

### 3.8 RAPID BIOASSAY PESTICIDE RESIDUE ANALYSIS IN NEPAL

by Man Bhadaur Thapa

<p><b>Successful Implementation of RBPR Program in Nepal and Its Future Planning for Pesticide Residue Monitoring in Fruits and Vegetables</b></p> <p><b>M.B.Kshetri</b> Senior Plant Protection Officer PPD Hariharbhawan, Lalitpur, Nepal</p>	<p><b>TOPICS</b></p> <ol style="list-style-type: none"> <li>1 situation of Pesticide consumption in Nepal</li> <li>2 Pesticide mis-use</li> <li>3 RBPR History             <ol style="list-style-type: none"> <li>3.1 RBPR Program Implementation in Nepal</li> <li>3.2 RBPR Lab establishment</li> <li>3.3 RBPR Technology</li> <li>3.4 Impact of RBPR Lab in Pesticide Residue Monitoring</li> <li>3.5 Summary of RBPR Analysis</li> <li>3.6 Challenges/Issues</li> </ol> </li> <li>4 Future Planning for Pesticide Residue Monitoring in Nepal</li> <li>5 Media Coverage on RBPR</li> </ol>														
<p><b>Situation of pesticide consumption in Nepal</b></p> <table border="1"> <thead> <tr> <th>Crops</th><th>Dose (ai kg/ha)</th></tr> </thead> <tbody> <tr> <td>Cereals</td><td>0.046125</td></tr> <tr> <td>Vegetables</td><td>1.604693</td></tr> <tr> <td>Cash Crops</td><td>0.186542</td></tr> <tr> <td>Pulses</td><td>0.05075</td></tr> <tr> <td>Fruits</td><td>0.029187</td></tr> <tr> <td>Average use</td><td>0.396</td></tr> </tbody> </table>	Crops	Dose (ai kg/ha)	Cereals	0.046125	Vegetables	1.604693	Cash Crops	0.186542	Pulses	0.05075	Fruits	0.029187	Average use	0.396	<p><b>PESTICIDE MIS USE</b></p> <p><b>Ways of pesticide misuse by Nepalese farmer</b></p> <ul style="list-style-type: none"> <li>• Wrong selection of pesticide</li> <li>• Frequent / unnecessary spraying</li> <li>• Dipping fruits/ vegetables in pesticide solution</li> <li>• No use of Personal Protective Equipments (PPE).</li> <li>• Do not care of waiting Period.</li> <li>• Un safe Handling</li> </ul>
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<p><b>PESTICIDE MIS- USE</b></p> <p>Many misuses of pesticide on vegetable have been reported by different studies and DFTQC Nepal</p> <p><b>As per report</b></p> <ul style="list-style-type: none"> <li>• Some farmers are using pesticide in a crop just prior to sending market.</li> <li>• Farmer never cared about pesticide waiting period.</li> <li>• Some farmer were dipping the fruits and vegetable (tomato, brinjal) in a pesticide solution (malathion) to bring shining of a vegetables and fruits.</li> <li>• Huge amount of pesticides were used in a stored potato to save infestation from potato tuber moth.</li> </ul>	<p><b>PESTICIDE MIS -USE</b></p> <p><b>General situation</b></p> <ul style="list-style-type: none"> <li>• Some time Pesticide smell can be feel at the time of visiting the vegetable wholesale market.</li> <li>• Farmers are not aware on safe use of pesticides, waiting period, and its hazardness.</li> <li>• All public media were giving a lot of coverage on pesticide misuse and pressure to government to take necessary action on it.</li> <li>• Pesticide residue in the fruits and vegetable was alarming.</li> </ul>														
<p><b>ADOPTION OF RBPR TECHNOLOGY</b></p> <ul style="list-style-type: none"> <li>• Nepal government decided to establish RBPR Lab under the PPD at Fruits and Vegetable Market of Kalimati, Kathmandu.</li> <li>• Laboratory established in June 18, 2014.</li> <li>• PPD started pesticide residue monitoring work with a four trained officer and with a limited resources.</li> </ul>	<p>Recently established RBPR laboratory are-</p> <ul style="list-style-type: none"> <li>• Jhapa (Birtamod)</li> <li>• Sarlahi (Nawalpur)</li> <li>• Kaski (Pokhara)</li> <li>• Rupandehi (Butwal)</li> <li>• Banke (Nepalgunj)</li> <li>• Kailali (Attaria)</li> </ul>														

### GUIDELINE AND OTHER RELATED LEGAL DOCUMENT SUPPORTING RBPR

- RBPR Guidelines -2071 BS
- Pesticide Act -2048 BS
- Pesticide Rule 2050 and first ammended in 2064 BS
- Environment Protection Act -2053
- Environment Protection Rule -2054
- Food Act - 2023
- Plant Protection Act -2064

### RBPR TECHNOLOGY

#### RBPR Technology

Technology: TARI (Taiwan Agriculture Research Institute), Taiwan  
 Analysis type: Based on Enzymatic Reaction  
 Taiwan: For the first time in 1985 (38 station), 250 station are running now  
 Legalized : China ,Central America,Korea

#### Advantage :

- Simple
- Detection is quick.
- Low expenditure.
- Result is clear
- Easy to Established
- No need of high level Technicians

### Fruits and Vegetable Whole-sale Market in Kalimati, Kathmandu



### UV vis Spectrophotometer 1240



### RBPR (Rapid Bioassay for Pesticide Residues)

- Technology: Taiwan Agricultural Research Institute (TARI)
- Enzymatic reaction: AChE (Acetylcholinesterase) Test to screen the residues of acetylcholinesterase - inhibiting (neurotoxic -OP and Carbamate) insecticides on fruits and vegetables

### RBPR (Rapid Bioassay for Pesticide Residues)

- The RBPR/TARI program pack is recorded the AChE reaction and calculated the inhibition percentage through Spectrophotometer.
- The increasing absorbance for sample at 412 nm is recorded and compared to the insecticide free blank (normal) AChE reaction, and the inhibition percentage is calculated.

### Calculation of inhibition

$$\% \text{ inhibition} = \frac{\text{Absorbance change (normal)} - \text{Absorbance change (Sample)}}{\text{Absorbance change (normal)}} \times 100$$

### RBPR test kit

- AChE (Acetylcholinesterase)
- ATCI (Acetylthiocholine iodine)
- DTNB (5,5- dithio- bis-2 nitrobenzoid acid)
- Phosphate buffer solution
- Needs to get from TARI only

#### Other chemicals:

- Ethanol
- Bromine water



## RBPR

RBPR does not calculate amount of pesticide neither it gives type of pesticides

RBPR is purely based on enzymatic reaction in toxicological sense.

It gives only inhibition percentage from which the result is withdrawn

- Below 35% is edible
- 35- 45% need quarantine for few days and warning
- More than 45% considered as not edible in toxicological sense

## Month-wise RBPR Result (2014)

S.N	Months	no of tested sample	Green	yellow	Red
1	Jun/July	187	147	11	29
2	July/Aug	124	119	2	3
3	Aug/Sept	175	173	2	0
4	Sept/oct	117	115	1	1
5	Oct/Nov	129	129	0	0
6	Nov/Dec	136	133	2	1
7	Dec/Jan	119	119	0	0
8	Jan/Feb	121	121	0	0
9	Feb /March	120	120	0	0
10	March/April	137	137	0	0
11	April/May	67	67	0	0
12	May/Jun	155	153	2	0
13	Total	1619	1566	21	32

## Month-wise RBPR Result (2015)

S.N	Months	no of tested sample	Green	yellow	Red
1	Jun/July	154	152	2	0
2	July/Aug	192	192	0	0
3	Aug/Sept	130	130	0	0
4	Sept/oct	65	65	0	0
5	Oct/Nov	119	117	1	1
6	Nov/Dec	191	188	2	1
7	Dec/Jan	207	204	3	0
8	Jan/Feb	139	137	0	2
9	Feb /March	169	169	0	0
10	March/April	100	99	0	1
11	April/May	218	217	0	1
12	May/Jun	251	247	0	4
13	Total	1935	1917	8	10

## Month-wise RBPR Result (2016)

S.N	Months	no of tested sample	Green	yellow	Red
1	Jun/July	152	148	1	3
2	July/Aug	158	156	1	1
3	Aug/Sept	134	134	0	0
4	Sept/oct	85	85	0	0
5	Oct/Nov	154	151	0	3
6	Nov/Dec	167	166	0	1
7	Dec/Jan	184	175	1	8
8	Jan/Feb	0	0	0	0
9	Feb /March	0	0	0	0
10	March/April	0	0	0	0
11	April/May	0	0	0	0
12	May/Jun	0	0	0	0

## 2014 Shrawan To 2017 Magh RBPR Result

No Of Tested Sample	Green	Yellow	Red
4588	4495	32	61

## Month-wise RBPR Result 2073-74

Month	Inhibition Percentage			Total
	<35%	35-45%	>45%	
Shrawan	148	1	3	152
Bhadra	156	1	1	158
Aswin	134	0	0	134
Kartik	85	0	0	85
Mangsir	151	0	4	154
Poush	165	0	2	167
Magh	175	1	8	184
Falgun	0	0	0	0
Chaitra	0	0	0	0
Baisakh	0	0	0	0
Jestha	0	0	0	0
Asar	0	0	0	0
Grand Total	1012	3	19	1034


## RBPR results that exceeds above 35% (crop-wise) Shrawan to magh 2073

S.N	Crop	Yellow	Red	Total
1	Cauliflower	1	7	8
2	Tomato	2	8	10
3	Bitter gourd	0	3	3
4	Cucumber	0	1	1
	Total	3	19	22

Note: Out of 1034 Sample

## Summary of Lab Analysis

- Total 4588 sample were examined during this two & half year period.
- Sample were taken from whole sale market, truck/vehicle, retailers.
- Vegetables imported from India, China, and Bangladesh were also examined.
- Out of the 4588 sample tested, 61 were found red (discard), 32 were found yellow (need for quarantine) and other remaining samples were found Green (consumable).
- 28 red and 12 yellow were found in the first month of lab. establishment.
- From the 2nd month of establishment onwards, it was found decreasing trend.
- Vegetables from Chitwan, Kavre and Sarlahi districts are found to have major pesticide residual problem.
- Off season vegetables have more residual problem then to seasonal vegetables.

<div data-bbox="383 205 628 231" data-label="Section-Header"> <h3>Impact of RBPR Labrotory</h3> </div> <ul data-bbox="256 254 751 483" style="list-style-type: none"> <li>• Fruits and vegetable available in Kalimati whole sale market are now in decreasing trend in terms of pesticide (OP and Carb group ) residue.</li> <li>• Created awareness to farmers and consumers on pesticide residue.</li> <li>• Consumer Association, Farmer Association and other private organization (youth ) are also interested to established RBPR Lab.</li> <li>• Public media have given great concern on pesticide residue monitoring and made substantial coverage on their newspaper, FM, Radio etc..</li> <li>• FAO (TCP ) is going to be help in pesticide Residue monitoring program through supporting soft ware package.</li> <li>• PACT (Project for Agriculture Commercialization and Trade ) project also helping in RBPR lab establishment.</li> </ul>	<div data-bbox="1008 199 1214 224" data-label="Section-Header"> <h3>Experience / learning</h3> </div> <ul data-bbox="862 275 1341 466" style="list-style-type: none"> <li>• Proper space for lab and for holding facilities is needed.</li> <li>• Need of extra spectrophotometer with RBPR program pack</li> <li>• Research and development work is a continue process.</li> <li>• Provision of mobile laboratory facilities is necessary.</li> <li>• <b>Technical backstopping support needed-</b> for upgrading knowledge and skill</li> </ul>
<div data-bbox="350 640 662 678" data-label="Section-Header"> <h3>Experience / learning</h3> </div> <ul data-bbox="256 693 735 921" style="list-style-type: none"> <li>• Need of linkage between District Agriculture Development Office and RBPR Lab.</li> <li>• RBPR result should be provided to the owner very fast. ( within an hour of sample taken )</li> <li>• Some time we take samples from trucks at entry point, but there is no provision of holding those trucks until the test completion.</li> <li>• It is very difficult to dispose the residual samples .</li> <li>• Strong administrative support needs during stuck disposal.</li> </ul>	<div data-bbox="880 623 1193 646" data-label="Section-Header"> <h3>VISITORS AND THEIR COMMENTS</h3> </div> <p data-bbox="834 770 1382 875">Students, Professors, leader farmer, consumers, journalists, politicians, high level personnels and International pesonnels have visited RBPR labrotory and express their positive and encouraging comments.</p>
<div data-bbox="420 1071 591 1096" data-label="Section-Header"> <h3>Challenges/Issues</h3> </div> <ul data-bbox="240 1157 763 1407" style="list-style-type: none"> <li>• Need to upgrade for fungicide residue analysis also.</li> <li>• No reliable rapid analysis technology available for other group of insecticides rather then carbamate and organophosphate</li> <li>• Pesticide Residue analysis (RBPR) done in one whole sale market is not sufficient .</li> <li>• It is also important to monitor regularly pesticide residue at the collection center and major production sites</li> <li>• Coordination with regulatory bodies and markets</li> <li>• Maintaining laboratory discipline . (safety , avoiding contamination etc)</li> </ul>	<div data-bbox="862 1050 1385 1073" data-label="Section-Header"> <h3>Our Future Programe for rapid pesticide residue analysis</h3> </div> <p data-bbox="1029 1087 1188 1108">We have support of</p> <ul data-bbox="862 1113 1229 1165" style="list-style-type: none"> <li>❖ F.A.O /TCP - Soft ware part.</li> <li>❖ PACT Project / World Bank - Hard ware part.</li> </ul> <p data-bbox="862 1169 1013 1190"><b>PLANNING OF PPD</b></p> <ol data-bbox="862 1194 1170 1266" style="list-style-type: none"> <li>1 Man Power Development <ul data-bbox="980 1222 1170 1266" style="list-style-type: none"> <li>- Abroad Training</li> <li>- In-country Training in RBPR</li> </ul> </li> </ol> <p data-bbox="862 1270 1373 1312">(PPD has planning to provide RBPR TOT for staffs within the country with the help of FAO (TCP) project).</p> <ol data-bbox="862 1316 1135 1337" style="list-style-type: none"> <li>2 Existing Manpower Management</li> </ol>
<div data-bbox="295 1491 605 1516" data-label="Section-Header"> <h3>FUTURE PROGRAME .....</h3> </div> <ol data-bbox="224 1554 708 1890" style="list-style-type: none"> <li>3 <b>Technology adoption</b> <ul data-bbox="228 1577 498 1709" style="list-style-type: none"> <li>- OP and Carbamates Test RBPR Test</li> <li>- Synthetic Pyrothroids Test Py Test kit Methods</li> <li>- Fungicide Test BT Test (RBPR)</li> </ul> </li> <li>4 <b>SAMPLING</b> <ul data-bbox="228 1734 599 1799" style="list-style-type: none"> <li>• whole sale and retailer Sampling</li> <li>• Entry point Sampling</li> <li>• Mobile random Sampling and Testing in production site.</li> </ul> </li> <li>5 <b>AWARENESS PROGRAM</b> <ul data-bbox="256 1824 708 1890" style="list-style-type: none"> <li>Radio /Television, FM, Newspapers, Hoarding board</li> <li>No Pesticide Use Week, Street drama, Training /Seminar/ workshop</li> <li>Exhibition , Demonstration</li> </ul> </li> </ol>	<div data-bbox="917 1501 1308 1524" data-label="Section-Header"> <h3>RBPR news on national daily newspapers.</h3> </div> 



### Nepal police Disposing of pesticide contaminated cowpea

# क्षतिपति माग गई किसानद्वारा विषादीयुक्त बोड़ी नष्ट गर्न अवरोध

# Request made by Secretary of MOAD to farmer for judicious use of pesticides

A farmer preparing for dipping tomato in a pesticide solution prior to sending wholesale market

[illegible]



### 3.9 INTENSIFICATION AND INSTITUTIONALIZATION OF IPM-FFS IN NEPAL

by Binod Saha

**Intensification and institutionalization of IPM FFS in Nepal: Lesson learnt and Way forward**

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2017

**Outline of Presentation**

- IPM in Nepal-a historical perspective
- Need, objectives and strategy of Intensification and Institutionalization Phase
- Coordination and Collaboration mechanism
- Major steps followed in Planning and Implementation
- Achievement made
- Lesson Learnt
- Way Forward

**History of IPM FFS in Nepal**

**Inception Phase**

1997  
Implementation of Integrated Pest Management in Rice project (ICP/NEP/5712)

1998-2001  
Community IPM Programme in Asia-FAO Regional Program (GCP/RAS/172/MCR)

**Intensification and Institutionalization phase**

2004-2007  
Support to the National Integrated Pest Management Programme in Nepal (NIP/NEP/053/NEP)

2010-2015  
Support to the National IPM Programme in Nepal- Consolidation, Up-scaling and Institutionalization phase (NIP/NEP/059/NEP)

**Why Intensification and Institutionalization phase?**

- Inadequate trained and motivated human resource base in IPM including field level technicians and farmers
- Lack of wider perspective and vision together with strengthening of organizational and managerial capacity of IPM Farmers Groups/Associations, and quality of farmer education;
- Lack of wider focus on FFS to cover the entire crop cycle of one year along with development of IPM-FFS modules to cover these crops especially the high value crops such as potato, tea, coffee, vegetables, citrus, and apple.
- Lack of follow up support and backstepping to previous FFS groups and associations to ensure continuity and sustainability;
- Need for continuous updating of curriculum for IOE Refresher courses and FFS based on actual need of the targeted beneficiaries and addressing the food safety issues in the context requirements of global trade (WTO-SPS Agreement);
- Need to identify and put in place measures that help to realize increased economic benefits to farmer after completion of FFS;
- Improvement in field-based research, and documentation of farmer's field research results including its adaptation and replication in other sites;



## Why Intensification ...

- Need for research on IPM issues including establishment of facilities for bio-agent rearing, bio-pesticide testing, and monitoring of pesticide residue in collaboration with agricultural research institutions and relevant academic institutions and universities.
- Need to undertake specifically designed impact evaluation of IPM interventions.
- Need to design a strong M&E system of the IPM programme and involve more deeply the various IPM related coordination committees and concerned stakeholders at different level with defined M&E plan.
- Need for establishing a separate IPM unit with adequate human resources to ensure continuity and sustainability of the programme after phasing out of the project.
- Need to integrate the IPM Programme activities as core (regular) activities of respective district and sub-district level Agriculture offices.
- Need to further strengthen collaboration with institutions that are active in IPM related activities in the country e.g. NGOs, INSOs, various public and private institutions and with the related FAO Programmes in the Asia Pacific Region.
- Need to introduce IPM principles and approaches in the curricula of selected schools and agriculture related vocational training centres.

## Objectives of Intensification and Institutionalization Phase

1. To **contribute to sustainable broad-based poverty reduction and food security** while contributing to human health and environmental protection
2. To **institutionalize a sustainable national IPM Programme in Nepal** by strengthening the capacity of the PPD, collaborating national, regional and district level training and extension institutions in the government and non-government sectors to integrate IPM training and support programme for small holder farmers
3. To **increase crop productivity in an environmentally sustainable way**, avoiding health hazards for betterment of their livelihood and linking with markets, while enhancing the capacity of men and women to manage the development process

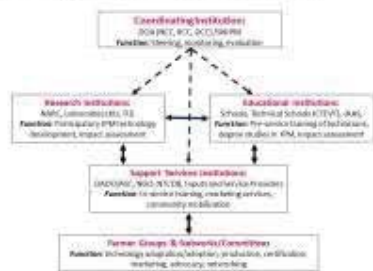
## Programme Thrust/Strategy

- Mainstreaming and gradual internalization of IPM Programme in DoA/PPD regular program
- Scaling up the program within the existing and new districts
- Institutionalization of IPM Programme, networking and strengthening of IPM groups/Association/ Cooperatives
- Capacity enhancement of farmers and technicians to address organized production, self certification and marketing of healthy crop products
- Linkages with Research Institutions and Participatory Field Research
- Collaboration/coordination with teaching institutions/universities and INGOs/NGOs other like minded institutions
- Strengthening of Institutions and Laboratories
- Human Resource Development
- Development of crop specific IPM modules-GAP (IPM Standard), Post harvest handling and marketing. Cluster based approach to empower the farmers
- Sustainability

## Specific Modules under Intensification and Institutionalization of IPM Program

1. Crop specific IPM modules
2. Cropping system specific training module (Yearly FFS)
3. Farmers Organization Development and Strengthening module
4. Post harvest handling module
5. IPM Standards
6. Product Certification and marketing module
7. Curricula for IAAS, CTEVT, HS Schools

Fig. 1 Institutional linkages and Coordination Mechanism



## B. Major steps followed in the implementation of Intensification and Institutionalization of IPM and FFS program in Nepal



(Fig. 2)

### 1. District level Orientation Workshop

This is a one day introductory activity to inform and orient the major stakeholders about the IPM FFS program and get their feedback, interest and its implementation feasibility of collaboration with other stakeholders, partners and beneficiaries. The objectives of the workshop are District and program level. The three major objectives for the workshop are:

- To share about IPM FFS program, its importance and get feedback from the stakeholders.
- To discuss and select on the overall program scope, modality, sustainability and arrangements to the district technical team.
- To identify and recommend the potential sites (village/zone) for program implementation.

**Participants:** Program team, NGO staff, representatives from government line agencies, INGOs working in the district, CSOs, media/political parties, Journalist etc.



### 2. VDC level Orientation Workshop

After program sites (VDCs) are selected from district level workshop, a VDC level mass meeting should be organized to inform and orient the farming community and major stakeholders of VDC about the IPM FFS program, its intent and its implementation feasibility. This meeting also provides level of their opinion, interest and feedback. Workshop objectives are primarily the same supported by the program team. The three major objectives of the workshop are:

- To share about IPM FFS program, its importance and get feedback from the stakeholders.
- To familiarize the farmers on the overall aspects of program (objectives, implementation modality and arrangements) for support and their building to ensure farmers' participation in the program as well as maintain transparency in the program implementation.
- To select wards and participating farmers to implement the FFS based on the criteria required for effective program implementation.

**Participants:** Program team, NGO and ASG staff, representatives from (NGOs working in the VDC, CSOs, major political parties, VDC secretary and team, school teacher, religious institutions and other relevant organizations)



### 3. VDC level Workshops

#### 3.1 VDC level Comprehensive Need Identification and Planning

The major workshop are:

- To collect general information such as physical facilities (road network, irrigation infrastructure, community health services, marketing facilities etc.), topography, soil type, temperature regimes and rainfall pattern of the area etc.) and prepare village profile.
- To analyze present cropping pattern and cropping intensity, identify gaps/problems and develop alternative cropping patterns suitable to existing conditions, to analyze existing crop production and post management practices, identify gaps/problems and develop plan for improvements.
- To analyze existing situation with procurement of inputs, credit facilities, marketing practices and technical support services, identify gaps/problems and prepare plan for improvements.
- To develop long, medium and short term plan for interventions to be addressed by the programme.



### 3.2 Village (Cluster) level Comprehensive Planning Workshop

This planning process provides opportunity to review and finalize the preliminary action plan developed earlier during VDC level planning. Three major objectives of the workshop are:

- To review the yearly FFS plan prepared during comprehensive participatory planning.
- To assess the status of crop production and farmers' practices in managing pests.
- To assess the farmers' organizational strength.
- To understand yearlong FFS and develop the farmers' annual cropping plan.



### 3.3 Site/Group Level Participatory Planning Meeting

One to two days meeting is organized in the specific selected sites of the VDC. Participants are those local farmers and who are interested participatory in IPM FFS and will be facilitated by the district technical team. This meeting is more focused to draw community mapping and identification of problems and opportunities. Four major objectives of the workshop are:

- To review, finalize and align the information of the comprehensive planning.
- To appraise the existing cropping patterns and priority crop(s) in the cluster.
- To assess the status of crop production and farmers' practices managing the pests.
- To understand yearlong FFS and develop the farmers' annual cropping plan.



**Participants:** Program team, DADO and ASC staff, participating

### 4. Selection of farmer facilitators, their capacity building & service delivery

- Farmer facilitators (FF) have major role in the implementation of IPM FFS who provide technical training and facilitation support to FFS groups in the community.

#### Major role of farmer facilitators:

- Organize/conduct the field schools - determine the site for the FFS, identify study fields, potential participants, determine local endemic problems to be treated by the FFS; and conduct review and planning meetings.
- Facilitates the activities associated with meetings of the field school.
- Careful handling of logistic issues like location of the FFS, synchronization of the FFS with the planting season, control over study fields etc.
- Maintains active coordination and collaboration with VDC, ASC and other local government officials, NGOs and institutions working in the area.
- Develop his/her farm as demonstration site for the major technologies/practices that are promoted in the FFS.

### 5. Conduction of yearlong IPM FFS (Major activities)



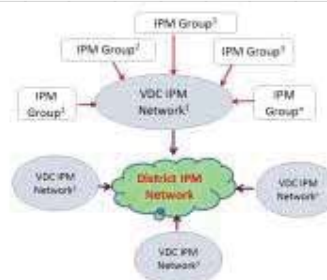
### 6. Group strengthening



### 7. Organized IPM based production and product certification



### 8. Marketing of IPM products & networking of FFS for market promotion



**Fig. 8: Networks of IPM FFS at different level**



### Major Functions of IPM FFS and their network:

- Systematic production and marketing plan at HHs, group and network level,
- Improved quality of products, packaging/labeling and product certification,
- Development of market facilities and marketing,
- Advocacy/lobbying for the promotion of IPM & its products,
- Processing & value addition of IPM products.

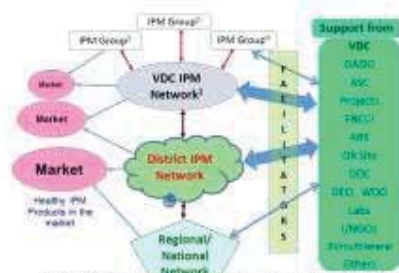


Fig. 9: IPM farmer groups, their network and promotion of IPM programme and marketing of healthy IPM products through the facilitation and support from stakeholders

### Achievements made on intensification & Institutionalization of IPM FFS in Nepal

1. Capacity building of farmers, officers and non-officers of DoA
2. Institutional capacities enhanced to provide pre- and in-service training on IPM-FFS
3. Development of Training Modules, Curriculum, Field guides, Process, Methodological tools and Policy documents
4. Yearlong IPM Farmers' Field School Established
5. Student-Teacher IPM Field School conducted
6. IPM FFS Participants' Knowledge, Attitude and Skill Enhanced
7. Post FFS (PFFS) Activities and Follow up Programme

### Achievements...

8. Development of Training Materials, guides and manuals
9. Development and Adoption of IPM Component Technologies
10. Impact of project on Use of chemical Pesticides in the Project Districts
11. Decreased Field Environmental Impact Quotient (EIQ)
12. Enhanced Knowledge on Pesticide Hazard
13. Improvement in Crop Productivity and Income Gain
14. System of Organized Production for Sustainable Crop production
15. Increased Market Access to IPM based safer commodities

### Achievements...

17. Participation of Women and Socially Excluded Group
18. Food Security, Better Nutrition and Livelihood Promotion through Post FFS Activities
19. Nepal IPM Standard developed
20. Institutionalization Support to Universities, Technical and Vocational institutes
21. Networking of IPM Farmer Group at higher level
22. Farmers' Self monitoring for Quality Control of IPM Products
23. Community IPM Resource Centers Established
24. Advocacy and Consumer Awareness building
25. Up Scaling of IPM/FFS Approach in other areas (Water management, Nutrition, Livestock etc)

### Lesson Learnt

1. Starting IPM-FFS is more effective in educating the farmers on IPM for better management of crops on cropping pattern basis at individual as well as group level contributing to food security, food safety, human health and environmental protection.
2. Enhanced knowledge and skill with change in attitude of farmers supported from IPM-FFS contributed to gradual reduction of hazardous chemical pesticides use.
3. System of regular monitoring and backstopping support should be in place to maintain the quality of program interventions and finally the IPM product by the service providers.
4. Inclusion of IPM curriculum in pre- and in-service training courses provided cost effective approach to develop human resources.
5. Availability of substitutes for chemical pesticide is pre-requisite for the promotion of IPM technology and production of bio pesticides in country.

### Lesson Learnt ...

6. Formation of IPM farmer's and facilitators networks provided legal basis for exchange of information, planning, outsourcing of resource with an effective approach in institutionalization.
7. Linkage and cooperation is required among all the development actors working in agriculture and marketing.
8. FFS is found to be a good entry point to initiate other development interventions as it respects and promotes the human capital as change agent for overall development.
9. The project developed an adaptive model of sustainable agriculture to integrate local capitals and resources efficiently and wisely to meet the development objectives.
10. There is a need for concerted efforts from both government and development partners to out scale the module in the country for wider benefit.

### Way Forward

1. Diversification of IPM product/commodities and increase scale of value addition and demand led production,
2. Enabling environment (policy, market outlets, branding and price incentive mechanism) for linking IPM products to market,
3. Enhance participation and ownership of primary stakeholders in all steps of development agenda,
4. Development and inclusion of climate-resilient production technologies to address the potential threats of crop failure due to pest insurgence/outbreak and climate vulnerability,

### Way Forward...

5. Needs to find a joint agenda and common goals among Government and other partners for wider application of IPM in the country
6. Strengthen the system of quality monitoring and regulation of IPM products at strategic levels to assure quality, build on consumer faith and program's reliability,
7. Policy and increased budgetary support for promotion and safeguarding the IPM approach



Fig. 10: Glimpses of IPM FFS Activities in Field



### 3.10 FFS – AN APPROACH TO ADDRESS FOOD AND NUTRITION SECURITY

by Ratna Kumar Jha

#### Farmer Field School – An Approach to Address Food and Nutrition Security Issue

*A Case of Agriculture and Food Security Project in Nepal*

Ratna Kr Jha, PhD  
Binod Saha, PhD  
BKP Shaha, Dr.  
Food and Agriculture Organization of the United Nations

Presented for Workshop on Empowering Farmers Field School Through FFS-PM-Y Training in Support of Sustainable Intensification of Crop Production within context of Climate Change

#### Outline

- Status of Food and nutrition security in Nepal
- Agriculture and Food Security Project (AFSP)
- Specific features of FFS in AFSP
- Lesson learnt and quality concerns
- Way forwards

#### Food Deficit

Number of food deficit districts

Year	Number of food deficit districts
2014/15	33
2015/16	30

#### Food Security Situation

- 25.17 population below poverty line; 37 percent in far and mid-western region
- Low in food availability, highest prevalence of hunger and malnutrition
- yields of major crops below the national averages.
- per capita consumption of animal products : the lowest in the world

#### Child under Nutrition in Nepal

Prevalence of stunting

Year	Stunting (%)
2001	45
2006	39
2011	29
2013	24
2015	20
2017	15

Target: 15.3%

#### Some Nutrition Indicators

Indicator	Far-western (%)	Mid-western (%)
Chronic energy deficiency in women	25	20
Prevalence of low birth weight babies	15	15
Stunted	35	40
Underweight	45	35
Wasting	10	10

#### Agriculture and Food Security Project

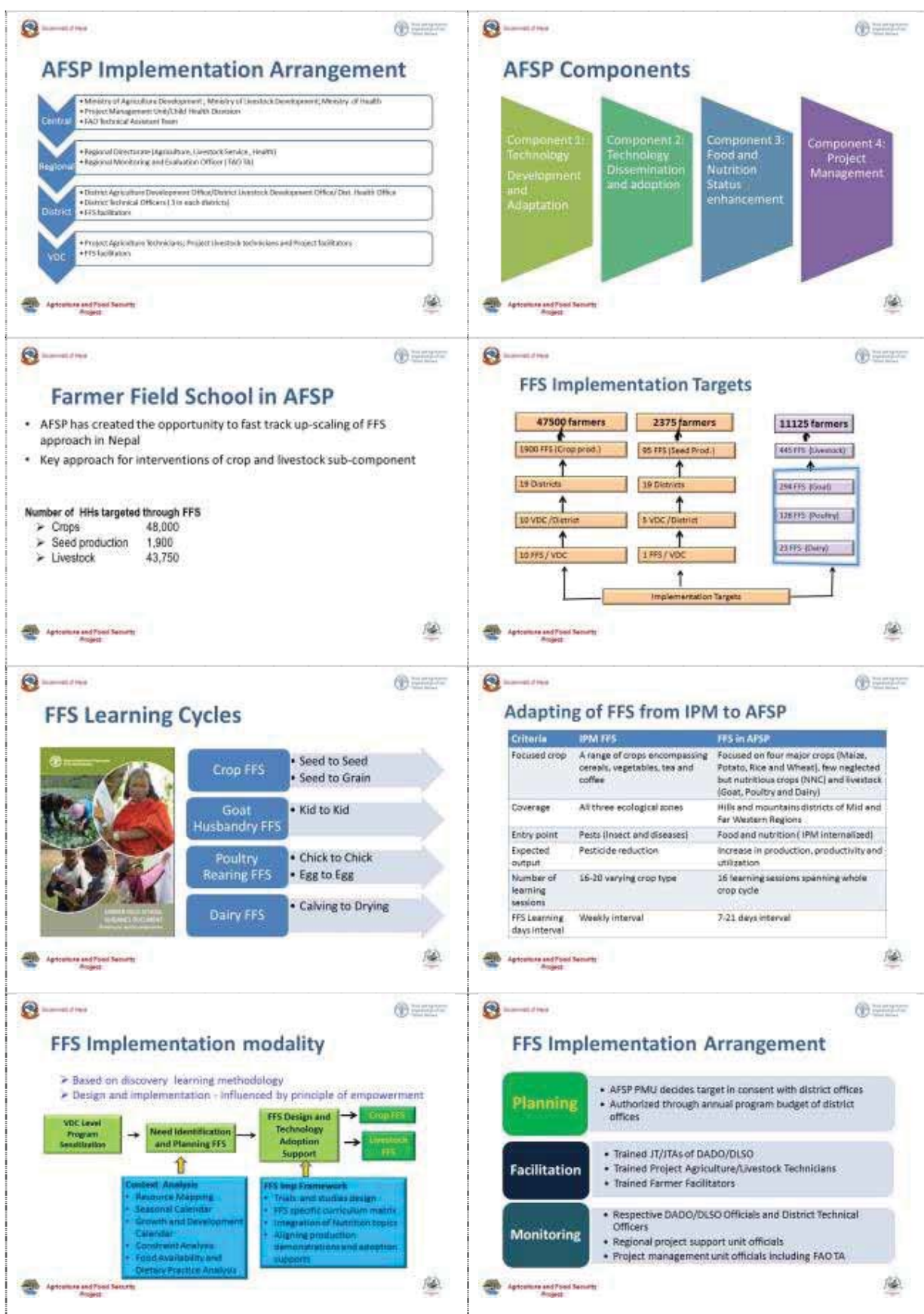
- A GAFSP funded and GoN-led project (Jan 2013- Dec 2017)
- WB as supervising entity and FAO as technical assistance
- An USD 58 million large scaled, multi-sectoral, multi-dimensional project
- Led by MoAD, co-led by MoH and MoLD
- Covers 12 Mid-western and 7 far western districts : Several Geophysical constraints

#### Project Development Objective

Enhance food and nutritional security of targeted communities in selected locations of Nepal

Food security	Nutrition security
through increased food availability, made possible by increasing productivity of agriculture, both crop and livestock.	through improved dietary intake, made possible by promotion of diversified diets, and improved feeding and caring practices for pregnant and nursing women and children up to 2 years of age.





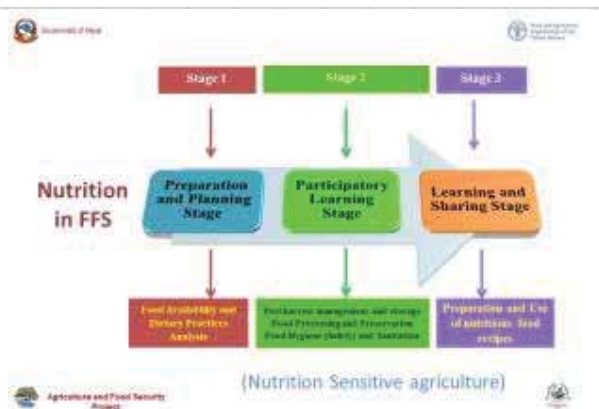




### Comparative Study in Poultry Rearing FFS (Chicks to Chicks model)

Pen No.	Existing Practice (EP)	Improved Practice (IP)	Pen No.
EP 1	4 Female + 2 Male + 1 local hen	4 Female + 2 Male + 1 local hen	IP 1
EP 2	4 Female + 2 Male + 1 local hen	4 Female + 2 Male + 1 local hen	IP 2
EP 3	4 Female + 2 Male + 1 local hen	4 Female + 2 Male + 1 local hen	IP 3
EP 4	4 Female + 2 Male + 1 local hen	4 Female + 2 Male + 1 local hen	IP 4

New Hampshire (NH) breed

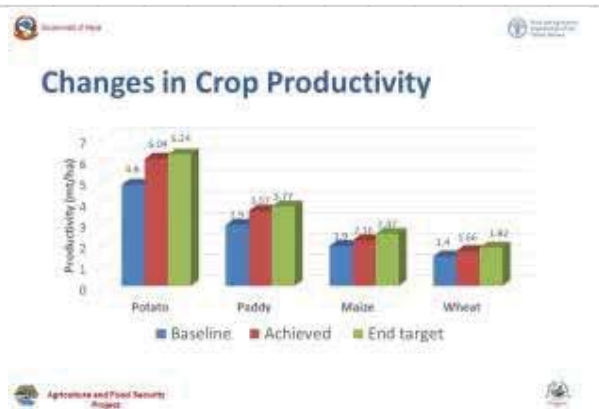


### Agro Ecosystem Analysis (AESA) Format

### Poultry Ecosystem Analysis (PESA) Format

### What we measure in FFS?

- Immediate Output:** Enhanced observation skill, speaking ability, critical thinking ability, leadership skill at individual level
- Intermediate Output:** Increased group cohesiveness and collective decision making, team work
- Outcome:** Increased knowledge and awareness, Adaptation of the interventions, Change in husbandry practices
- Impact:** Productivity Enhancement, Change in Utilization Practices



### FFS facilitation guides prepared in AFSP



## Lesson learnt

- Successful approach in AFSP context
- Innovations in FFS implementation process
  - Location specific crop FFS models ( Hills and high mountains)
  - Integration of optimal utilization of crop residue in livestock FFS
  - Integration of nutrition sessions in crop and livestock FFS



Experiment + Interaction (AES) = FFS  
FFS - Interaction (AES) = Demonstration



## Quality Issue

- Any compromises made in FFS process lead to inadequate opportunities for experiential learning by farmers.
  - Concession in the training curriculums (TOF or FFS)
  - Overloaded responsibility of FFS facilitators
  - Inadequacy of FFS facilitators
  - Inadequate readiness for FFS facilitation
- Shifting up of facilitation to teaching



## Adaptation of FFS approach in Nepal



## Ways forward

- Advocacy about FFS quality
  - Translate FFS guidance document in Nepali
  - Improve Facilitation, stop teaching
- Institutionalization of FFS process
  - Develop National FFS guidance document
- Organize FFS facilitators (e.g. TITAN)
  - Refresh FFS facilitators on quality parameters of FFS





Thank you





### 3.11 DISSEMINATION OF COST-EFFECTIVE ORGANIC FARMING TECHNOLOGY

by Khadga Bhakta Paudel

<p><b>"Dissemination of Cost-effective organic farming technology in Asia-Pacific region"</b> Developed by <b>Nepalese Farming Institute (NFI)</b></p> <p>Presented By: Khadga Bhakta Paudel Executive Director/ Chief Scientist Nepalese Farming Institute (NFI) Phone number: 0097714451443 Mobile number: 009779841343059 Email: kbpaulde@hotmail.com kbpaulde@nfi.org.np</p> <p> www.nfi.org.np</p>															
<p><u>The specific objectives of NFI are:</u></p> <ul style="list-style-type: none"> <li>❖ To develop technical and managerial capacity of the stakeholders on utilizing their own local resources for increased productivity and dependable eco-system services.</li> <li>❖ To develop technical capacity of the stakeholders for production of chemicals/pesticides residue free/ organic agro-products.</li> <li>❖ To develop competitive capacity of value chain actors of agriculture sector.</li> <li>❖ To enable and enhance the stakeholders' capacity for claim of carbon credit.</li> </ul> <p>NFI has been engaged in four main activities:</p> <p><b>Activities:</b></p> <ol style="list-style-type: none"> <li>1. Dissemination of Cost-effective, Organic Farming technology in SAARC Region.</li> <li>2. Dissemination of Zero Energy Cold Storage technology in SAARC Region.</li> <li>3. Dissemination of technologies for instant control of foul odor emitted by bio-degradable waste &amp; convert them into value added dynamic compost in SAARC Region.</li> <li>4. Dissemination of Hill Water Recharging Technology in SAARC region.</li> </ol>	<p><b>Farming systems in south &amp; southeast Asia</b></p> <ol style="list-style-type: none"> <li>1. Subsistence farming system</li> <li>2. Chemical based farming system</li> <li>3. High cost organic farming system</li> </ol> <p>It is therefore organic farming in developing countries is done for export market. So efforts have been made to convert above mentioned farming system into cost-effective organic farming system.</p>														
<p><b>SAAR C Summits Declarations</b></p> <ul style="list-style-type: none"> <li>• Fourteenth(2007) , Fifteenth (2008), Sixteenth(2010) , Seventeenth (2011) &amp; Eighteenth (2014) SAARC Summits and SAARC Agriculture Vision,2020 duly recognized the need to improve the present agricultural system for enhancing productivity to ensure food and nutritional security in the region. They also underscored the importance of promoting sustainable agriculture.</li> <li>• Following the Fourteenth, Fifteenth and Sixteenth declarations Multi-stakeholder Dialogue was held in Dhaka (10 October 2010) with extensive discussion on the theme 'Management of Soil/ Land- towards Sustainable Agriculture in South Asia'. The Multi-stakeholder Dialogue &amp; TCARD noted sustainable, cost-effective organic farming concept introduced by Nepal.</li> <li>• Pursuant to the Multi-stakeholder's Dialogue and Sixth Meeting of the Technical Committee on Agriculture and Rural Development (Dhaka, 10-12 October 2010), the Government of Nepal convened a Regional Workshop with the expert group on "Up-Scaling of Sustainable Eco-friendly farming technology focused on beneficial microbes (Jeevatu) – in SAARC Region " in Nepal, Dhulikhel 5-6 July 2011 to discuss and develop the project further.</li> </ul> <p>www.nfi.org.np</p>	<p><b>Introduction of Jeevatu</b></p> <ul style="list-style-type: none"> <li>• Jeevatu is a consortium of non-poisonous, eco-friendly, cost-effective, natural beneficial microbes found in Nepalese natural condition.</li> <li>• Jeevatu has been proven to manage a diverse range of soil, crops, &amp; medicinal plant problems in different agro-ecological zones from terai (60 masl) to (3200 masl) of Jumla district</li> </ul> <p>www.nfi.org.np</p>														
<p>Natural beneficial microbes in Jeevatu as per report of accredited laboratory of Ministry of Agriculture Developmet, Kathmandu</p> <table border="0"> <tr> <td>• Trichoderma sps.</td> <td>2.3 * (10)<sup>3</sup></td> </tr> <tr> <td>• Azotobacter sps.</td> <td>4.1 * (10)<sup>3</sup></td> </tr> <tr> <td>• Bacillus sps.</td> <td>9.9*(10)<sup>4</sup></td> </tr> <tr> <td>• Pseudomonas sps.</td> <td>2.1 *(10)<sup>3</sup></td> </tr> <tr> <td>• Lactobacillus sps.</td> <td>3.2 * (10)<sup>3</sup></td> </tr> <tr> <td>• Yeast mold mold</td> <td>2.4* (10)<sup>5</sup></td> </tr> <tr> <td>• Total plate count</td> <td>2.8 * (10)<sup>7</sup></td> </tr> </table> <p>www.nfi.org.np</p>	• Trichoderma sps.	2.3 * (10) <sup>3</sup>	• Azotobacter sps.	4.1 * (10) <sup>3</sup>	• Bacillus sps.	9.9*(10) <sup>4</sup>	• Pseudomonas sps.	2.1 *(10) <sup>3</sup>	• Lactobacillus sps.	3.2 * (10) <sup>3</sup>	• Yeast mold mold	2.4* (10) <sup>5</sup>	• Total plate count	2.8 * (10) <sup>7</sup>	<p><b>Scientific Background of Jeevatu</b></p> <ul style="list-style-type: none"> <li>&gt; Jeevatu has been proven to manage diverse range of plant nutrition &amp; protection problems as well as mitigate adverse effects of Climate Change.</li> <li>&gt; Beneficial, natural microbes of Jeevatu have been analysed/ identified &amp; certified by Central Department of Microbiology, Tribhuvan University as well as accredited laboratories of Ministry of Agriculture Development.</li> <li>&gt; Jeevatu based technologies have been recognized/verified and approved by several reports (NARC, NARDF, PACT &amp; SDF) National and International Seminars/Symposiums.</li> <li>&gt; Tea produced using Jeevatu by Himalayan Shangri-la Tea Producers (P) Ltd. Nepaltar, Ilam has been certified by NASAA (Australian and International Organic Certifier)</li> <li>&gt; Jeevatu is a permanent registered product in Ministry of Agriculture Development &amp; Ministry of Industry.</li> </ul>
• Trichoderma sps.	2.3 * (10) <sup>3</sup>														
• Azotobacter sps.	4.1 * (10) <sup>3</sup>														
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• Total plate count	2.8 * (10) <sup>7</sup>														



### Impacts of the technology

## Contribution To

- Increase crop productivity.
- Achieve permanent, dependable food & nutrition security.
- Increase farm income by the sell organic agro-products.
- Improve of public health.
- Increase employment & income generation opportunities by conversion of subsistent, high cost organic & chemical based farming into cost-effective organic farming system.
- Manage problems related to city/rural waste (sewage and sewerages).
- Sequester CO<sub>2</sub> through increased soil organic matter. Jeevatu based technology can easily increase one per cent soil organic which sequesters 88 metric ton of carbon dioxide per hectare/year.

### Sustainability of the Technology

- Economy – Highly cost-effective, maximum return on investment.
  - Simplicity- To be understood by any illiterate person.
  - Adoptability – Non-poisonous and easy to adopt by any society.
  - Eco-friendly – Jeevatu is highly selective to control pest problems but does not harm to beneficial insects like bee.
  - Availability – Materials required for multiplication of Jeevatu are easily available in any farming community.
  - Diminishing use – If the use of chemicals stopped, the need of Jeevatu decreases as the microbes continue multiplying in farming system.
- [www.tif.org.in](http://www.tif.org.in)

### Recognition of Jeevatu based technology

- Jeevatu based technology has managed several untended problems like rhizome rot of ginger, citrus decline, apple replant problem, white grub etc. The findings have been published in several reports (NARC, NARCF, PACTG & SDF) national & international proceedings.
- Jeevatu based value added dynamic compost has more nutritive value than normal compost which has been verified by public & private soil laboratories in Kathmandu. Such compost has also beneficial microbes to solubilize fixed nutrients and manage soil inhabitant pest problems.
- NFI conducted joint training program with Asia Pacific Center for Transfer Technology (APCTT- UN ESCAP) on **SATHET National Training Programme on Best Practices in Integrated Nutrient Management and Jeevatu Based Cost-effective Organic Farming** during 23-25 April, 2014 at Kathmandu.
- Farmers of Afghanistan, Bhutan, India and Nepal are adopting of Jeevatu based technology replacing all types chemical fertilizers & pesticides which may be verified from the visit of our working sites.
- Validation studies through field visits have been completed in Nepal by Food Security Center of University of Hohenheim, Germany under SATHET Asia project.

[www.ef.org/no](http://www.ef.org/no)

Krishi Vigyan Kendra (KVK) Rohru, Shimla of Dr.  
Y. S. Parmar University of Horticulture & Forestry.  
Solan, H.P., India mentioned

- "With the use of Jeevatu the fertility status of the soil was improved and the yield of quality apple fruit was also increased, in addition to maintaining the vegetative and reproductive balance in the tree. The income of the orchardists at the project sites which was earlier approximately ranging between 5 to 6.0 lakhs was increased from 8.0 to 9.0 lakhs per ha/year".

[www.nfi.org.nz](http://www.nfi.org.nz)

**Annual Report of Soil Science Division, NARC and Horticulture, 2008/09 and 2009/10 "Disseminating Pesticide Residue Free Tomato Production during Rainy/Autumn season in the Mid Hills of Nepal".**

Studies done by Soil Science Division and Horticulture Research Division, Nepal Agricultural Research Council, Kathmandu on tomato crop at Sharda Batase-10f Kavre (hill) district suggest average increased soil fertility in terms of organic matter percentage, nitrogen percentage, available phosphorous Kg/ha and available potash Kg/ha were 1.25, .062, 150.83 and 602.5 respectively after the harvest of tomato 143 metric tons/ha (Annual Report of Soil Science Division, 2008/2009). During the growth of the fruit of tomato, the calcium deficiency was observed in all experimental plots which were successfully managed by the drenching of Jeevatu based organic liquid manure, two times in a week, in 1:4 ratios (one part Jeevatu based organic liquid manure and four parts of water). The result reveals that organic liquid manure can also supply micronutrients needed by the crops. Further, it has been noted that the tomato produced by the use of such eco-friendly technologies, can be kept at room temperature for 3-4 weeks in Kathmandu. The tomato crop was infested by insect pests (aphid, tomato boll worm, caterpillars, white fly, white grub and red ant) and infected by diseases (damping off of seedling, late blight, early blight, collar rot, Septoria leaf spot and powdery mildew).

[www.rf.cpa.ru](http://www.rf.cpa.ru)

### Techniques to use Jeevatu

- **Direct Use of Jeevatu**
  - ❖ As prophylactic spray, 50 ml of Jeevatu should be mixed in 950 ml of water and can be used twice a week to manage various pest problems on crops.
  - ❖ As curative spray, 10% solution (6 liters, water + 3 liters, cattle urine + 1 liter, Jeevatu) of Jeevatu can be used daily till the targeted pest controlled.
  - ❖ Mosquito & other household pest can be controlled by the use of Jeevatu.
  - ❖ Multiplication of microbes of Jeevatu
- **Jeevatu For Compost Preparation**
- **Jeevatu For Organic Liquid Manure 1, 2 & 3**

some of our

Value added dynamic Jeevatu based  
compost

www.ef.com

[illegible]



## Compost sources and its nutritional status

Parameters	Jeevatu based compost	Ordinary compost/ FYM	Mo A D Rec.
Nitrogen (N%)	2.28-4.025	0.2-0.3	>1.5
Phosphorous (P%)	0.51-1.125	0.1-0.2	>0.5
Potash (K%)	1.51-2.250	0.3-0.5	>1.5

\* Mo A D = Ministry of Agricultural Development, Nepal

Jeevatu based compost consist of natural beneficial microbes to accumulate (nitrogen), solubilize the fixed nutrients (like phosphorous) and control soil inhabitant pest problems which are additional advantages of Jeevatu based compost.

More than 100 times more quantity of high quality compost can be availed to farmers by Jeevatu based approach.

[www.nfi.org.np](http://www.nfi.org.np)



## Preparation of Organic Liquid Manure



## Organic Liquid Manure - 1

### Materials Required:

Compost Based (25 -33 Kg Well Decomposed Compost/FYM + 1 liter of Jeevatu + 25-33 liter Cattle Urine +25-33 Liter water)

Choose an open sunny place and make a circular pit measuring 1 feet depth and 2 feet in diameter



Smoothing the pit surface by raw cattle manure to increase the temperature and maintain the uniformity



Tying the one end of 500 gauze, 4 feet long 3 feet wide plastic sheet



Making it airtight



Putting the tied plastic bag inside the pit



Put 25-33 Kg of well decomposed compost inside the plastic bag



Shake the bottle nicely and pour 1 litre on the well decomposed, fine compost and mix thoroughly



Pour 25-33 litre of cattle urine



Pour 25-33 litre of water in the plastic bag



Mix compost, cattle urine and Jeevatu thoroughly



Mixing the compost



Tying the other end of plastic bag



Organic liquid manure in course of preparation





Open the bag, stir the mixture thoroughly; twice a week



Ready to use: Greenish growth and no off smell  
In warmer weather: It will take 15 days  
In cooler weather: It will take 30 days



**Method of application**  
Mix organic liquid manure -1 thoroughly, take 1 litre and add 3 litre of water ; drench on root zone twice a week



Nutrient Deficiency + Disease and Insect Pest which are in the root zone and under the soil. That is used for Drenching Purpose

## Organic Liquid Manure-2 Cattle Urine Based

**Materials Required:**  
(37.5-50 liter of Cattle Urine +  
37.5-50 liter of Water + 1  
liter of Jeevatu)

Pour 37.5-50 liter of cattle urine



Mix 1 liter of Jeevatu



Pour 37.5-50 liter of water and mix thoroughly



Organic Liquid Manure-2(76-101 liter)



Open the bag and stir it twice a week



**Indicators:**

- Greenish growth inside the plastic
- Absence of off flavour

### Organic Liquid Manure-3

#### Materials Required:

(100 liters of Water + 2Kg of mustard cake + 1 liter of Jeevatu)

100 liters of water + 2 Kg mustard cake + 1 liter Jeevatu



Putting 2Kg. mustard cake in water



Pouring one liter Jeevatu



[www.nfi.org.jp](http://www.nfi.org.jp)

Mixing thoroughly

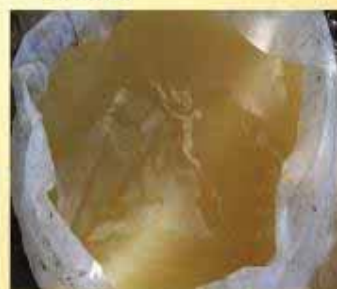


[www.nfi.org.jp](http://www.nfi.org.jp)

Organic Liquid Manure-3(101 liters)



Open the bag and stir it twice a week



#### Indicators:

- Yellowish colour & whitish growth inside the plastic bag
- Presence strong flavour of mustard oil



## How to apply this product

### • Organic Liquid Manure - 3 (Mustard cake Based):

Disease and Insect Pest Problems which are above the Ground level.

This is used for Spraying Purpose  
Save crops from Nilgai/ Blue bull  
(*Boselaphus tragocamelus*)

### A. Prophylactic Application

- Take 1 litre of organic liquid manure-1 & 2 should be mixed with 3 litre of water ; twice a week

### B. Curative Spray

- 1 part of organic liquid manure-2 should be mixed in 1 part of water, spray daily till the pest problems is managed

### C. Curative Spray

- Organic liquid manure-3 should be used directly for the control any insect pest & diseases; twice a week &
- After the control of pest problem, the spray should be scheduled as prophylactic spray.

Annual report, National Agriculture Research Development Fund, (NARDF) 2009; "Introduction of High Value Low Volume Cash Crops for Income generation in Karnali Zone"

1. Himalayan cumin : *Carum bulbocastanum* Syn *Bunium bulbocastanum* Syn *Bunium persicum*
2. Himalayan Sup/ Caraway: *Carum carvi*
3. Saffron: *Crocus sativus*

Himalayan cumin

Himalayan Sup

Saffron



Annual report, NARDF, 2011, "Domestication of Non Timber Forest Products in Karnali Zone"

1. Jatamansi (Spikenard, *Nardostachya grandiflora* DC, syn. *Nardostachya jatamansi* DC)
2. Kutki (Gentain, *Picrorhiza kurroa* Royle ex Benth)
3. Paanch Aunle (Salap, *Dactylorhiza hatagirea* (D. Don) Soo, syn *Orchis latifolia* L).

Kutki (*Picrorhiza kurroa*)

Jatamansi (*Nardostachya grandiflora*)

Paanch Aunle (*Dactylorhiza hatagirea*)



White grub infestation on *Picrorhiza kurroa* Royle ex Benth which has been controlled by the application of Jeevatu based organic liquid manure



## Jeevatu based organic rice farming



www.nf.org.np

## Organic production of Kasturi; yield 3 tons/ hectare



www.nf.org.np



## Organic wheat production



www.nri.org.np

## Control of Rhizome rot of Ginger:

Dr. Bharat Poudyal, Chief, Central Vegetable Seed Production Centre, Department of Agriculture, Khumaltar, Lalitpur, Nepal.

### Rhizome rots of Zinger



### Control of Rhizome rots of zinger by Jeevatu based organic liquid manure



## Control of Root Knot Nematode on Tomato by the application of Jeevatu based organic liquid manure ;

Dr. Bharat Poudyal, Chief, Central Seed Production Centre, Department of Agriculture, Khumaltar, Lalitpur, Nepal (Received Best Presenter Award in International Symposium, SEAVEG-2012 in Thailand)

### Tomato Root knot Nematode (control Plot)



### Tomato Root knot Nematode (treated by Jeevatu)



## Mentioned in Annual Report of Horticulture Research Division, Nepal Agriculture Research Council, 2009/10 "Management of Club Root in the Hills of Nepal."

### Club Root of Cauliflower



### Club Root Management by Jeevatu



Fig: Apple tree infected with woolly aphid  
Date: 11<sup>th</sup> Sep 2011

DISTRICT: PHAGMAN  
Afghanistan

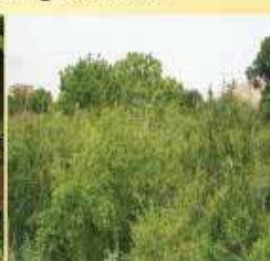


Fig: Apple tree after spraying Jeevatu  
Date: 15<sup>th</sup> Sep 2011

## Kholm District, Afghanistan



Treated by Jeevatu based technology

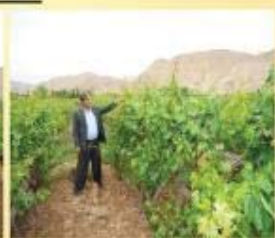


Available best practices

## Management of Grapes Vein Yards



Treated with Jeevatu based Organic Liquid Manure



Available best practices Vein Yards





## Management of Woolly Aphid Site: Damchena, Bhutan

Woolly aphid



Treated by Jeevatu based technology



## Management of Stem Black of Apple, Bhutan

Stem Black of Apple



Treated by Jeevatu based technology



## Healing on infected parts of stem black, Damchena, Bhutan



## Management of Premature Leaf Fall, Damchena, Bhutan



Available best practices



Treated by Jeevatu based technology

## Management of Cedar Rust of Apple, Damchena, Bhutan



Available best practices



Treated by Jeevatu based technology

## Himachal Pradesh

### Implementing Agency:

Krishi Vigyan Kendra (Rohru), Dr. Y.S Parmar University Of Horticulture and Forestry, Nauni, Solan.

### ZECS Sites: (4)

1. Dalog : Apple
2. Dalgaon: Apple
3. Devidhar: Apple
4. KVK, Roharu: Apple

### Nodal Officer:

Dr. NARENDER SINGH KAITH- PROGRAMME COORDINATOR (KVK) Krishi Vigyan Kendra

www.nf.org.sp

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## Management of Apple Re-plantation Problem in Himachal Pradesh

Available best practices



Treated by Jeevatu based technology









Chemicals used rice



Jeevatu used rice



## Quality production Training in Afghanistan



www.nfi.org.np

## Quality Production Training in Bhutan



www.nfi.org.np

## Quality Production Training in Himachal Pradesh, India



www.nfi.org.np

## Quality compost Production Training in Nepal



www.nfi.org.np

Compost Treatment

## Apples stored in Zero Energy Cold Store, Jumla



www.nfi.org.np

Some Photos of His Excellency Ambassador India ,His Excellency Ambassador Germany and delegates at Second International Trade Fair from 8<sup>th</sup> to 13<sup>th</sup> March 2013 Organized at Brikutimandap, Kathmandu



## Benefits to economy & social development

- Jeevatu based cost-effective organic farming technology enhances quality & productivity of crops at lower cost than chemical farming.
- Adoption of cost-effective organic farming system & trade organic agro-product increase employment & income generation opportunities for millions of outgoing youths.
- Substitution for billions spent on chemical pesticides and fertilizers
- Value chain actors develop capacity of competitiveness in the trade due to decrease cost of cultivation & increase quality of agro-products
- Any competitors adopting any other technology & receiving any amount of subsidy cannot compete in market in terms of quality & price

www.nfi.org.np



## 3.12 DEVELOPING IPM PACKAGES FOR VEGETABLE CROPS

by Lalit Prasad Sah

### Developing IPM packages for vegetables crop and its dissemination in FtF districts of Nepal

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ATP/CEAO/Workshop on Empowering Farmers through FFS/IFM (Training) Support of Sustainable Intensification of Crop Production within context of Climate Change

Royal Sleg Hotel, Dharan, Kailashnagar, February 28, 2017 Tuesday

### Highlights of the Presentations

- Introduction
- Components of IPM packages
- IPM packages for vegetables
- Technologies transfer
- IPM learning Center
- CBF model and approaches for supply chain strengthening
- Challenges in Vegetables IPM
- Tata in Nepal and IPM solutions for its managements
- Conclusions
- Way forwards

### IPM Innovation Lab Asian Countries

◆ A USAID-funded multi-year investment globally led by Virginia Tech University in USA with Consortium of Penn state, Washington, Ohio state, USA, University.

### IPM Innovation Lab

- **Global Program Nepal (2009-14):** Verifying IPM packages / technologies for major vegetable crops in cooperation with NARC/DOA
- **Nepal Mission Associate Award (2013-16):** Provide models, training, and technical support for the FTF initiative to scale up IPM for the vegetable subsector
- **Global Program Nepal (2015-2019):** Support to scale IPM for FTF, improve/new tech packages, special areas study on Tuta, viral diseases, train for biopesticides.

➤ Nepal led by IDE with CEAPRED, HICAST strong partnership with NARC, DOA/PPD, AFU, Agricare/Private Partners, others. (Linked to Horti Lab, Climate Change Lab)

➤ Main IPM Sites Banke, Surkhet (Vegetables research sites) and Lalitpur for technology demos sites with special areas (include Tuta, viral diseases, train for bio tech)

### FTF districts (20 districts)

Legend:

- Blue: Southern zone: 4 districts (Palpa, Nepal, Arghakhanchi and Kapilvastu)
- Green: Western zone: 3 districts (Banke, Bardiya, Topkesh, Dabke, Jagdoh)
- Yellow: Eastern zone: 3 districts (Dang, Pyuthan, Palpa, Salyan and Panchthar)
- Red: North Western zone: 4 districts (Jajarkot, Kanchanpur, Doti, DOL, Mohana and Dardak)

## Major Highlights

### IPM Packages for Vegetables!

- Packages for Tomato, Cauliflower, Cucumber, Bitter gourd tested and verified!
- Diffusion of these packages thru various USAID and non-USAID projects in FtF districts along with some DADO's.

### Major Components of IPM Packages

- Seed treatment using Trichoderma and Pseudomonas
- Use of seedling trays with Coco-peat
- Soil solarization (nursery)
- Nursery/seedling dip with Trichoderma
- Raising virus infested plants
- Grafting on resistant rootstock for bacterial wilt and others diseases
- Use of traps for monitoring and taking necessary action depending upon thresholds
- Yellow sticky traps for aphids, leafminer and others

### Major Components of IPM Packages

- Nursery nets against virus transmitting insect vectors
- Destruction of crop residues from earlier infested plantings
- Use of botanical pesticides (neem based pesticides)
- Locally prepared pesticides (Jhol-Mol)
- Use of trap crops e.g Mangold
- Application of bio pesticides (Metarhizium, Beauveria, Trichoderma, Psuedomonas etc)



## Components of IPM Packages for different vegetable crops

Component	Tomato	Cucumber	Brinjal	Okra	Chilli	Peas
Seed treatment with Trichoderma viride (4g/kg)	X	X	X	X	X	X
Seed treatment with Pseudomonas @ 10 g/kg of seed	X	X	X	X	X	X
Seed Sterilization (seed bed)	X	X	X	X	X	X
Nursery + seedling dip treatment with Pseudomonas @ 10 g/lit of water	X	X	X	X	X	X
Use of yellow sticky traps	X	X	X	X	X	X
Clipping of shoot borer-infested terminals/Rouging virus infected plants	X	X	X	X	X	X
Nursery nets against virus transmitting insects	X	X	X	X	X	X
Pheromone traps (Lecanodius, Heliothis, Spodoptera, Cus-cus, TLM larvae)	X	X	X	X	X	X
Disturbance of crop residues from earlier infested plantings	X	X	X	X	X	X
Application of Neem products (Azadirachtin based formulations/ NSKE 5%)	X	X	X	X	X	X
Need based Application of Bio-Pesticides	X	X	X	X	X	X

## IPM Package: Tomato



## IPM Package: Tomato



## Public Private Partnership for Last Mile Supply chain Development - Community business facilitators (CBFs)

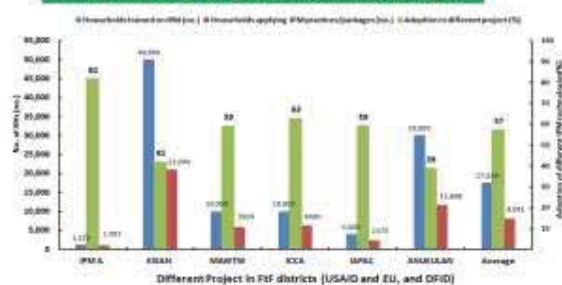


## Technologies Diffusion

### Collaboration with Value Chain Project

- USAID Knowledge-based Integrated Sustainable Agriculture and Nutrition (KISAN) project
- USAID Food for Peace Project/PAHAL
- ICCA/MAWTW and other EU & DFID Funded projects
  - Expand and disseminate verified IPM components and packages
  - Demonstration of IPM technologies - IPM components and Learning Center in all 14 FIF districts
  - Regular trainings to the staffs / 107 KISAN staff members were trained in IPM approaches. Reports provided by the KISAN team suggests that 21,064 farmers (MF: 7461/13543) have applied IPM practices and packages. 65 staffs trained (private sector & GoN)
  - Over 67404 Hts reached with IPM-Lab technologies/packages (different project)

## Adoptions of IPM practices and packages



## Information Communication Services

### Bulk SMS system: Using ICT in Agriculture

Platform: Smiles Group (ict4agriculture)  
Interface: IDE Nepal  
Collaborative Project: IPMIL, IAPAC, MAWTW  
Piloting district: Sirkhet, Rupsa, Kailali



## Improving local capacity thru trainings and workshops

- GOs/NGOs staffs on IPM packages/components thru trainings, workshops and exposure visit
- 122 trainings/workshops and other capacity building events for farmers, government personnel (such as scientists, extension officer), projects (e.g. KISAN), private sectors, NGOs and community based organizations.
- Our record indicates that there were altogether 2,366 (1,069/1,297: M/F) participants
- Of this total number 43 were from the government sector, 168 were from the private sector and 123 were from civil society organizations and NGOs.



## IPM Learning/Demonstration Center

- 2 valued extension concepts (also: basic pillars of these centers)
  - ✓ "Learning by doing" and
  - ✓ "Seeing is believing"
- 6 Demo centers developed (2 each in Banke and Sirkhet): IPMIL-1, DADO-1, RPPL, Khajura-1
- All the available pest management tools and techniques are on display (local/imported)
- Lead farmer who has intensive knowledge on IPM tools and techniques is in-charge in IPMIL sites
- People have appreciated this concept
- Under DOA/Regional PPD Lab, Khajura, DADO Sirkhet have also replicated this kind of center in their premises. Already started!



To bring researchers and other agriculture technicians to Learning Center to expand its concept  
To enhance the technical capacity of farmers for adoption of IPM tools and components

## Component Technologies of IPM Learning Center

- Plastic trays and cocopeat
- Soil solarization
- Nylon nets in nurseries
- Plastic mulching
- Pheromone traps (funnel traps, delta traps, water traps, soap-water traps)
- Other insect traps (light traps, sticky traps, pitfall traps, yellow pan traps)
- Drip Irrigation
- Tricho-compost
- Marigold Plantings
- Jhok-mol
- Insect specimens for display
- Information board with IPM products currently available in market with list of agro-vels where they are available.



## Update - IPM Lab Tuta Absoluta

- Outbreak in 2016, rapid test of IPM Solutions
- Plan to verify /demonstrate IPM solutions simultaneously working with GON
- Will provide training for IPM solutions to Tuta

Tuta Video



- Asian Vegetable IPM Lab assisted Climate Change IPM Lab to conduct regional Tuta Symposium (Jan. 2017)



## Conclusions

- IPM packages, which are dynamic and need-based approaches, are very important in the current context of rapidly changing pest context;
- Building capacity of local scientists and extension officers will be a key.
- Improving lab facilities and training field technicians in diagnosis of plant diseases, insects and mites, and developing an operation system for identification and diagnosis will be very important.
- Supply chains agents that are able to supply pest control technologies, seeds and other agricultural inputs to the farming communities need to be developed.
  - It is very important to assure that these inputs and supplies are available **in the right quality, at the right time, and in the right place** for farmers to access what they need at a reasonable price.

Continued

- The promotion of IPM practices and packages requires a whole set of factors beyond pest control. **Proper certification of IPM produce** is one of the major factors. There are difficulties for a country like Nepal to guarantee and certify IPM grown produce due to lack of expert knowledge in production and certification.
- The role of mobile communications technology is increasingly allowing information to be shared in real time, linking stallholders and cooperatives to local, national, and international business and markets in ways that have not previously been possible. These tools allow farmers to make better planting decisions, reduce post harvest loss and crop damage due to insect, pest and weather while increasing access to markets. Wherever it is affordable and applicable, mobile technology should be used to improve communication and simplify logistics.

## Challenges in vegetable IPM

- Lack of consumer awareness on IPM vegetable produce
- Diagnosis and management of Viruses in vegetables
- Technology transfer
- **Open border:** change of cultivar/hybrid season after season
- **Supply chain of IPM products**
  - Lures, traps and bio-products are still imported from India
- National level issue certify health produce

## Way forward

- Develop last mile supply chains to promote IPM solutions in PPP
- Promote IPM-based certification thru rural collection centers using truth in labeling
- Need to form a working group for practical considerations for extending IPM technologies.
  - For example activating and strengthening the mechanism for NARC recommended technologies to be include in the DOA program thru regional technical committees.
- As Tuta absoluta is a **major national issue and requires a coordinated approach to extend the best science to control Tuta and mobilize resources.**
- **Formation & mobilization of PPFD-DOA led Task Force** to update and disseminate best current control technologies to promote testing and verification of IPM solutions (IPM Innovation Lab can facilitate, support accessing best international science and verification of technologies)
  - **Extension of Best Control Technologies.** Based on task force recommendations orientation and training to public sector, private sector, development programs/projects, farmers/extension field schools, and others (IPM Lab can facilitate supporting materials/training activities)
  - **Plant quarantine division**-sensitizing the problem at plant quarantine check post
  - **Raising awareness through mass media**
  - **Recommendations for alternatives crops for farmers unable to adopt control tech**

Contd.

## Way forward for Tuta managements

- Establish network between scientists from Asian Countries for cross country information sharing and international linkages.
- Capacity building programs from both Gov. and Non-Gov. sector for proper detection and identification of pest at different levels, for scientists, technicians and the farmers.
- Development and dissemination of field kits for proper identification and leveling of pests and its natural enemies.
- Preparation of a visual guide for its identification and management.

Continued

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## Thank you!!!

Any Questions?



IDE

Photo by Binata Rai Colaninno, IDE Volunteer  
(see related materials and videos on IDE website: [www.ideglobal.org/](http://www.ideglobal.org/))



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### 3.13 SUMMARY

#### *Pesticide Risk Reduction: Results of a long-term impact assessment – Gerd Walter-Echols*

In 2015, surveys were conducted in Cambodia and Vietnam to determine the long-term impact of the IPM-FFS risk reduction programmes in both countries. The results were compared with data from the 2008 baseline survey and the 2010 impact survey, which was done one year after training on pesticide risk reduction. While the short-term impacts in 2010 were largely the result of a single intervention – the FFS –, the long-term impacts were additionally affected by a variety of post-FFS activities such as community actions, GAP and organic production training, local regulations and national legislation. While the long-term impact cannot be pinpointed to specific causes, results showed that in 2015 there was a lasting increase in knowledge among community officials and farmers, and pesticide shops still operated more safely. Pesticide use in both countries was roughly half of 2008 (though notably less among FFS participants than control farmers), and highly toxic pesticides were no longer in use. As a result, fewer poisoning cases were reported and ecosystems had become richer. It can be concluded that in both countries pesticide risks have been effectively reduced for more than six years after the IPM-FFS training with lasting benefits to individual farmers and their communities.

#### *FFS Institutionalization and networking for up-scaling agroecology in Asia – Alma Linda Abubakar*

Since current global food systems are not sustainable, a transformation is needed which requires changes in field practices, farm management and mobilizing farmer knowledge and learning systems. To discuss the institutionalization of FFS, a regional workshop was organized in Bangkok, Thailand in May 2016. The objectives of the workshop were to (1) share and learn from country experience and lessons learned on institutionalization, (2) develop action plans for operationalization of FAO's FFS Guidance Document; and (3) assess needs and interests for a regional FFS network in Asia. The workshop concluded that one should make use of the existing Asian regional FFS networking platforms such as the Field Alliance or the FAO Regional IPM Programme, as well as informal social networks such as *Line* or *Facebook*. The workshop adopted a resolution to urge FAO to take the lead in institutionalizing the FFS learning system and to set up FFS support centres. It called on governments to ask FAO for support in the institutionalization process, and it urged all other stakeholders to join hands in institutionalizing FFS.

#### *FAO Farmer Field Schools Guidance Document: An outline – Alma Linda Abubakar*

In April 2016, FAO published an FFS Guidance Document (<http://www.fao.org/3/a-i5296e.pdf>) for planning FFS programmes. It addresses concerns over the quality of FFS programmes while maintaining its uniqueness and flexibility. The chapters of the document cover key elements of the FFS approach, designing a programme, developing human capacities, defining the content, monitoring, evaluation, impact assessment, budgeting and building on the basic FFS learning cycle. It is hoped that the Guidance Document would start a constructive collaboration among FFS experts and programmes around the world, and that it would assist producers and their communities in achieving sustainable food production and improved livelihoods for their families and children.

#### *Climate change adaptation in agriculture through FFS: An experience sharing from Nepal – Madhu Sudan Paudyal, Binod Saha and Krishna Prasad Pant*

Nepal is experiencing more prolonged and frequent droughts, as well as erratic onsets and cessations of the rainy season. Combined with the degradation of land and forest cover, this has increased the vulnerability of the rural population. Working in four districts, the project “Climate Change Adaptation in Agriculture through Farmer Field Schools” established 120 FFS for community sensitization, testing and validation of adaptation technologies. In the wheat/goat based FFS, farmers experiment with

drought resistant varieties, minimum tillage, soil/water conservation measures, use of organic matter, balanced fertilization, mulching and drip irrigation. The agroecosystem analysis includes the use of agro-meteorological data collected with mini-weather stations. It was concluded that FFS is a suitable approach to involve communities in climate change adaptation.

*Innovations in IPM-FFS and adaptation to climate change – Cahyana Widyastama*

The FIELD Foundation has applied the FFS approach in a variety of innovative applications such as ecological vegetables and sweet potatoes; estate crops; family food security, nutrition and health; plant breeding; watershed management; eco rice and rice-fish; multi-purpose trees; living food bank; biogas; water and sanitation; and understanding climate and its impact on the village. Save & Grow FFS included anticipation for abnormal climates such as too much or too little water, and how to “read” the climate and wrong onsets of the rainy season. Farmers screened for drought and salinity tolerant varieties, and learned to improve the water holding capacities of their soils. Furthermore, they developed technologies to mitigate the impact of climate conditions by transplanting older rice seedlings to adapt for water salinity or growing appropriate crops and varieties adaptive to new climate conditions.

*IPM Development in support of Save & Grow in Thailand – Paveena Konyong*

Because most Thai farmers are small-scale and vulnerable to natural disasters, the Government has launched a new policy of encouraging large-scale farming as a way to enhance farmers’ knowledge, increase their bargaining power and reduce production costs. This transition will be supported by 882 Agricultural Learning Centres which assist communities in the new integrated approach. These centres apply participatory learning curricula in an FFS setting for IPM, GAP, soil and fertilizer management and marketing. In 2016, 600 large-scale farms participated in the programme for rice, dry crops, orchards, vegetables, mulberries, livestock and fish farms. The Department of Agricultural Extension is using IPM-FFS as a tool to disseminate knowledge to the member farmers of the Agricultural Learning Centres. The expected outcomes are a 20% cost reduction, an increased marketing efficiency, a 20% higher income for the farmers, and a sustainable production based on the needs of the community.

*Linkage of IPM-FFS with Plant Clinics in Nepal – Dilli Ram Sharma and Vinod Pandit*

CABI is promoting the *Plantwise* programme for improving plant health systems in developing countries by establishing a network of plant health clinics that deliver advice to farmers. In Nepal, *Plantwise* was launched in 2012 and now operates 38 clinics in four regions of the country. It promotes locally based IPM strategies, gives technical backstopping and diagnostic support with access to a global knowledge base. Synergies between FFS and *Plantwise* are utilized and FFS farmer facilitators were trained as plant doctors who can deliver quality services even in remote areas.

*A success story of rapid Bioassay Pesticide Residue Analysis in Nepal – Dilli Ram Sharma and Man Bhadaur Thapa*

Misuse of pesticides leads to excessive residues on agricultural products, particularly on vegetables. As a way to reduce pesticide residues and to monitor the situation, the Nepal Government has decided to establish a Rapid Bioassay Pesticide Residue laboratory in Kathmandu in 2014. Since then, six more laboratories were established in the country. Using a spectrophotometer, the bioassay method measures the amounts of AChE in a sample via an enzymatic reaction. Samples that show an inhibition of more than 45% are considered unsuitable for human consumption. So far, a total of 4588 samples were analysed, of which 61 were found above 45%. Almost half of these excessive samples were found in the first month after laboratory establishment; after that, farmers became more careful since they were afraid that their shipment would be confiscated. It was found that off-season



vegetables, particularly tomatoes and cauliflower, were prone to excessive residues. Due to the extensive media coverage and public concern, the laboratory has had a positive impact on the pesticide residue situation even though its detection range is quite limited and the enforcement procedures are difficult to carry through.

#### *Intensification and institutionalisation of IPM-FFS in Nepal – Binod Saha*

The national IPM Programme in Nepal exists since 1997. From 2008 to 2013 was the Consolidation, Upscaling and Institutionalization Phase of the programme that linked the plant protection services with research institutions, educational institutions, public and private support organizations and farmer groups. Within year-long IPM-FFS that covered the farmer group's entire cropping system, the programme established standard procedures for group strengthening, organized production, monitoring product certification and market promotion. The system ensured maintaining a high quality of the services and started placing the IPM-FFS curriculum in the pre-service training of agricultural graduates. It was found that FFS was a good entry point to initiate other development interventions and to promote sustainable agriculture on a large scale.

#### *FFS – an effective approach to address food and nutrition security: a case of Agriculture and Food Security Project in Nepal – Ratna Kumar Jha*

This large-scale \$58 million project by the Ministries of Agricultural Development, Livestock Development and Health covers 19 mid- and far-western districts of Nepal where food security is the lowest. A key element of the programme are the 1900 FFS on crop production, 445 on goat, poultry and dairy, and 95 on seed production. Though the FFS methodology was found highly suitable and adaptive to the variety of tasks, it was difficult to adequately qualify the large number of FFS facilitators in the available time and to maintain the quality standards necessary for experiential learning.

#### *Dissemination of cost effective organic farming technology in SAARC region: Use of Jeevatu for safe crop production in Nepal – Khadka Bhakta Paudel*

Developed by the Nepalese Farming Institute, Jeevatu is the 15-30 days fermentation product of farmyard manure/compost, cow urine and water. The final product contains a mixture of beneficial microbes which are claimed to control a variety of insect and disease problems in the soil and on plants. Furthermore, it improves the nutrient status of crops. It can be used as a low-cost substitute to agricultural chemicals and is suitable for organic farming.

#### *Developing IPM packages for vegetable crops and its dissemination in FtF districts of Nepal – Lalit Prasad Sha and Dilli Ram Sharma*

A USAID-funded collaboration project with a consortium led by Virginia Tech University, a number of IPM technology packages were developed for eggplant, tomato, cauliflower, cucumber and bitter melon and disseminated in 20 Feed-the-Future (FtF) districts. The packages include seed treatment with *Trichoderma* and *Pseudomonas*, coco-peat seedling trays, nursery soil solarisation, seedling treatment with *Trichoderma*, rouging virus infested plants, grafting for control of bacterial wilt and other diseases, yellow sticky traps, and monitoring traps for determining thresholds and many more. The technologies are disseminated through IPM Learning/Demonstration Centres. The adoption requires a supply chain to assure that the inputs are available in the right quantity, at the right time and in the right place at a reasonable price. A recent example of an IPM package development was against an outbreak of *Tuta absoluta*, an invasive tomato leafminer, in 2016 which involved trapping and drowning the insect after being attracted by a commercially available lure.

## **Discussions**

During the discussions, the following issues were raised:

#### *FFS Quality Assurance*

One of the biggest challenges of FFS is to uphold quality standards and its experiential learning orientation, and not fall back into top-down teaching in order to reach large number of farmers. The FAO Guidance Document can be used as a reference guide to assess the quality of local FFS programmes. While the Guidance document may look complicated, it can be used to write operational documents for local level applications.

#### *FFS Networking*

After 30 years of experience with FFS in the region there is enough expertise for helping each other with new challenges. There is no need to rely on external inputs. Networking must involve farmer groups and community learning centres in collaboration with technical, environmental and educational institutions.

#### *Opportunities for FFS*

Even though FFS started with IPM, it can be used in a broader context. Donors are tired of funding more IPM-FFS, but there are opportunities for FFS as an approach for climate change adaptation, organic farming, food security, etc. New opportunities require working together with new organisations and tackling new challenges. One should not just repeat past applications, but seek to overcome weaknesses and make further adaptations. The next generation of FFS experts has the chance of a fresh look at FFS and its opportunities.

#### *Plant Doctor*

Some participants expressed concerns of potential risks when the role of FFS facilitators shifts from capacity development of farmers' abilities for discovering, analysis and decision making to providing solutions and prescriptions. If there is a Plant Doctor, farmers may no longer investigate their problems.

### **Conclusion**

The examples presented at the workshop showed a great diversity of IPM and FFS approaches and demonstrated the adaptability of the FFS methodology. With the FFS Guidance Document, a universal standard for FFS has been established that can be used as a reference point for assessing the quality of FFS, something which is crucial for its successful practice. The examples further showed the long and difficult process of FFS adoption and changing the top-down technology transfer mindset into one that follows participatory learning principles. Many of the existing and newly emerging challenges show the suitability of the FFS approach for achieving lasting changes. The presentations also demonstrated that FFS is much more than a tool for IPM, but that it can be successfully applied to support SCPI in the context of “*Save and Grow*” as well as to food security, food safety and climate change adaptation.



## 4. FIELD TRIP

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On 2<sup>nd</sup> March, a field trip was organized to visit the Rapid Bioassay Pesticide Residue Laboratory in Kathmandu, and a Community IPM Resource Centre and two IPM-FFS in Kavre District, about 50 km east of the city.

### 4.1 Rapid Bioassay Pesticide Residue Laboratory

The laboratory was located in a small office at the premises of the Kalimati Wholesale Market in Kathmandu. It was established in June 2014 and is equipped with a UV spectrophotometer. For the analysis, they use test kits from the Taiwan Agricultural Research Institute as well as ethanol and bromine water. In the morning, samples are taken randomly from trucks entering the wholesale market and straightaway analysed. However, there are no provisions of holding the produce until the tests are completed and the vegetables are usually sold by the time when the results are known. In recent months, more than 95% of the samples showed no elevated enzymatic reaction. Even though the analytical detection range and enforcement procedures are limited, the activities of the laboratory make producers more careful and they are more likely to observe the waiting period before they bring their vegetables to the market.



Rapid Bioassay Pesticide Residue Laboratory at the Kalimati Wholesale Market

### 4.2 Sayapatri IPM Resource Centre, Kushadevi, Kavre, Nepal

The Sayapatri IPM Resource Centre is located in the small town of Kushadevi. It was established in 2013 by the National IPM Programme. The centre serves as a meeting place for the local IPM Farmer Cooperative, and some of the rooms are utilised to produce biopesticides with technical support provided by the Plant Protection Directorate and the District Agriculture Development Office. For the biopesticide production, there are five trained persons. In one room, entomopathogenic nematodes (*Steinernema lamjungense*) and NPV are produced, in another one *Trichoderma viride*. The final biopesticide products are packaged and sold to cooperative members and other farmers. The shelf life of the products is about one month. Last year, they produced 5000 IJ of entomopathogenic nematodes, 1300 ml of HNPV and 554 kg of *Trichoderma viridae*.

Unfortunately, the production is sometimes hampered by power cuts which requires an emergency power supply for some of the crucial instruments. There are plans to produce *Beauveria* and *Acorus calamus* dust in the future. In addition, the cooperative organizes the marketing of their IPM products

in the nearby city of Banepa, and the members test and validate IPM technologies in the field and providing technical information to the farming community.



Laboratories for the production of biopesticides at the Sayapatri IPM Resource Centre



*Trichoderma* culture and final product

#### 4.3 IPM-FFS

During the time of the workshop, the following IPM-FFS operated in Kavre District:

Name of IPM-FFS	Champadevi	Panchakanya	Laligurans	Dugdheswor
Location	Kushadevi-8	Mahendrajyoti-1	Banepa-10	Panchkhal-2
Start date	10 Jan. 2017	16 Jan. 2017	12 Dec. 2016	Nov. 2016
Crop	Cabbage	Potato	Cauliflower	Cauliflower
Participants (female+male)	27 (17+10)	26 (17+9)	27 (15+12)	24 (24+0)
Responsible organization	PPD and DADO	PPD and DADO	DADO	DADO

The workshop participants visited two of the ongoing IPM-FFS, Panchakanya and Laligurans. The Shree Panchakanya FFS in Mahendrajyoti grew potatoes and had set up the following trials: (1) Comparison study between IPM and farmer's practice, (2) fertilizer application trial, (3) Trichoderma application trial, (4) Late Blight management trial, (5) cut and whole tuber plantain trial, and (6) and testing of Spodolure pheromone traps and Jeevatu mixture.



The Shree Laligurans FFS in Banepata grew cauliflower and had set up (1) an IPM and farmer practice comparison trial, (2) a varietal trial with three varieties, (3) a club root diseases management trial, and (4) a damping off management trial with *Trichoderma* and Carbendazium,



Panchakanya IPM-FFS in Mahendrajyoti



Laligurans IPM-FFS in Banepa

#### 4.4 Conclusion

The workshop field trip demonstrated two things:

First, the importance of enforcement procedures for effective pesticide management. Even small and incomplete measures can have lasting effects if they demonstrate a political will to carry through.

Second, the cooperative-run IPM Resource Centre at Kushadevi was an enlightening example of institutionalizing IPM at local level and to make IPM economically sustainable. The enthusiasm with which farmers carried out FFS field trials showed the great potential of experiential learning for producing lasting changes in the life of rural people.

## 5. DISCUSSIONS AND FOLLOW-UP

### 5.1 SWOT ANALYSIS OF IPM-FFS

Participants were divided into four groups to discuss the strengths, weaknesses, opportunities and threats (SWOT) of IPM-FFS. The individual results were:

#### *Group 1*

*(Bangladesh, Laos, Malaysia, Thailand)*

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Long experience with IPM research and government policy</li> <li>• Promotion of IPM through NGOs and private sector (Malaysia, Bangladesh)</li> <li>• Information on IPM easily available through internet</li> <li>• Not dependent on government</li> <li>• Farmers eager for IPM and ready to learn (Thailand)</li> <li>• Many donors interested in IPM, GAP and organic farming (Laos)</li> <li>• Government project funds (Bangladesh)</li> <li>• Donor project funds (Laos, Bangladesh)</li> <li>• Regular extension activity (Malaysia, Thailand)</li> <li>• Free distribution of bio-pesticides or traps (Bangladesh)</li> <li>• Farmers responsive to FFS (Thailand, Malaysia, Laos)</li> </ul>	<ul style="list-style-type: none"> <li>• Research not in line with the needs of IPM</li> <li>• No FFS training in universities or institutes</li> <li>• Lack of coordination between NGOs and government</li> <li>• Missing lead organization within government for IPM-FFS; who should provide funds?</li> <li>• Landless farmers less interested and demand more money (Bangladesh)</li> <li>• Commercial farmers prefer quick fixes (Malaysia)</li> <li>• Trained facilitators move on</li> <li>• Purpose of curriculum/data collection not clearly understood by farmers and facilitators</li> <li>• Does not address landless or big farmers (need for new types of FFS)</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• Demand for safe products drives governments and markets</li> <li>• International donors willing to give for food safety and food security</li> <li>• More private sector investments in IPM products</li> </ul>	<ul style="list-style-type: none"> <li>• Donors still support non-FFS top-down approach</li> <li>• Chemical industry</li> <li>• Globalization drives industrial farming</li> <li>• Different policies with different ministers</li> </ul>

#### *Group 2*

*(Cambodia, Myanmar, Sri Lanka, Vietnam)*

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• More than 20 years of experience</li> <li>• Institutionalization from community level to national level</li> <li>• Internalized in government policy as a regular programme</li> <li>• Multiple organizations involved (Gov't./NGO)</li> <li>• Sufficient skilled human resources at local level (master trainers and trained farmers)</li> <li>• Farmer organization support</li> <li>• Acceptance and ownership by farmers</li> <li>• Developed curriculum available</li> <li>• Platform to launch other projects (like AFSP)</li> <li>• Development of IPM Resource Centres</li> </ul>	<ul style="list-style-type: none"> <li>• Limited allocation of government budget</li> <li>• No special market with IPM brands</li> <li>• Quality assurance and attitude of facilitator</li> <li>• Weak coordination</li> <li>• Insufficient local government financial support (Nepal)</li> <li>• Existing organizations are not functionally active</li> <li>• Programme reaches only few farmer groups</li> <li>• Limited coverage of programmes</li> <li>• Unequal distribution of IPM farmer facilitators and resource utilization</li> </ul>



Opportunities	Threats
<ul style="list-style-type: none"> <li>• Rising consumer awareness</li> <li>• Linkages to other programmes/projects</li> <li>• Donor interest</li> <li>• Government (parliament committee) also positive</li> <li>• Positive involvement of FAO</li> <li>• IPM certified products for premium markets (specific outlets, etc.) and branding</li> <li>• More compliance to international markets (SPS and private labels)</li> </ul>	<ul style="list-style-type: none"> <li>• Retention of facilitator /trained human resources</li> <li>• Strong inclination of farmers to use pesticides for quick solutions</li> <li>• Availability of appropriate technology</li> <li>• Lack of understanding between technical staff and policy makers</li> <li>• Policy priorities - less support for agricultural sector as compared to other sectors like power, tourism, or defense</li> </ul>

### Group 3

(China, Indonesia, Nepal, Pakistan, Thailand)

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Strong networks among the farmers organization</li> <li>• Government funds used in FFS for extensions of the IPM technologies</li> <li>• Farmers have long experiences with IPM and implement IPM activities</li> <li>• Well defined curriculum for FFS</li> <li>• Policy level support for FFS programme</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of regular funds (only project based)</li> <li>• Lack of trained manpower (IPM expert) who implement the IPM programme</li> <li>• Very few promotional materials (video documentary, factsheets) for community farmers</li> <li>• Lack of cooperation among the stakeholders</li> <li>• Proper certification of IPM commodities</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• Scope for the fund to incorporate FFS (Government sectors)</li> <li>• Coordination and collaborations among different line agencies</li> <li>• Opportunities to address different funding agencies to implement IPM programme</li> <li>• Opportunities for extensions of the IPM technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Strong networks of multinational pesticides companies and many schemes to promote pesticide uses</li> <li>• Contradictory policy (chemical as well as biopesticides )</li> <li>• Invasions of new pest species (Tuta, nematodes, mealy bugs, fruit flies, etc.)</li> <li>• Climate change</li> <li>• Open borders</li> <li>• Lack of taxonomical manpower and lab facilities for proper identifications of pests and diseases</li> </ul>

### Group 4

(CABI, Nepal, Philippines, Thailand)

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Skilled IPM trainers</li> <li>• Relevant support structure in the country for implementing IPM-FFS</li> <li>• Structure of the National IPM Programme in Cambodia for implementing the IPM-FFS</li> <li>• Availability of FFS curriculum and other support documents</li> <li>• Long experiences with supporting IPM-FFS and committed trainers</li> </ul>	<ul style="list-style-type: none"> <li>• Inconsistent funding from the government</li> <li>• Aging trainers and farmers</li> <li>• Rotating participating farmer</li> <li>• No regular funding from donors</li> <li>• Less funding from the government and donors</li> <li>• Attitude of farmer toward chemicals (pesticides and fertilizers)</li> <li>• No standards for the conduct of FFS (e.g. 3 days training is called an FFS)</li> <li>• High cost and long time for FFS implementation</li> <li>• No databases of all field results</li> <li>• Slow results from bio-control and botanical pesticides</li> </ul>

<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>• Strong government support</li> <li>• Strong outside support (FAO and others NGOs)</li> <li>• IPM-FFS Policy Guidance Document</li> <li>• Need for sufficient and safe food for consumers</li> <li>• Greater opportunity for market access</li> <li>• Networking of farmers with other institutions and private sector</li> </ul>	<ul style="list-style-type: none"> <li>• Strong lobby from chemical companies to the government</li> <li>• Easy access to pesticides</li> <li>• Quick action of agro-chemical</li> <li>• Strong pesticide promotion (free products, gifts, loans)</li> <li>• Good-looking crop harvest after using chemicals</li> <li>• Lack of manpower in the fields, because farming is not attractive to young generation</li> </ul>

## Summary

All groups produced similar results, and the analysis showed the rich experience with the IPM-FFS approach. The value of farmer participation is clearly understood, but also its difficulties were realistically assessed. It appears to be a good time to move forward and to share the rich expertise and experience beyond IPM in order to achieve sustainable development and improvement of people's livelihoods.

The main points of the analysis can be summarized as follows:

<b>STRENGTHS</b>	<b>WEAKNESSES</b>
<ul style="list-style-type: none"> <li>• Wealth of experience accumulated over more than 20 years in all countries of the region;</li> <li>• Availability of trained facilitators, experienced resource persons and guidance documents;</li> <li>• Strong acceptance by farmers;</li> <li>• Increasing recognition by governments and donors;</li> <li>• Flexible platform for launching other applications.</li> </ul>	<ul style="list-style-type: none"> <li>• High cost and unreliable funding as temporary projects.</li> <li>• No institutionalized facilitator training at agricultural institutes or universities;</li> <li>• High quality is difficult to maintain;</li> <li>• Parts of the curriculum still not clearly understood by farmers and facilitators;</li> <li>• Trained facilitators move on to other organizations;</li> <li>• Landless and big commercial farmers appear less interested.</li> </ul>
<b>OPPORTUNITIES</b>	<b>THREATS</b>
<ul style="list-style-type: none"> <li>• Increasing public demand for safe food and certified IPM products;</li> <li>• More private sector investments into IPM and organic products;</li> <li>• Commercial farmers not yet involved in FFS;</li> <li>• Collaboration with different agencies could open up new applications.</li> </ul>	<ul style="list-style-type: none"> <li>• Powerful lobby of the chemical industry;</li> <li>• Globalization drives industrial farming;</li> <li>• Many donors and governments still favor top-down approach;</li> <li>• Politicians and farmers prefer quick fixes and results.</li> </ul>



## 5.2 FOLLOW-UP STRATEGY FOR SUSTAINABLE INTENSIFICATION OF CROP PRODUCTION

With regard to the question, what changes are needed to achieve sustainable intensification of crop production (SICP), the main ideas were:

### *Group 1*

- Continue FFS education;
- Facilitator qualification in the regular education system;
- Change mindset of decision makers who prefer quick results;
- Mainstreaming coordination, leadership and regular funding;
- Tapping into private sector support.

### *Group 2*

- Reach more farmers to increase awareness for adopting IPM programmes;
- Link farmers with production programmes of the target crop;
- Utilize farmers' *healthy crop production green book* for IPM products (quality product for group certification);
- Diversified husbandry (crop/animal/aqua) approach – sustainable economic growth;
- Adoption of farmer and science approach (technology verification and adaptive research);
- Adapt new knowledge and technology at community level;
- Link with climate change and livelihood programmes;
- Special market oriented IPM production packages;
- Network of farmer communities at district, regional and central levels in policy making;
- Community crop and pest management learning centres;
- Capacity building for bio-pesticide and on-farm input production that is managed and owned by farmers;
- Linkages with community-based organizations;
- Policy support at national level.

### *Group 3*

#### *Continuing strategies:*

- Utilization of network organizations for implementing IPM-FFS programmes;
- Availability of regular funds for continuing the programmes;
- Continuation of quality FFS process;

#### *Improvements and way forward:*

- Invitations of different stakeholders to the field days
- Refresher and enhancement training to new generations
- Linkages and coordination among different stakeholders
- Government strategies for the proper certifications
- Establishment of IPM Community Resource Centres at grassroots level

### *Group 4*

- Participatory technology development for the management of new pests and for the reduction of production cost in order get higher net-income;
- Promoting agro-ecology training through IPM-FFS;
- Convince policy makers to support IPM for getting more financial support;
- Coordinated mass media programmes;
- Participation of politicians during Farmer Field Day;
- Organizing demonstrations against heavy use of agro-chemicals;

- Establishment of market facility of IPM products;
- Developing posters on pesticide hazards to humans like with cigarettes;
- Develop/strengthen pesticide residue testing programme.

## Summary

Many of the responses for the follow-up strategy proposed doing more of the same and intensifying past IPM experiences. However, some saw the FFS approach in a broader context and proposed new applications such as FFS for animal husbandry and aquaculture, climate change or livelihood programmes.

## Conclusion

There is need to expand the IPM-FFS process and employ new strategies that reflect changing societies and new opportunities. With a new generation of IPM-FFS facilitators and experts, there is an opportunity to free ourselves from the past focus on IPM and technical issues, and promote the participatory methodology in new contexts. Other organisations have adapted quickly to shifting situations, and the IPM-FFS community could learn from their experience in order to attract new support from donors. We should use our experience and capacities to promote participatory technology development and explore new alliances for achieving the goal of sustainable agricultural development and intensification of crop and animal production.

## 5.3 DEVELOPMENT AND USE OF POSSIBLE ALTERNATIVES TO CHEMICAL PESTICIDES

Chemical pesticides are still widely used, and the search for alternatives is part of all IPM programmes. During an exchange of experiences between the workshop participants, the following alternatives were brought forward:

Rice: Brown plant hopper; insect count and if needed, chemical; Philippines: no spraying, more plant cover; Sri Lanka: synchronized planting; Pakistan: spacing 2-3 plants/hill; Nepal: drainage and fresh irrigation; Vietnam: reduce seeds, *Metarhizium*, *Beauvaria*, resistant variety; Thailand: cultivar, seed rate, biopesticide; balanced use of N-fertilizer; Cambodia: wider spacing, bamboo shoot juice (2 kg ground or boiled per 20 l water, 2-3 days fermentation; repellent action)

Maize: China: Asian Corn borer (dominant one of two species): natural enemies, light trap (1 light/3 ha), pheromone trap (1/600 m), biopesticide (*Beauvaria*); Sri Lanka: destruction of crop residues; *Bacillus thuringiensis* (*Bt*) at the right time at start of larval stage; Myanmar: Yellow stem borer: change cropping pattern with sunflower, Neem biopesticide, *Trichogramma*;

Crucifers: Flea beetle: infection from seed bed: botanical pesticide (Neem, chili with alcohol); crop rotation, mixed/strip cropping; destruction of crop residues and secondary hosts, intercropping; neem oil and leaf extract of papaya; hoe out the soil around the plant to remove eggs in the soil; problem only 4-5 weeks after planting; *Metarhizium* applied to the soil around the plant; sprinkler irrigation prevents hatching of eggs;

Oil palm: Malaysia: bag worm; *Bt* aerial spray, beneficial plant ground cover;

Tomato: Nepal: *Tuta* on tomato: *Tuta* lure pheromone (from India) + light trap mass trapping (soap/cypermethrin water in yellow pan); piece of potato rotting in trap water acts as additional lure, *Bt* alternative with Neem; pest exclusion netting; removing lower leaves and destroy;

Yellow spine grasshopper/Bamboo locust: *Metarhizium*, *Nosema* fungi, nematodes (in ground), light trap, (also Vietnam, China).



## 5.4 NEW PESTS

Cambodia: Rice: rice blast: new variety, tests with *Trichoderma*; reduce nitrogen, do not spray nitrogen, correct seed rate; seed bed treatment with *Trichoderma*; clean field, water level at 5 cm, balanced fertilizer; wet nursery

Philippines: Mango: mango gall midge: paper bag, *Metarhizium*, *Trichoderma*, pruning tree canopy;

Sri Lanka: Virus diseases in vegetables, also banana (bunchy top); destruction of crop residues, conservation of natural enemies, minimize insecticide spray, sprinkler irrigation in dry season, crop rotation, yellow traps, seed treatments, removal of affected plant in early stages; Jeevatu could be tried; selection of good seed; products come into Nepal from India, Thailand, China, netting in the seedling stage; micronutrient foliar spray may be helpful; rice straw as a mulch.

Thailand: Cassava: after pink mealybug, now cassava, root rot: clean seed cassava system; soil treatment with urea before planting; witches broom: destroy, clean seed system.

## Conclusion

The integrated management of pests and diseases continues to be a challenge and provides opportunities for innovations and new approaches. Exchanging country experiences is important to further develop IPM in the region.

## 5.5 CLIMATE CHANGE CHALLENGES

Finally, the workshop participants were asked to apply their experiences with IPM-FFS to the emerging challenge of climate change that is starting to be felt in many countries of the region. The following themes were discussed by the different working groups:

Rising temperatures/ less rainfall: FFS groups need to be encouraged to discuss possible climate change effects for their communities and start experimenting with possible solutions. For example, many areas with irrigated rice may have to shift to dry rice production while in northern areas, rice could be introduced as a new crop. Communities can learn from farmers in areas that have already a hotter and dryer climate. FFS activities could include testing new short duration varieties; adjust sowing time; or looking out for new pests. Furthermore, the basket of options for “climate smart villages” may also include water conservation and sanitation issues.

Rising sea levels: Possible reactions are shifting to seafood production or continue cropping with salt tolerant varieties. Conservation of fresh water reservoirs will be an increasing issue. Certain areas may be protected from the rising sea with a system of dykes through community action. For all these changes, FFS could be the starting point for action and changes.

Longer or shorter cropping seasons: FFS groups may experiment with different varieties, nurseries, tunnel houses, intercropping and multicropping; pest exclusion netting or grafting tomato seedlings. On a regional level, it was recommended to share experiences and collaborate with pest monitoring and surveillance for new pests

Adaptive measures against extreme weather conditions: The development of a national stakeholder system, early warning systems, community-based surveillance or living food banks may be mitigating measures for FFS groups.

## Conclusion

Many countries will be affected by climate change effects and communities need to find suitable solutions to local conditions, and possible collaborative actions which could be an outcome of FFS groups.

## 6. CLOSING SESSION

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In his closing remarks, Mr. Piao Yongfan, Senior FAO Plant Protection Officer and Secretary of the Asia-Pacific Plant Protection Commission (APPPC) thanked the organizers and participants for their active participation and contributing their experiences. To move forward, we need to explore ways of dealing with new challenges beyond IPM in support of sustainable intensification and diversification of crop production. Rather than merely increasing the number of IPM-FFS, we need to use our experience and expertise for supporting colleagues and counterparts with finding solutions to new challenges. The workshop has presented many examples where FFS was used beyond IPM: water management in India; food and nutrition security in Nepal; Climate Field Schools in Bangladesh; community actions in Vietnam; or innovative practices in the Philippines. It takes a long time until new concepts are widely accepted, but with a new generation of dedicated officers entering the FFS movement, new opportunities arise. We need to free ourselves from the concepts of pest control and technology transfer and move forward to manage our soils, water and health. With this preparedness and road map into the future, we will obtain new opportunities beyond IPM, create new alliances or share resources. With the support of FAO, APPPC will continue to be a platform for the exchange of experiences and helping the next generation of officers to carry on and further develop the FFS approach to achieve sustainable intensification of agricultural production for a better future.

Some delegates joined the words of thanks and gratitude to the organizers and FAO, and the workshop was then closed by Mr. Dilli Sharma with the kind presentation of a souvenir to each participant.



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**APPPC/FAO Workshop on empowering farmers through IPM-FFS in support of sustainable intensification of crop production within context of climate change**  
**27 February – 2 March 2017**  
**Kathmandu, Nepal**

**Workshop Programme**

<b>First Day, 2017/02/27</b>		
Title	Time	Remarks/ Responsible person
Registration	08.30-09.00	PPD Officers
Inauguration Session	09.00-10.00	
Welcome Remarks : PD, PPD, Dr. Dilli Ram Sharma Highlights of the Workshop : Dr Piao Yongfan, General Secretary, APPPC <b>Few words</b> : Dr. Somsak Pipoppinyo, FAO-R, Nepal <b>Few words:</b> Mr. Dila Ram Bhandari, Director General, DoA <b>Few words :</b> Chief Guest (Honorable State Minister for Agricultural Development, Mrs. Radhika Tamang) <b>Closing Remarks</b> : Chairperson (Secretary, MoAD, Dr. Suroj Pokharel)		
Photo session	10.00-10.15	
Coffee Break	10.15-11.00	
Adoption of Workshop Agenda	11.00-11.05	
Appointment of rapporteur	11.05-11.10	
Country Paper- IPM-FFS in Support of Sustainable Intensification of Crop Production within context of Climate Change		
• Bangladesh	11.10-11.25	
• Cambodia	12.25-11.40	
• China	11.40-11.55	
• India	11.55-12.10	
Indonesia	12.10-12.25	
• Lao PDR	12.25-12.40	
• Malaysia	12.40-12.55	
• Lunch	13.30-14.00	
• Myanmar	14.00-14.15	
• Nepal	14.15-14.30	
• Pakistan	14.30-14-45	
• Philippines	14.45-15.00	
• Sri Lanka	15.00-15.15	
• Thailand	15.15-15.30	
• Viet Nam	15.30-15.45	
• Discussion	15.45-16.00	
Coffee Break	16.00-16.15	



• Pesticide Risk Reduction in the Greater Mekong Subregion: Results of a Long-term Impact Assessment	16.15-17.00	FAO, Mr Gerd Walter-Echols
Closing for the day	17.00	
Welcome Dinner	18.00	Hosted by FAO/RAP
<b>Second Day, 2017/02/28</b>		
• FAO Farmer Field Schools Institutionalization Workshop: Result and Follow Up	9.00-9.20	FAO, Ms Alma Linda Abubakar
• FAO Farmer Field School Guidance Document: An Outline	9.20-9.50	FAO, Ms Alma Linda Abubakar
Discussion	09.50-10.00	
• IPM Farmers Field School in Nepal; a milestone for climate change adaptation	10.00-10.20	Nepal, Mr Madhusudan Paudel, Climate change Project/FAO.
Discussion	10.20-10.30	
Coffee Break	10.30-10.45	
• IPM developments in support of <i>Save and Grow</i> (IPM in support of agroecology, safe food production, value chains)	10.45 -11.10	Thailand
Discussion	11.10-11.20	
• Innovations in IPM Farmer Field Schools and adaptation to Climate Change	11.20-11.50	Mr Cahyana Widyastama, FIELD Indonesia
Discussion	11.50-12.00	
• Linkage of IPM-FFS with Plant Clinic in Nepal	12.00 -12.25	Nepal, Dr Dilli Ram Sharma(PPD) and Dr Vinod Pandit( CABI)
Discussion	12.25-12.35	
• A success story of Rapid Bioassay Pesticide residue Analysis in Nepal	12.35-12.55	Nepal, Dr Dilli Ram Sharma and Mr Man Bhadaur Thapa, PPD
Discussion	12.55-13.00	
Lunch	13.00-14.00	
• Intensification and institutionalization of IPM-FFS in Nepal: Lesson learnt and Way forward	14.00-14.30	Nepal, Dr Binod Saha, FAO/Nepal
Discussion	14.30-14.40	
• “Farmer Field School – an effective approach to address food and nutrition security: A Case of Agriculture and Food Security Project in Nepal”.	14.40-15.05	Nepal, Dr Ratna Kumar Jha FAO TA to Agriculture and Food Security Project
Discussion	15.05-15.15	
• Dissemination of cost effective organic farming technology in SAARC region (Use of Jeevatu for safe crop production in Nepal)	15.15-15.45	Nepal, Dr Khadka Bhakta Paudel
Discussion	15.45-15.55	
Coffee Break	15.55-16.15	
• Developing IPM packages for vegetables Crops and its dissemination in FtF districts of Nepal	16.15-16.40	Nepal, Mr Lalit Prasad Sha IDE/Nepal and Dr Dilli Ram Sharma (PPD),
Discussion	16.40-16.50	
Closing for the day	17.00	

<b>Third Day, 2017/03/1</b>		
Departure from the Hotel	08.00	
<b>Field visit-</b> Whole day field trip to observe <ul style="list-style-type: none"> <li>• Rapid Bioassay pesticide Residue Analysis Laboratory</li> <li>• Interaction and visit with the IPM production farmers side at Kavre district.</li> <li>• Visit and observation IPM community resource centre, Kavre district.</li> </ul>		Nepal
Lunch	14.00-15.00	
Arrival at Hotel	17.30	
<b>Fourth Day, 2017/03/2</b>		
1. Panel Discussion <ul style="list-style-type: none"> <li>• SWOT Analysis of IPM-FFS</li> <li>• Follow up strategy for SICP ( Four Group formulation)</li> </ul>	09.00-10.30	FAO
Coffee Break	10.30-10.50	
<ul style="list-style-type: none"> <li>• Development and use of possible alternative of Chemical pesticides</li> </ul>	10.50-11.25	FAO
Presentation and discussion	11.25-13.00	Group leader
Lunch Break	13.00-14.00	
<ul style="list-style-type: none"> <li>• Plan for the future: How can we support IPM and FFS on Save and Grow for SCPI for farmer empowerment</li> </ul>	14.00-16.00	FAO
Conclusion of workshop	16.00-16.30	



**APPPC/FAO Workshop on empowering farmers through IPM-FFS in support of sustainable intensification of crop production within context of climate change**

**27 February – 2 March 2017**

**Kathmandu, Nepal**

**List of Participants**

	Name	Designation	Organization	Country	Email
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