the farmers from Chuchukonda and Thimmarajupeta Review of day's activity and planning for next day activities
Tuesday 26-05-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Crop physiology- vegetative – Tillering stage in sugarcane (field activity) Drawing and tabulation of field activity 	<ul style="list-style-type: none"> Special topic on "IPM in sugarcane" by Dr Ch V Narasimharao, Sr Scientist (Ento), Review of day's activity and planning for next day activities
Wednesday 27-05-09	<ul style="list-style-type: none"> Recap and briefing of day's activity AESA Drawing ,discussion and presentation of AESA 	<ul style="list-style-type: none"> Exposure visit to Chuchukonda , Thimmarajupeta villages and RARS by the FFS Farmers of Juttada and Lakkavaram Review of day's activity and planning for next day activities
Thursday 28-05-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Presentation on the exposure to pesticides during handling and spraying Preparation of facilitators guide and session guide for FFS 	<ul style="list-style-type: none"> GD – Battle of sports Presentation on vegetative to tillering stage in sugarcane (Crop Physiology) Review of day's activity
Friday 29-05-09	<ul style="list-style-type: none"> Visit to FFS villages 	<ul style="list-style-type: none"> FFS feed back
Saturday 30-05-09	<ul style="list-style-type: none"> Recap and briefing of day's activities Women 's and men's role in sugarcane cultivation (Work matrix for men and women in sugar cane cultivation) 	<ul style="list-style-type: none"> Estimation of leaf area damage by defoliators and diseases in sugarcane Review of day's and weekly activity and planning for next day activities
Sunday 31-05-09	<ul style="list-style-type: none"> Planning for next week 	
3rd week (1-06-09 to 7-06-09)		
Monday 1-06-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Pesticide calculation and discussion 	<ul style="list-style-type: none"> GD- super market Brain stormig Review of day's activity and planning for next day activities
Tuesday 2-06-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field observations on long term experiments Video conference with president, PRDIS and DE, ANGRAU, Hyderabad Topic on climate management with reference to sugarcane 	<ul style="list-style-type: none"> Presentation of long term experiment data and discussion Review of day's activity and planning for next day activities
Wednesday 3-06-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Report writing for WHO officials visit 	<ul style="list-style-type: none"> Special topic on community health and village sanitation Review of day's activity and planning for next day activities

Day /date	Forenoon	Afternoon
Thursday 4-06-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Discussion on cost of cultivation and updating cost of cultivation in management plots and FFS villages 	<ul style="list-style-type: none"> ● Preparation of facilitators guide and session guide for FFS ● Discussion and completion of FFS records update ● Review of day's activity
Friday 5-06-09	<ul style="list-style-type: none"> ● Visit to FFS villages 	<ul style="list-style-type: none"> ● FFS feed back
Saturday 6-06-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activities ● Topic on Inter Node Borer ● Preparation of charts for WHO officials visit 	<ul style="list-style-type: none"> ● Review of day's and weekly activity and planning for next day activities
Sunday 7-06-09	<ul style="list-style-type: none"> ● Repot writing ● Planning for next week 	<ul style="list-style-type: none"> ● Chart preparation
4th week (8-06-09 to 17-06-09)		
Monday 8-06-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● AESA ● Drawing ,discussion and presentation of AESA 	<ul style="list-style-type: none"> ● Preparation of charts for WHO officials visit ● Review of day's activity and planning for next day activities
Tuesday 9-06-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Preparation of charts for WHO officials visit 	<ul style="list-style-type: none"> ● Arrangements for exhibition ● Review of day's activity and planning for next day activities
Wednesday 10-06-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● FFS villages visit and interaction with FFS farmers by Dr Senguptha, National Project Officer, WHO, New Delhi 	<ul style="list-style-type: none"> ● Visit to TOF experimental plot and interaction with trainees by Dr Senguptha, National Project Officer, WHO ● Review of day's activity and planning for next day activities
Thursday 11-06-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Interaction with Facilitator and Trainees on strengthening and scaling up of IPM in sugarcane 	<ul style="list-style-type: none"> ● GD on broken squares and team building ● Preparation of facilitators guide and session guide for FFS ● Review of day's activity
Friday 12-06-09	<ul style="list-style-type: none"> ● Visit to FFS villages 	<ul style="list-style-type: none"> ● FFS feed back
Saturday 13-06-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activities 	<ul style="list-style-type: none"> ● Review of day's and weekly
Sunday 14-06-09	<ul style="list-style-type: none"> ● Planning for next week 	
Monday 15-06-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● AESA ● Special topic on "Management of sugarcane under adverse soil conditions by Dr Rama Krishna Rao 	<ul style="list-style-type: none"> ● Special topic on "Agro techniques for increasing sugarcane productivity in ratoons by Dr T Chitkala Devi ● Review of day's activity and planning for next day activities

Day /date	Forenoon	Afternoon
Tuesday 16-06-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Field observations on long term experiments Drawing ,discussion and presentation of AESA 	<ul style="list-style-type: none"> Presentation of long term experiment data and discussion Preparation, presentation and discussion of activities for the break period Review of day's activity and planning for next day activities
Wednesday 17-06-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Finalization of activities for the break period 	<ul style="list-style-type: none"> Conclusion of 2nd session and holiday assignment

**ANGRAU-PRIDS-WHO TRAINING OF FACILITATORS OF
INTEGRATED PEST MANAGEMENT FOR SUSTAINABLE
SUGARCANE PRODUCTION
III Phase (25-08-09 to 04-09-09)**

Activities conducted day vice

1st week (25-08-09 to 30-08-09)

Day /date	Forenoon	Afternoon
Tuesday 25-08-09	<ul style="list-style-type: none"> Planning for III phase daily activities Visit to TOF fields to assess the crop situation 	<ul style="list-style-type: none"> Discussion on break period activities in TOF plots Review of day's activity and planning for next day activities
Wednesday 26-8-09	<ul style="list-style-type: none"> Visit to FFS villages to assess the crop Visit of District Collector and Magistrate Sri Syamal Rao to Juttada FFS fields 	<ul style="list-style-type: none"> Discussion on break period activities in FFS Planning for action to be taken in FFS
Thursday 27-08-09	<ul style="list-style-type: none"> Recap and briefing of day's activity AESA in management plots and presentation 	<ul style="list-style-type: none"> Planning for FFS Group Dynamics- Square formation Review of day's activity and planning for next day activities
Friday 28-08-09	<ul style="list-style-type: none"> Visit to FFS villages 	<ul style="list-style-type: none"> FFS feed back
Saturday 29-08-09	<ul style="list-style-type: none"> Recap and briefing of day's activities Field activity on trash twist Propping Observation in experiment plots and presentation 	<ul style="list-style-type: none"> Discussion on trash twist Propping Special topic on Organic Farming in sugarcane by Dr T Sreelatha Review of day's and weekly activity and planning for next day activities
Sunday 30-08-09	<ul style="list-style-type: none"> Planning for next week 	

Day /date	Forenoon	Afternoon
2nd week (31-08-09 to 4-09-09)		
Monday 31-08-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Lab visit -Biotechnology aspects in sugarcane and micro propagation by Dr Ravi Kumar Discussion on updating cost of cultivation 	<ul style="list-style-type: none"> Special Topic on Crop physiology of sugarcane by Dr Ch Mukunda Rao Review of day's activity and planning for next day activities
Tuesday 1-09-09	<ul style="list-style-type: none"> Recap and briefing of day's activity Role of Neem and neem products in IPM in Sugarcane Presentation and discussion on long term experiments 	<ul style="list-style-type: none"> Ten handy tips to facilitators Group dynamics – winner takes all Review of day's activity and planning for next day activities
Wednesday 2-09-09	<ul style="list-style-type: none"> Recap and briefing of day's activity AESA Drawing ,discussion and presentation of AESA 	<ul style="list-style-type: none"> Planning for FFS Review of day's activity and planning for next day activities
Thursday 3-09-09	<ul style="list-style-type: none"> Visit to FFS villages 	<ul style="list-style-type: none"> FFS feed back
Friday 4-09-09	<ul style="list-style-type: none"> Recap and briefing of day's activity 	<ul style="list-style-type: none"> Field assignments
Saturday 5-09-09 to Monday 9-09-09	<ul style="list-style-type: none"> Field observations on FFS, experimental plots, organic demonstrations and exposure visits to sugar factories 	
Tuesday 10-09-09	<ul style="list-style-type: none"> Review and finalization of activity for break period 	

**ANGRAU-PRIDS-WHO TRAINING OF FACILITATORS OF
INTEGRATED PEST MANAGEMENT FOR SUSTAINABLE
SUGARCANE PRODUCTION
IV Phase (25-11-09 to 15-12-09)**

Activities conducted day vice

1st week (25-11-09 to 29-11-09)

Day /date	Forenoon	Afternoon
Wednesday 25-11-09	<ul style="list-style-type: none"> Planning for IV phase daily activities Special topic on global warming and climate change by Dr R L Narasimha Rao 	<ul style="list-style-type: none"> Discussion on break period activities Review of day's activity and planning for next day activities

Day /date	Forenoon	Afternoon
Thursday 26-11-09	<ul style="list-style-type: none"> ● Visit to TOF fields to assess the crop situation ● Meeting about planning of Stake holders work shop to be held on 9-12-09 	<ul style="list-style-type: none"> ● Discussion on crop cutting experiments and other parameters in sugarcane ● Planning for action to be taken in FFS
Friday 27-11-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Crop cutting and collection of data in FFS fields at Lakkavaram and Juttanda 	<ul style="list-style-type: none"> ● Juice analysis of samples of Lakkavaram and Juttanda villages ● Review of day's activity and planning for next day activities
Saturday 28-11-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activities ● Calculation of cost of cultivation for FFS field of Lakkavaram and Juttanda villages 	<ul style="list-style-type: none"> ● Calculation of cost of cultivation for FFS field of Lakkavaram and Juttanda villages ● Review of day's activity and planning for next day activities
Sunday 29-11-09	<ul style="list-style-type: none"> ● Planning for next week 	
2nd week (30-11-09 to 6-12-09)		
Monday 30-11-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Crop cutting and collection of data in FFS fields at Chuchukonda and Timmarajupeta 	<ul style="list-style-type: none"> ● Juice analysis of samples of Chuchukonda and Timmarajupeta villages ● Review of day's activity and planning for next day activities
Tuesday 1-12-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Crop cutting and collection of data in TOF experimental plots 	<ul style="list-style-type: none"> ● Juice analysis of samples of experimental plots ● Review of day's activity and planning for next day activities
Wednesday 2-12-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Crop cutting and collection of data in ICM plots 	<ul style="list-style-type: none"> ● Juice analysis of samples of ICM plots ● Review of day's activity and planning for next day activities
Thursday 3-12-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Calculation of cost of cultivation for FFS field of Chuchukonda and Timmarajupeta villages 	<ul style="list-style-type: none"> ● Tabulation of analysis data and calculation quality parameters yield of FFS villages ● Review of day's activity and planning for next day activities
Friday 4-12-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Tabulation of analysis data and calculation quality parameters yield of FFS villages 	<ul style="list-style-type: none"> ● Tabulation of analysis data and calculation quality parameters yield TOF plots ● Review of day's activity and planning for next day activities
Saturday 5-12-09	<ul style="list-style-type: none"> ● Recap and briefing of day's activity ● Tabulation of analysis data and calculation quality parameters yield of TOF plots 	<ul style="list-style-type: none"> ● Calculation of cost of cultivation for experimental plots
Sunday 6-12-09	<ul style="list-style-type: none"> ● Finalization of charts for display in stakeholders work shop and preparation of charts 	

Day /date	Forenoon	Afternoon
3rd week (7-12-09 to 12-12-09)		
Monday 7-12-09	<ul style="list-style-type: none"> ● Preparation of charts 	
Tuesday 8-12-09	<ul style="list-style-type: none"> ● Preparation of charts 	
Wednesday 9-12-09	<ul style="list-style-type: none"> ● Stakeholders workshop 	
Thursday 10-12-09	<ul style="list-style-type: none"> ● Visit to TOF plots and FFS villages by WHO officials ● Preparation of final report on SLTP ● Preparation of final report on SLTP 	<ul style="list-style-type: none"> ● Valedictory function and distribution of certificates to the trainees ● Conclusion of the SLTP

ABBREVIATIONS

AESA	Agro Eco System Analysis
ANGRAU	Acharya N.G.Ranga Agricultural University
BBT	Ballot Box Test
CaCo ₃	Calcium Carbonate
DAP	Diammonium Phosphate
DAP	Days After Planting
DOP	Date of Planting
ESB	Early Shoot Borer
FFS	Farmer Field School
FP	Farmer Practice
FYM	Farm Yard Manure
ICM	Integrated Crop Management
IPM	Integrated Pest Management
K / K ₂ O	Potash
LBB	Lady Bird Beetle
MT	Metric Tonnes
N	Nitrogen
NFE	Non Formal Education
NGOs	Non Government Organizations
OC	Organic Carbon
OF	Organic Farming
P/ P ₂ O ₅	Phosphorus
PAR	Participatory Action Research
PRDIS	Participatory Rural Development Initiatives Society
RARS	Regional Agricultural Research Station
SGD	Small Group Discussion
SPP	Species
SSP	Single Super Phosphate
STK	Soil Test Kit
SWA	Sugarcane Woolly Aphid
SWOT	Strengths Weakness Opportunities
ToF	Training of Facilitators
TT P	Trash Twist Propping
WHO	World Health Organisation