

## Year 8 Workplan for the Asian Site in Bangladesh

In year 8, the IPM CRSP will begin its third year of research in Bangladesh. Activities focus on rice/vegetable systems, with key crops including eggplant, cabbage, gourds, tomatoes, and okra. The PIPM approach is being followed in which pest management problems and constraints are being diagnosed through crop/pest monitoring, baseline survey data are being analyzed, and follow-up participatory appraisal and focus group activities are being undertaken that focus specifically on adoption issues, including gender. Multi-disciplinary on-farm pest management experiments are being conducted in Kashimpur, complemented by varietal screening, laboratory, greenhouse, and micro-plot experiments on station near Joydepur. Socioeconomic analyses address three primary issues: impact assessment, adoption, and market analysis. Linkages have been made, both with the local extension service in Bangladesh and with CARE-Bangladesh, to facilitate farmer training with lessons learned on the CRSP.

Research activities are planned and conducted in a multidisciplinary fashion. Bangladesh and U.S. scientists review progress and plan future activities in joint meetings with all disciplines contributing to the discussion. Biological scientists assist the social scientists by collecting cost and return data that is used in impact assessment. The site coordinator and his staff help coordinate the day-to-day research activities. They are housed with most of the scientists at the Bangladesh Agricultural Research Institute (BARI), the primary agricultural research institute in the country. They coordinate with scientists at The Bangladesh Rice Research Institute (BRRI), CARE-Bangladesh, and with the agricultural university at Mymensingh and the Institute for Post Graduate Studies in Agriculture (IPSA) near BARI for student training. International and U.S. institutions contributing to the IPM CRSP program in Bangladesh include AVRDC, IRRI, the National Crop Protection Center of the Philippines, Penn State, Ohio State, and Virginia Tech.

### I. Baseline Survey and Crop/Pest Monitoring

#### I.1 Monitoring of Crop Pests and their Natural Enemies in Rice and Vegetables in Rice – Vegetable Systems

- a. **Scientists:** Z. Islam, G.J. Uddin, M.A. Nahar – BRRI; S. N. Alam, M. F. Zaman H. Rahman, M.S. Nahar, Anwar Karim, Nazrul Islam– BARI; M.A. Razzaque – BARC; M.N. Islam – BSMRKB; H.S. Jasmine, M.S. Alam, A. Bashed– IPM CRSP/Virginia Tech; L. Black – AVRDC; E. Rajotte – Penn State; A. Baltazar – NCPC/UPLB; S.K. De Datta, G. Luther – Virginia Tech; S. Miller – Ohio State
- b. **Status:** Continuing
- c. **Objectives (overall and current year):** 1) To determine incidence, seasonality, and abundance of pests (insects, diseases, nematodes and weeds) and natural enemies in different sites; 2) To determine damage levels; 3) To determine abundance of generalist predatory arthropods in different cropping patterns.

- d. **Hypotheses:** 1) Pest and natural enemy population fluctuations affect crop production in rice-vegetable systems; and 2) Cropping patterns influence incidence and abundance of pests and natural enemies.
- e. **Description of research activity:** Monitoring of pests, initiated in 1998, will be continued up to April 2001. Pest monitoring (insects, diseases, nematodes and weeds) will be carried out on rice, and on winter and summer vegetables in Kashimpur site and in some nearby areas in farmer fields at one month intervals. Studies will consist of recording pest incidence (species), assessment of pest intensity and damage level by direct count (hill/head, fruit/quadrat) and scoring. Abundance of generalist arthropod predators in vegetable-rice/vegetable-rice and vegetable-vegetable-vegetable systems will be determined by using pitfall traps. Weed incidence and biomass will be determined using a 1m x 1m quadrat, and weed biomass will be recorded by weighing the fresh and dry weights of the prevailing species. In addition, cropping pattern, crop and field conditions, weed management practices, and inputs used will be recorded.
- f. **Justification:** The pests and natural enemy complex in rice-vegetable systems is poorly understood. It is important to understand the seasonal fluctuations of pests and natural enemies and their association as it will lead to the identification of research issues and priorities for solving pest problems in rice-vegetable systems.
- g. **Relationship to other research activities at the site:** 1) The study will help in prioritizing research in other IPM CRSP activities; and 2) The study will also provide valuable insights that contribute to explaining research data gathered by other activities/experiments.
- h. **Progress to date:** Monitoring of rice pests and natural enemies was completed during the T. Aman rice season. Monitoring of vegetable pests has been conducted in each season.
- i. **Projected outputs:** 1) Improved knowledge of key pests, and association between pests and natural enemies and 2) Improved understanding of the role of existing natural enemies in pest management.
- j. **Projected impacts:** 1) Identification of appropriate research activities; 2) Improved understanding of the pest situation in rice-vegetable systems.
- k. **Start:** October 1998
- l. **Projected completion:** September 2001
- m. **Projected person-months of scientists time per year:** 10 person-months
- n. **Budget:** BARI/BRRI/BARC, \$2,810; Virginia Tech, \$1,905; Penn State, \$4,809; NCPC, \$1,100; AVRDC, \$0

## II. Multidisciplinary On-farm Pest Management Experiments

### II.1a Varietal Screening of Eggplant for Resistance to Bacterial Wilt, Fruit and Shoot Borer, Leafhopper (jassids) and Root-Knot Nematode and of Tomato for Resistance to Bacterial Wilt, Virus Disease, and Root-Knot Nematode

- a. **Scientists:** M.A. Rashid, M.M. Hossain, M.A. Rahman, A.K.M. Motiar Rahman, M.H. Rashid, S.Nahar, M. N. Alam, M. Nazimuddin, I. Faruq – BARI; M.N. Islam – BSMRKB (IPSA); H.S. Jasmine, M. S. Alam, A. Bashed – IPM CRSP/Virginia Tech; L. Black, J.F. Wang, N.S. Talekar – AVRDC; G. Luther – Virginia Tech; S. Miller – Ohio State
- b. **Status:** Continuing
- c. **Objectives:** To 1) confirm the usefulness of previously reported bacterial wilt (BW) resistant eggplant and tomato cultivars and potential focus on *Solanum* rootstock in Bangladesh; 2) search for new sources of wilt resistance; 3) confirm previously reported FSB resistant sources and to identify new sources of resistance in eggplant; 4) confirm root-knot nematode resistance in eggplant and tomato cultivars previously identified at BARI; 5) confirm previously reported TYLCV resistant sources and to identify new sources of resistance in tomato; and 6) evaluate commonly used eggplant and tomato cultivars in Bangladesh for their reaction to RKNs.

**In 2000-2001:** For eggplant, the preliminarily selected entries and those showing variable reactions will be evaluated.

- d. **Hypotheses:** 1) Based on previous work at BARI and AVRDC, BW resistant eggplant and tomato cultivars exist. Further selection in Bangladesh will lead to identification of cultivars that can be utilized by Bangladeshi farmers. Grafting with susceptible eggplant and tomato varieties onto resistant *Solanum spp.* rootstocks is effective in controlling bacterial wilt; 2) Natural FSB resistance that occurs in *Solanum spp.* can be introgressed through breeding into eggplant cultivars; 3) Sources of TYLCV resistance are present in currently available cultivars that may be useful to Bangladeshi farmers; and 4) Sources of RKN resistance are present in currently available cultivars that may be useful to Bangladeshi farmers.
- e. **Description of research activity:** Initial work will be completed at HRC, BARI laboratory and infested nurseries. Approximately 120 cultivars, 5 rootstock sources and 5 grafted rootstocks of eggplant and 39 cultivars/lines as well as tolerant lines of tomato which were identified previously at BARI will be evaluated for their BW reactions. Inoculum levels will be enhanced to  $10^8$  cfu/gm soil by incorporating highly BW infested eggplants in the nurseries prior to transplanting. Thirty-day old seedlings of eggplant and tomato will be uprooted, roots trimmed and transplanted into the infested nursery using 6 x 6 inch spacing. Plants will be observed closely. Plant mortality will be recorded at 3-day intervals. In years 2-5 and 2-3 for eggplant and tomato respectively, the resistant

varieties evaluated at BARI will be evaluated in farmer fields to further evaluate resistance and acceptance by the farmers.

Initial study for FSB will be conducted at the BARI field to evaluate the resistance sources of major cultivated varieties and available resistant wild species. Seeds will be sown in March 2001 and transplanted in April 2001. About 200 *Solanum* accessions will be evaluated for their resistance to the natural population of FSB without application of insecticides. A replicated trial with 3 replications of 5 plants each will be arranged in RCBD using a spacing of 70x70 cm. Weekly observation will be made on fruits and shoots. Wilted shoots will be counted along with the total number of shoots per plant. Along with this, mass culture of adults and 1<sup>st</sup> instar larvae will be completed from the infested fruits and will be released in cages having twigs of different eggplant lines in the screen-house and in the field under confinement. Observations will be taken on the difference in egg laying and larval entry in different lines.

The initial study of TYLCV will be conducted in screen-house at HRC, BARI to evaluate the reported resistance sources of major cultivated varieties. Seeds will be grown in 40cm x 30cm x 8cm tin trays and the seedlings at the age of 21 days will be infested with viruliferous whiteflies for TYLCV infection. Weekly observation will be made on TYLCV infection. Infected seedlings will be counted and discarded, and disease free seedlings will be transplanted in the field for seed multiplication. Data will be recorded after 2 weeks and 8 weeks of the release of viruliferous.

Initial study of RKN will be made at BARI in infested nurseries. Approximately 120 cultivars of eggplant, including cultivars that have previously shown resistance, and 39 cultivars of tomato, including 2 cultivars that previously showed moderate resistance will be sown directly in the infested nursery and uprooted 60 days later and evaluated for severity of galling. Galling will be scored on a scale of 1-10.

- f. Justification:** Bacterial wilt (*Ralstonia solanacearum*) is a devastating disease in eggplant and tomato in Bangladesh. No practical chemical control or cultural practices have been developed for successful control of this disease. Resistance is said to be site specific, and therefore the BW resistant cultivars from other locations must be tested for usefulness in Bangladesh.

Eggplant fruit and shoot borer is a severe pest throughout Asia. There is no resistant variety available. For controlling this pest, farmers are using insecticides indiscriminately, with potentially harmful effects to consumers and the environment. Development of pest resistant varieties will minimize the risks of hazards.

TYLCV, which is transmitted by whitefly (*Bemisia tabaci*), is one of the serious diseases of tomato in Bangladesh and the yield loss can be total. Varietal resistance may be the most cost effective means of minimizing the disease.

Nematode is a major problem of eggplant and tomato and there is no practical chemical control or cultural practices developed for its control. Development of resistant varieties is one option for minimizing losses due to this pest.

- g. Relationship to other research activities at the site:** Identification of resistant varieties and grafting technology will be utilized in farmers field studies in combination with other integrated pest management strategies.
- h. Progress to date:** In the 1999-2000 winter season, 80 germplasm lines were evaluated against bacterial wilt and RKN in sick-beds, and tests of 275 germplasm lines, including 200 from AVRDC, were conducted at the BARI farm under natural conditions against FSB, BW and jassids (leafhoppers). Also, 39 lines/varieties of tomato have been screened against BW. Several varieties/lines have been preliminarily selected in each case.
- i. Projected outputs:** (1) Confirmation of reported BW resistance sources under Bangladesh condition; (2) Identification of additional BW resistance sources; (3) Confirmation of reported FSB resistance sources under Bangladesh condition; (4) Identification of additional FSB resistance sources; (5) Confirmation of reported TYLCV resistance sources under Bangladesh conditions, (6) Identification of additional TYLCV resistance sources; (7) Utilization of their resistance for development of varieties; and (8) Identification of RKN resistance sources.
- j. Projected impacts:** (1) Eggplant and tomato varieties available to farmers will provide high levels of resistance to BW and reduce plant mortality in the hot wet season; (2) Improved yield; (3) Reduced losses caused by fruit and shoot borer; (4) Reduced use of insecticides; and (5) High level of resistance to RKN and reduced plant mortality.
- k. Start:** Eggplant: March 1999; Tomato: September 1999
- l. Projected completion:** 2003
- m. Projected person-months of scientists time per year:** 6 person-months
- n. Budget:** BARI, \$5280; Ohio State, \$2,520; AVRDC, \$0

#### **II.1b. Evaluation of Grafted Eggplant and Tomato Plants to Bacterial Wilt in Sickbeds, in the BARI Experimental Field, and in Farmer Fields**

- a. Scientists:** M.A. Rashid, A.K.M. Motiar Rahman, M.A. Goffer, M. Aatur Rahman, Nurunnahar Shireen, M Nazim Uddin, – BARI; H. S. Jasmine, M. S. Alam, A. Bashed – IPM CRSP/Virginia Tech; S. Miller – Ohio State; L. Black, J.F. Wang-AVRDC.
- b. Status:** Continuing

- c. **Objectives:** To control bacterial wilt in eggplant and tomato through grafting.
- In 2000-2001:** The reaction of the grafted plants to BW will be observed under natural infection levels in the field.
- d. **Hypotheses:** Bacterial wilt resistant wild *Solanum spp.* (*Solanum turvum* and *Solanum melongena* ) exist and grafting with susceptible eggplant/tomato varieties into these resistant *Solanum spp.* rootstocks is effective in controlling it.
- e. **Description of research activity:** The work will be done at HRC, BARI nursery beds and experimental field. Seeds of two *Solanum melongena* and *S. turvum* will be sown in 9 cm dia poly bags, while the seeds of cultivated eggplant/tomato will be sown in the seedbeds. The scion (cultivated variety) will be grafted on the rootstocks (wild species) by “side grafting” method. The grafted rootstocks will be planted both in the infested sick beds and in the field. Two popular eggplant varieties Signnath and Shufala and two popular tomato varieties Ratan and BARI Tomato-3 will be grafted on resistant *Solanum* rootstock ‘*Solanum torvum*’. About 250 seedlings from each combination will be planted in farmer fields in October, 2000. The plots will be laid out in three farmer fields as replications; standard production practices will be followed.
- f. **Justification:** Bacterial wilt (*Ralstonia solanacearum*) is a devastating disease of eggplant and tomato in Bangladesh. No practical chemical control or cultural practices or resistant varieties have been developed yet for successful control of this disease. In last year’s screening test no truly resistant sources were found. Therefore, grafting of cultivated varieties on resistant *Solanum* rootstock seems to be a viable alternative at this moment.
- g. **Relationship to other research activities at the site:** Identification of resistant rootstocks and development of grafting technology will be utilized in farmer fields in combination with other integrated pest management strategies.
- h. **Progress to date:** In 1998-1999, grafting compatibility of eggplant onto two *Solanum* rootstocks were studied and a 95% survival rate was recorded. It is now necessary to observe the reaction of the grafted plants to BW in sickbeds as well as under field conditions.
- i. **Projected outputs:** Utilization of resistant rootstock in grafting for controlling bacterial wilt in eggplant and tomato.
- j. **Projected impacts:** (1) Reduced plant mortality due to bacterial wilt and (2) Improved yield (3) Higher economic returns.
- k. **Projected start:** Eggplant: March 1999; Tomato: September 2000
- l. **Projected completion:** Eggplant: 2002; Tomato: 2003

m. **Projected person-months of scientist's time per year:** 6 person-months

n. **Budget:** BARI, \$3300

### II.1c **Development of Eggplant Hybrids Resistant to Bacterial Wilt, FSB and RKN.**

a. **Scientists:** M.A. Rashid, A.K.M. Motiar Rahman, M.Hossain, M.A.Goffer, M.Nazimuddin, Nurunnahar Shireen, – BARI; M.S.Alam, A.Bashet – IPM CRSP/Virginia Tech; Greg Luther-Virginia Tech; S. Miller – Ohio State; L. Black, J.F. Wang - AVRDC.

b. **Status:** New

c. **Objectives:** The existing eggplant cultivars, now being cultivated in Bangladesh are open-pollinated and are prone to bacterial wilt and FSB. Available reports show that resistant/tolerant genes of bacterial wilt and FSB can be transferred to cultivated varieties through hybridization. The objective is to develop high yielding hybrid varieties resistant to bacterial wilt and FSB.

**In 2000-2001:** Lines identified as resistant/tolerant to BW, FSB and RKN will be crossed with cultivated varieties having good horticultural traits.

d. **Hypotheses:** Bacterial wilt and FSB tolerant eggplant cultivars exist, and this character is transferable to cultivated varieties through hybridization.

e. **Description of research activity:** The lines identified as resistant/tolerant to BW, FSB and RKN will be used as donors and will be crossed with cultivated varieties having good horticultural traits. The crossing combinations will be placed under replicated trials to study heterosis and combining ability.

f. **Justification:** Eggplant varieties, cultivated in Bangladesh are susceptible to BW, FSB and RKN. No cultivated varieties were found completely resistant to these pests. Therefore, development of F<sub>1</sub> varieties involving tolerant character will help to overcome the damage done by these pests to a considerable extent.

g. **Relationship to other research activities at the site:** Tolerant/ resistant F<sub>1</sub> varieties will be utilized by Bangladeshi farmers in combination with other integrated pest management strategies.

h. **Progress to date:** New

i. **Projected outputs:** Development of BW, FSB and RKN resistant/tolerant high yielding eggplant varieties.

- j. **Projected impacts:** (1) Reduced plant mortality due to BW, RKN and less infestation of FSB and (2) Higher yield.
- k. **Projected start:** September, 2000.
- l. **Projected completion:** 2003.
- m. **Projected person-months of scientist's time per year:** 6 person-months
- n. **Budget:** BARI, \$2640

## II.2a. Management of Lepidopteran Pests in Cabbage Using an Integrated Approach

- a. **Scientists:** S.M. Manowar Hossain, Salim Reza Mallik, M. Nazimuddin, M. N. Alam, A.K.M. Khorsheduzzaman – BARI; S. Islam – DAE; M.S.Alam, A.Bashet – IPM CRSP/Virginia Tech; N.S. Talekar – AVRDC; E. Rajotte – Penn State; Z. Alam – BSMRKB (IPSA); G. Luther – Virginia Tech
- b. **Status:** Continuing
- c. **Objectives:** To minimize the infestation of lepidopteran pests on cabbage using an integrated control approach.  
  
**In 2000-2001:** To complete second of two years of the experiments laid out below.
- d. **Hypotheses:** Using an integrated approach of control measures will reduce the populations of *Spodoptera litura*, diamondback moth (*Plutella xylostella*), *Crociodolomia binotalis* and other lepidopteran pests.
- e. **Description of research activity:** There will be three treatments with four replications in a RCBD in farmers' fields. If possible, one farmer plot will be taken as one block. The treatments are: (1) Farmers' practice and (2) Integrated approach: a) Lepidopteran pests will be hand-picked from the cabbage twice per week., b) If more than 5% of the cabbage heads are infested a blanket Bt spray will be made, c) On the subsequent sampling dates after Bt spraying, all heads still infested with lepidopteran larvae will be spot treated with malathion. (3) Control (no pesticide or hand-picking or other type of treatment)  
  
Plot size will be 7x6m. The cabbage seedlings will be transplanted in peat in October-November. The experiment will be carried out in Kashimpur. Numbers of lepidopteran larvae and pupae will be monitored and recorded twice per week in cabbage. Data will be recorded on predators and parasitoids. Cabbage head weight, size, and compactness will be recorded for all plots.
- e. **Justification:** Lepidopteran leaf feeders are serious pests of cabbage in Bangladesh. Farmers apply insecticides at high frequency to control these pests with little success.

Since cabbage is a quick-growing vegetable, it is very likely that insecticides sprayed on cabbage will have residues that will eventually appear in the food chain. This experiment will assist the farmer in producing cabbage with minimal insecticide applications, thereby reducing production costs and ensuring less toxic produce.

- f. Relationship to other research activities at the site:** This will be part of the integrated insect management program. Information on pest control and natural enemies of these insects may be shared with other projects.
- h. Progress to date:** A single season trial was conducted from Dec 1999 – Feb 2000. Pest infestation was very low; Bt appeared to be effective against the lepidopteran pests.
- i. Projected outputs:** Improved knowledge on integrated pest management in cabbage to control lepidopteran leaf feeders.
- j. Projected impacts:** Improved farmer knowledge in insect pest management on cabbage will be the driving force to obtain higher yields, better quality produce and thereby higher incomes. Pesticide applications will be reduced and this will have a positive impact on the environment and human health.
- k. Project start:** October 1998
- l. Projected completion:** April 2001
- m. Projected person-months of scientists time per year:** 12 person-months
- n. Budget:** BARI, \$2,640; Virginia Tech, \$1,270; Penn State, \$4,809 (includes grad student); AVRDC, \$0

## **II.2b. Management of Cabbage Pests Using a Nylon Net Physical Barrier**

- a. Scientists:** S.M. Manowar Hossain, Salim Reza Mallik, M. Nazimuddin, M. N. Alam, M. Khorsheduzzaman – BARI; S. Islam – DAE; M.S.Alam, A.Bashet – IPM CRSP/Virginia Tech; N.S. Talekar – AVRDC; E. Rajotte – Penn State; Z. Alam – BSMRKB (IPSA); G. Luther – Virginia Tech
- b. Status:** Continuing
- c. Objectives:** To test the effectiveness of a nylon net barrier in minimizing the infestation of various insect pests on cabbage.

**In 2000-2001:** To conduct second and final year of trial.

- d. **Hypothesis:** Nylon nets surrounding cabbage plots will reduce populations of *Spodoptera litura*, diamondback moth (*Plutella xylostella*), *Crociodolomia binotalis*, and other pests.
- e. **Description of research activity:** There will be three treatments with four replications in a RCBD, conducted at the BARI experiment station. The treatments are: 1) Barrier net 2m high surrounding the plot, with an open top, 2) Barrier net 2m high with top enclosed, and 3) Control (no net).  
  
There will be no pesticides used and no handpicking of pests on the cabbage. Plot size will be 7 x 6m, and nets will be white in color. Nets will be set up before transplanting cabbage. Cabbage seedlings will be transplanted in peat in October-November. Seedlings must be pest-free. Numbers of lepidopteran larvae and pupae, and any other major pests, will be monitored and recorded once per week in cabbage. Data will be recorded on predators and parasitoids. Head weight, size, and compactness will be recorded from all plots.
- f. **Justification:** Lepidopteran leaf feeders are serious pests of cabbage in Bangladesh. There has been notable success with reducing lepidopteran pest numbers with nylon nets in other Asian countries.
- g. **Relationship to other research activities at the site:** This will be part of the crucifer IPM program. Information on pest control and natural enemies of these insects may be shared with other projects.
- h. **Progress to date:** One season of trials has been conducted during Dec 1999 – Feb 2000. Insect infestation was too low to understand the effect of the barrier method.
- i. **Projected outputs:** Improved knowledge on integrated pest management in cabbage to control lepidopteran leaf feeders.
- j. **Projected impacts:** Use of nets may enable a substantial reduction of pesticide use, which will have a positive impact on the environment and human health.
- k. **Projected start:** October 1999
- l. **Projected completion:** April 2001
- m. **Projected person-months of scientists time per year:** 12 person-months
- n. **Budget:** BARI, \$2640; Virginia Tech, \$1,270; Penn State, \$7,213 (includes grad student)

## II.2c Assessment of Virus Infestation at Different Stages of Okra Plants

- a. **Scientists:** S.M. Monowar Hossain, M. Amir Hossain, Salim Reza Mollik, M. Nazimuddin, M. Khorsheduzzaman, K.A. Kader- BARI; M.S.Alam, A.Bashet - IPM-CRSP/Virginia Tech; E. Rajotte- Penn State Univ.; G. Luther - Virginia Tech.; S. Miller – Ohio State

- b. Status:** New
- c. Objectives:** To identify the degree of virus infestation (YMV) at different stages of okra plant growth by the vectors (white fly) so that appropriate control measures can be undertaken at the critical stage of vector infestation and virus transmission.
- d. Hypothesis:** Vectors usually attack the young okra plants at the vegetative stage for virus transmission. Appropriate control measures for the vector or virus transmission can be undertaken based on the growth stage of okra critical for virus transmission.
- e. Description of research activity:** The experiment will be conducted at BARI Research Farm, Joydebpur with the following treatments having three replications in split plot design maintaining plant spacing of 50cmx40cm; unit plot size will be 2m x 2m.

Main plot treatment: Variety – (a) Pusa Sawni (susceptible) and (b) BARI Dherosh-1 (resistant)

Sub-plot treatment: 2m high nylon net barrier around the plots

C <sub>0</sub>	No net barrier (control)
C <sub>1</sub>	Remove net barrier 7 days after emergence of plants
C <sub>2</sub>	Remove net barrier 14 days after emergence of plants
C <sub>3</sub>	Remove net barrier 21 days emergence of plants
C <sub>4</sub>	Remove net barrier 28 days after emergence of plants
C <sub>5</sub>	Remove net barrier 35 days after emergence of plants
C <sub>6</sub>	Remove net barrier 42 days emergence of plants
C <sub>7</sub>	Net barrier from planting to harvest

Okra will be grown following standard practices and by applying cow dung at 5 t/ha, and NPK at the rate of 40-50-90 kg/ha in the main field. Twenty five percent of the plants in each treatment will be sampled for recording all the parameters. Infestation of okra plants by yellow vein mosaic virus will be observed under field condition and confirmed by ELISA test.

No. of white fly and jassids per leaf of okra plants will be monitored and recorded every 7 days starting from one week after emergence.

No. of white flies per leaf of okra plants will be monitored and recored every 7 days starting from one week after emergence. Data will recorded on the following: a) No. of white fly per leaf before and after placing net barrier; b) Percent plants infected by YMV; c) Days to 1<sup>st</sup> flowering, d) No. of primary and subsequent branches; d) Days to first and last harvest; e) Plant height (cm) at maturity; f) Fruit length and diameter) (cm); g) No. of fruits/plant; h) Yield/plot (kg).

- f. **Justification:** Yellow vein mosaic virus, commonly known as YMV (Yellow mosaic virus) is a serious problem in okra transmitted by white fly. As a consequence YMV infestation becomes severe, particularly in plants susceptible to the vectors. Moreover, plants become weak due to attack of the vectors. YMV symptoms are normally noticeable in severe form at the fruiting stage when farmers apply insecticides randomly to control the vectors. It is necessary to ascertain the proper stage of plant growth when the virus transmission by vectors is critical. This information will help to develop appropriate control measures of vectors, which will eventually minimize pesticide application.
- g. **Relationship to other research activities at the site:** If this component technology is found effective, it can be incorporated into an IPM package for the control of virus vectors in other vegetable crops.
- h. **Progress to date:** New
- i. **Projected outputs:** Effective and improved control measures of vectors transmitting YMV in okra plants and increased yield.
- j. **Projected impacts:** This finding would eventually minimize the pesticide application in okra plants for controlling vectors of yellow mosaic virus.
- k. **Projected start:** March 2001
- l. **Projected completion:** June 2002
- m. **Projected person-months of scientists' time per year:** 6 person-months
- n. **Budget:** BARI, \$2290; Virginia Tech, \$1,270; Penn State, \$11,421 (includes grad student); Ohio State, \$1,260 (includes grad student)

### II.3 **Relationship Between Bait Trap Captured Cucurbit Fruit Flies (*Bactrocera cucurbitae*) and Fruit Injury in Sweet Gourd, Bitter Gourd and Cucumber**

- a. **Scientists:** M. Nasiruddin, S.N.Alam, M. Khorsheduzzaman, M.F.Zaman -BARI; H.S.Jasmine, M.S.Alam, A.Bashet-IPM CRSP/Virginia Tech; E. Rajotte- Penn State; N.S.Talekar- AVRDC.
- b. **Status:** New
- c. **Objectives:** To 1) track the presence of male and female fruit flies over time using cue lure and mashed sweet gourd traps; 2) determine correlation between trap capture and fruit injury throughout the fruit season; 3) test the relative attractiveness of pheromone bait traps and develop mashed sweet gourd trap preservation procedure; and 4) begin test of new bait materials.

**In 2000-2001:** Same

- d. Hypothesis:** Bait materials will attract both male and female fruit flies and they will be captured by traps. Number of captured fruit flies will help to determine the relationship between insect population and time of infestation versus fruit injury.
- e. Description of research activity:** The experiment will be conducted at 4 locations in farmer fields at Kashimpur. At each location, sweet gourd will be planted following normal cultivation practices. The traps of different bait materials in each plot will be set up just after first flower initiation. In each plot four traps having two bait materials (cuelure and mashed sweet gourd+dichlorovos) will be set up in the middle of the plot for studying the relationship between bait trap captured fruit flies and fruit injury and relation between time and infestation. Sampling will be done twice per week (same time as sweet gourd bait changed). Ten sub-plots each of one sq.m. area will be selected randomly for fruit assessment and every female flower will be tagged with the date. Previously tagged fruits will be assessed.

Data to be recorded: 1)the number of both male and female fruit flies captured by traps/plot will be recorded twice per week, 2) number of unstung fruit (not touched by insect ), stung fruit (touched by insect but marketable) and stung + rotted (affected by insect and rotted ) per plot will be counted, 3) weather information, such as daily temperature, rainfall and humidity will be recorded, and 4) harvest analysis (market price, quality) will be done.

- f. Justification:** Insecticides used for the control of fruit flies causes residual and environmental problems. It was found that pheromone cuelure attracts a large number of male fruit flies and mashed sweet gourd bait attracts both male and female fruit flies. With this approach, an environmentally safe, economic and easier method of controlling cucurbit fruit flies might be established. This study is designed to establish relationship between bait trap captured fruit flies and sweet gourd in other areas.
- g. Relationship to other research activities at the site:** If this component technology is found effective it will be incorporated into an IPM package for the control of fruit flies in gourd and cucumber.
- g. Progress to date:** New
- h. Projected outputs:** Improve environmentally safe, economic and easier method for the management of fruit flies.
- j. Projected impacts:** Fruit fly infestation in gourds will be reduced, thereby, increasing the yield without harming the environment.
- k. Projected start:** October 2000.

- l. Projected completion:** September 2001.
- m. Projected person-months of scientists time per year:** 4 person-months
- n. Budget:** BARI, \$2970; Penn State, \$11,421 (includes grad student); AVRDC, \$1100

#### **II.4 Crop Loss Due to Weed Infestation and the Efficacy of Different Weed Control Methods**

**a. Scientists:** Anwar Karim, Nazrul Islam – BARI; M.A. Razzaque – BARC; M.S.Alam, A.Bashet- IPM CRSP/Virginia Tech; A. Baltazar – NCPC/UPLB; S.K. De Datta – Virginia Tech

**b. Status:** Continuing

**c. Objectives:** To 1) determine minimum number of hand weedings required for optimal weed control and yield in eggplant and okra. 2) determine efficacy of mulching for controlling weeds in eggplant and okra.

**In 2000-2001:** Complete both objectives above, first year's experiment. Previous year focused primarily on cabbage

**d. Hypotheses:** (1) Weeds growing with vegetables compete with the crops and reduce yield; and (2) Hand weeding done at critical stages of crop growth will optimize weed control efficacy and increase yield.

**e. Description of research activity:** The efficacy of weeding at different growth stages will be evaluated in three farmer fields in 4m X 5m plots replicated four times in an RCB design. The treatments will consist of: T<sub>1</sub>- one hand weeding (HW) at 15 DAT (days after transplanting), T<sub>2</sub> – two HW at 15 and 35 DAT, T<sub>3</sub> – farmers' practice (time and frequency of weeding to be recorded), T<sub>4</sub> – mechanical weeding (BARI weeder) at 15 DAT and IHW 35 DAT, T<sub>5</sub> - no weeding, T<sub>6</sub> - weed free and T<sub>7</sub>-straw mulch.

Data to be gathered: 1) weed fresh weight by species at 35-45 DAT and 2 weeks before harvest; 2) crop yield and other yield components; 3) number of days to crop maturity; and 4) time spent in hand weeding (min/plot or hour/crop).

**f. Justification:** Crop loss in farmer fields due to weed infestation is a common phenomenon. Farmers use long period of time and labor in controlling weeds. There is a need to develop a cost-effective weeding scheme to reduce yield loss and also reduce production cost due to weed control.

**g. Relationship to other research activities at the site:** This activity will make use of data gathered in weed monitoring.

- h. Progress to date:** Two studies on efficacy of weed control methods in cabbage conducted in two winter seasons (1999-2000) have been completed. Three studies on okra were completed in the summer of 1999. Two studies on eggplant and two studies on cabbage were conducted in winter season of 1999-2000.

Cabbage (Rabi 1998-99): Two weeding operations during active growth stage of cabbage can effectively control the predominant weeds, reduce the weeding operations and weeding cost by 50% and bring about higher yield.

Okra (Kharif 1999): Farmers weed control practices can be reduced by about 50% by adopting only two hand weeding at 15 and 35 days after okra seeding that can effectively control weeds and cut down production cost without reducing weed control efficacy or yields.

Cabbage and Eggplant (Rabi1999-2000): The crops were harvested in March-April,2000. Weed infestations were very low. Two hand-weedings effectively controlled the weeds, but the economic benefits were not significantly different from the farmers' practice due to very low weed infestations.

- i. Projected outputs:** Cost effective weeding scheme will be available to vegetable growing farmers.
- j. Projected impacts: Reduced:** Reduced production cost and increased profit.
- k. Projected start:** October 1998
- l. Projected completion** September 2001
- m. Projected person-months of scientists time per year** 6 person-months
- n. Budget:** BARI, \$2420; Virginia Tech, \$3,175; NCPC, \$1,100

## **II.5a Management of Soil-borne Pathogens of Eggplant and Cucumber**

- a. Scientists:** M.H. Rahman, M.S. Nahar, M.I. Faruk, K.A.Kader, Nurunnahar Khanam, M.A. Rahman – BARI; H.S. Jasmine, M.S.Alam – IPM CRSP/Virginia Tech; L. Black – AVRDC and S. Miller- Ohio State
- b. Status:** Continuing
- b. Objectives: (2000-2001)** To complete evaluation of soil amendment and sawdust burning to control soil borne fungal diseases and nematode in eggplant and cabbage seedbeds. Complete evaluation of soil amendment to control fungal and nematode diseases of eggplant in the main field. To complete evaluation of soil amendment and sawdust burning in controlling fungal and nematode diseases of cucumber.

- d. Hypotheses:** (1) Soil and seed borne pathogens causing seed and seedling diseases in nursery and in the main field would be minimized through physical, chemical and biological treatments of soil and seed, and through soil amendments; and (2) Incidence of root-knot and wilt disease of cucumber would be minimized with organic soil amendment and application of chemicals.
- e. Description of research activity:** The experiments for management of soil-borne diseases of eggplant in seedbed will be conducted in the farmer fields at Kashimpur during Rabi 2000-2001 following randomized complete block design (RCBD) with five treatments having four replications. The unit seedbed size will be 3.0 sqm (3 m X 1 m). The treatments will consist of T<sub>1</sub> – soil solarization with polythene mulch (cover); T<sub>2</sub> – sawdust burning in seedbed (6 cm thickness); T<sub>3</sub> – incorporation of poultry refuse @ 3 ton/ha; T<sub>4</sub> – incorporation of mustard oil-cake @ 300 kg/ha, T<sub>5</sub> – untreated control, and T<sub>6</sub> – farmer practice.

Management of eggplant diseases in the main field will be conducted in farmer fields at Kashimpur during Rabi 2000-2001 following RCBD with six treatments having four replications. The unit plot size will be 20 sqm. (4m x 5m). The treatments are: T<sub>1</sub> – incorporation poultry refuse @ 3 t/ha; T<sub>2</sub> – incorporation of neem oil cake @200 kg/ha, T<sub>3</sub> – application of Rugby 10 G @ 30 kg/ha; T<sub>4</sub> – application of mustard oil-cake @ 300 kg/ha; T<sub>5</sub> – farmers practice, and T<sub>6</sub>- untreated control.

Management of soil borne disease of cucumber will be conducted in the farmer fields at Kashimpur during Kharif 2000 (April – October) following RCBD with eight treatments having four replications. The unit bed/plot size will be 2.5 sqm (2.5 m X 1 m). There will be six plants in each bed/plot. The treatments are: T<sub>1</sub> – application of poultry refuse @ 5 kg/bed; T<sub>2</sub> – application of neem oil-cake @ 1.5 kg/bed; T<sub>3</sub> – application of Furadan (carbofuran) 5 G @ 25 gm/bed; T<sub>4</sub> – sawdust burning (6cm thickness); T<sub>5</sub> – soil drenching twice with Bavistin (Carbendazim) @ 0.2%; T<sub>6</sub> – application of poultry refuse and sawdust burning; T<sub>7</sub> – application of mustard oil-cake @ 2 kg/bed; and T<sub>8</sub> - untreated control.

- f. Justification:** Seed and soil borne pathogens viz. *Rhizoctonia spp.*, *Fusarium spp.*, *Pythium sp.*, *Pseudomonas sp.*, and *Meloidogyne spp.* cause seed and seedling diseases in eggplant in the seedbed nursery as well as in the main field. A single approach would not help to minimize eggplant disease complex. Application of organic amendments, sawdust burning, nematicides and bio-control agents would help to minimize the incidence of soil borne diseases in cucumber.
- g. Relationship to other research activities at the site:** Integrated disease management research will complement the weed and insect research on these crops in other places.
- h. Progress to date:** (1) Experimentation on the management of seedbed nursery diseases showed that sawdust burning gave the best result. To confirm the results further experimentation is needed; and (2) Experiments on the management of eggplant and

cucumber diseases in the main field are in progress. Final results will be available by the end of August 2000.

- i. **Projected outputs:** (1) Improved knowledge about disease problems of eggplant; (2) Identification of promising practices that would minimize the disease incidence; and (3) Technologies would be generated to manage the soil-borne pathogens in cucumber.
- j. **Projected impacts:** (1) Improved understanding of integrated management of eggplant diseases among eggplant growers; (2) Reduced incidence of eggplant diseases; (3) Reduced dependency on chemical control; and (4) Improved eggplant and cucumber yield.
- k. **Projected start:** September 2000.
- l. **Projected completion:** September 2003
- m. **Projected person-months of scientists time per year:** 12 person-months
- n. **Budget:** BARI, \$2,640; Ohio State, \$9,072, (includes grad student); AVRDC, \$1,100

#### II.5b. Development of Forecasting System of Late blight in Tomato and Potato

- a. **Scientists:** M.H.Rahman, M.S.Nahar, K.A.Kader, M.R.Rafique, M.I.Rahman-BARI; M.S.Alam, A.Bashet- IPM CRSP/Virginia Tech; S. Miller- Ohio State
- b. **Status:** New
- c. **Objectives:** (1) To test late blight disease forecasting system for tomato and potato in Bangladesh. (2) To evaluate the relative efficacy of late blight control through use of forecasting system versus conventional system. In 2000-2001, to conduct the first year of the experiment laid out below.
- d. **Hypotheses:** (1) The epiphytotic disease 'late blight' of tomato and potato would be controlled effectively and economically through utilization of warning system of disease forecasting.
- e. **Description of research activity:** The experiment will be conducted in the farmer fields at Kasimpur and Munshigonj during Rabi 2000-2001 in randomized complete block design (RCBD) with four treatments and four replications. The unit plot size will be 4mx5m. The treatments are: (1) Spray recommended fungicide(s) only after receiving signal from forecasting. (2) Calendar spray (3) Untreated control and (4) Farmer's practices.
- f. **Justification:** Late blight caused by *Phytophthora infestans* is a destructive disease of tomato and potato. Control of late blight through utilization of forecasting system would

minimize the number of fungicide sprays, which will reduce the cost of crop production and thereby reduce environmental hazard.

- g. Relationship to other research activities at the site:** The research will complement IPM CRSP pest management activity on the same crop.
- h. Projected output:** Improved knowledge about the forecasting system; farmers can get benefit from forecasting of approximate time and severity of blight disease, so that they can apply appropriate and known control measures and avoid the loss.
- i. Projected impacts:** (1) Improved understanding of late blight disease management of tomato among tomato growers; (2) Reduced incidence of tomato disease; (3) Reduced dependency on chemical control and (4) Improved tomato and potato yield.
- j. Project start:** September 2000.
- k. Project completion:** September 2003.
- m. Projected person – months of scientists time per year;** 12 person-months.
- n. Budget:** BARI, \$5830; Ohio State, \$9,198 (includes grad student)

### **III. Multidisciplinary Laboratory, Greenhouse, and Microplot Experiments**

#### **III.1 Study of Biology and Behavior of *Trichogramma* on *Leucinodes* Eggs under Laboratory and Field Conditions**

- a. Scientists:** M.A. Mannan, K. Begum – BARI; Z. Islam – BRRI; N.S. Talekar – AVRDC; E. Rajotte – Penn State; R. Karim – IPM CRSP/Virginia Tech; G. Luther – Virginia Tech.
- b. Status:** Continuing
- c. Overall Objective:** To test feasibility of *Trichogramma* sp. egg parasitoid as a biocontrol agent of BSFB.

**Objective(s) for 2000-2001:** To 1) rear the egg parasitoid *Trichogramma* sp. on *Corcyra cephalonica*, 2) standardize *Corcyra* egg density and *Trichogramma* parasitoid density on cards, 3) determine the functional response of *Trichogramma* parasitization of *Leucinodes* eggs, 4) determine how long *Trichogramma* can be stored and at what temperatures, 5) determine the parasitism efficiency of *Trichogramma* for the control of *Leucinodes orbonalis* in the laboratory and in the field, and 6) determine existing egg parasitoid species in the field.

- d. Hypothesis:** Biological control suppresses the population of BSFB.
- e. Description of research activity:** The egg parasitoid *Trichogramma sp.* will be reared on the eggs of *Corcyra cephalonica* by standardizing *Corcyra* egg density and *Trichogramma* parasitoid density on cards. The density of *Corcyra* eggs will be calculated by counting the eggs on 20 cards according to the portion of the card covered by eggs. The number of *Trichogramma* that emerge from 'x' number of eggs will be counted. To determine the functional response of *Trichogramma* parasitization of *Leucinodes* eggs, varying numbers of *Trichogramma* will be released on various numbers of *Leucinodes* eggs, and the number of *Trichogramma* emerging will be counted. Parasitism rates will be assessed.
- Trichogramma* (parasitized eggs) will be placed at 6-10° C to determine how long *Trichogramma* can be stored and at what temperatures.
- Trichogramma sp.* will be tested on *Leucinodes* eggs to determine the parasitism efficiency for the control of *Leucinodes orbonalis* in the laboratory and in the field (under controlled conditions); comparisons will be made between plots with *Trichogramma* releases and plots with no releases. Collection and rearing of *Leucinodes* eggs will be continued to determine the existing egg parasitoid species in the field.
- f. Justification:** (1) Bio-control methods can reduce the population of *Leucinodes orbonalis* in eggplant, thereby reducing environmental pollution from chemical control; (2) Chemical control causes health hazards and secondary mite infestation; and (3) Farmers currently spray each crop about 15-70 times per season. IPM will help to produce insecticide free vegetables for exporting to different countries.
- g. Relationship to other research activities at the site:** The proposed work on biological control will provide IPM tactics to complement other IPM methods in eggplant, such as varietal screening for resistance/tolerance to BSFB.
- h. Progress to date:** Identified the species that parasitizes *Leucindoes* eggs as being *Trichogramma chilonis* (Ishii). Have successfully reared *Trichogramma chilonis* on *Corcyra*. Bio-control laboratory and techniques already enhanced to some extent.
- i. Projected outputs:** Enhanced Bio-control laboratory. BC method for managing *Leucinodes*.
- j. Projected impacts:** (1) Reduced pesticide use; and (2) Increased eggplant yield and farmers income.
- k. Projected start:** October 1998
- l. Projected completion:** September 2002
- m. Projected person-months of scientists time per year:** 8 person-months

- n. **Budget:** BARI, \$2,530 (includes cost of heater); Virginia Tech, \$1,270; Penn State, \$481

#### IV. Socioeconomic Analyses

##### IV.1 Measure Economic Impacts of Bangladesh IPM CRSP Research Activities

- a. **Scientists:** M.I. Hossain, – BARI; A.Bashet- IPM CRSP/VirginiaTech; G. Shively – Purdue; G. Norton – Virginia Tech..
- b. **Status:** Continuing
- c. **Objectives:** (1) Evaluate and forecast economic impacts resulting from pest management strategies (PMS) developed by the IPM CRSP Bangladesh; (2) Estimate potential country-wide impacts of PMS developed by the IPM CRSP Bangladesh; and (3) Incorporate experimental and baseline survey data in a farm-level optimization model to analyze the potential farm-level impact of IPM practices for representative farms.  
  
**In 2000-2001:** All three objectives will be worked on but not completed. An analysis of three new technologies developed on the CRSP will be completed and written up. Preliminary results of the optimization model will be obtained.
- d. **Hypotheses:** (1) Tested IPM practices will result in higher income for farms that adopt IPM; (2) IPM practices will generate economic benefits to Bangladesh society as a whole.
- e. **Description of research activity:** Individual IPM scientists are collecting data to be used to develop economic budgets for IPM components and packages. These budgets include production costs and financial returns. IPM packages will be assessed regarding their requirements of farm resources such as land, labor, and cash at specific times in the agricultural calendar. Farm level models will be used to assess the farm-level impact of IPM packages. Economic surplus analysis will be used to project national-level impacts of IPM adoption. GIS analysis will be used to assess the potential for extending IPM CRSP Bangladesh technologies to other locations.
- f. **Justification:** Knowledge regarding the farm-level profitability of IPM strategies is necessary for promoting IPM and predicting likely patterns of adoption. Knowledge regarding potential aggregate social benefits of IPM adoption is necessary for informing national policy makers and research directors of the overall merits of IPM strategies and their economy-wide impacts. Information can also be used to develop specific policies to encourage IPM adoption. Technology transfer to other settings requires information regarding the likely settings in which adoption is expected to occur.

- g. Relationship to other research activities at the site:** This work is very closely related to research being conducted by other IPM CRSP scientists. This research critically depends on accurate and timely contributions of data from other research scientists. The activity specifically addresses issues related to the private profitability of IPM strategies being developed by other IPM CRSP scientists. It also complements other socioeconomic research that focuses on IPM adoption and the role of prices and marketing in pest management decisions for vegetables.
- h. Progress to date:** The impacts of three IPM CRSP technologies are currently being evaluated with a thesis and paper expected this year.
- i. Projected outputs:** The profitability of IPM components and packages will be estimated and reported in a series of papers and presentations to the research community and policy makers in Bangladesh.
- j. Projected impacts:** Better decision making among researchers and policy makers regarding appropriate IPM technologies and likely on-farm impacts.
- k. Start:** September 1998
- l. Projected completion:** September 2002
- m. Projected person-months of scientists time per year:** 6 person-months
- n. Budget:** BARI/BRRI, \$1,870; Virginia Tech, \$10,785 (includes grad student)

#### **IV.2 Adoption of Integrated Pest Management Practices in Different Regions of Bangladesh**

- a. Scientists:** M.I. Hossain, – BARI; A.Bashet- IPM CRSP/Virginia Tech; G. Shively – Purdue; C. Sachs – Penn State; G. Norton – Virginia Tech ;.
- b. Status:** Continuing
- c. Objectives:** (1) To Assess the relative importance of the agronomic, economic and social factors explaining observed patterns of crop and pest management practices; (2) To determine the effect of IPM practices on labor allocation (especially women’s labor allocation) within farm households, and potential repercussions for health and nutrition in farm households; (3) Determine the extent of adoption of pest management practices of vegetables in different regions; (4) To study the ways in which farm characteristics, socio-economic factors, and cropping decisions affect child nutrition and health; and (5) To examine the effectiveness of IPM programs in facilitating improved pest management practices.

**In 2000-2001**, baseline survey data will be analyzed to determine factors explaining pest management practices, while focus group info will be used to address labor allocation issues.

- d. Hypotheses:** (1) Probability of pesticide use rises as the intensity of vegetable production on a farm increases; (2) Socio economic and demographic characteristics of households and their members affect adoption of IPM practices; (3) Adoption of IPM practices affect labor use in farm households and may affect women's time allocation and health; (4) Regional differences in on-farm employment and labor availability of both men and women influences adoption of IPM practices; (5) A mother education and the nature of her work influences pest management practices and child health; (6) IPM adoption is higher in areas with significant NGO and extension program.
- e. Description of research activity:** Data will be collected from three locations viz. Jessore, Manikganj and Gazipur. From each location, two villages will be selected considering the intensive vegetable growing areas. Again from each village, 5 focus groups will be interviewed. They are small farmers, medium farmers, large farmers, landless farmers, and women. Each group will consist of 8 members to determine their respective roles in pest management decision-making. Again, summer and winter season will be considered for the purpose. In total, 30 focus groups will be interviewed in each season. Data from baseline survey will also be used to classify major pest management practices. Probability and extent of adoption of the practices will be assessed using statistical models (probit/logit, and/or other multiple regression methods). Data from the focus groups and the in-depth interviews will be analyzed to enrich the findings from the baseline survey.
- f. Justification:** Understanding of the factors associated with different pest management practices is necessary for formulating policies to promote new pest management practices or discourage undesirable practices.
- g. Relationship to other research activities at the site:** This work complements other socioeconomic research on the IPM CRSP in Bangladesh. Other activities related to this include the impact assessment and the price and marketing study. Data from baseline study will be used as input.
- h. Progress to date:** Baseline survey data gathered in previous years and two thesis proposals have been prepared.
- i. Projected outputs:** Paper and presentations to research community and policy makers in Bangladesh.
- j. Projected impacts:** Better understanding of pest management practices and improved policy making within the Department of Agriculture.
- k. Start:** September 1998

- l. Projected completion:** September 2002.
- m. Projected person-months of scientists time per year:** 6 person-months
- n. Budget:** BARI, \$3245; Penn State, \$10,459; Virginia Tech, \$1,905

#### **IV.3 Study of Price and Marketing of Vegetables and other implications for Pest Management Practices**

- a. Scientists :** M.I. Hossain– BARI; A.Bashet- IPM CRSP/Virginia Tech; G. Shively – Purdue; G. Norton – Virginia Tech.
- b. Status:** Continuing
- c. Objectives:** To (1) monitor and measure levels and variability of farmgate and wholesale prices for vegetables and relate to farm level data on crop and pest management decisions; (2) determine marketing costs and margins of different vegetables operated by different intermediaries; (3) study the market structure for commercial vegetable production, including actual and potential fresh vegetables exports; (4) monitor and measure export quantities of fresh vegetables; and (5) measure price premia for blemish-free vegetables.
- d. Hypotheses:** (1) Farmers’ crop and pesticides choices reflect risk avoidance strategies; (2) Pesticide use is higher for vegetables that receive a greater appearance premium in the market; (3) High marketing cost receive lower returns; and (4) Export potential increases the use of pesticides.
- e. Description of research activity:** Data will be collected from four locations viz. Jessore, Comilla, Dhaka and Gazipur. From each place, primary and secondary markets will be selected and concerned traders like bepari, aratdar (commission agent), wholesaler, retailer will be selected. From Dhaka city, stallholders from urban retail markets and some exporters from terminal markets will be selected for interview. A weekly survey of farmers will also be conducted to measure prices received for vegetables. Price data will be categorized according to mean and coefficient of variations on monthly and annual bases. Data on vegetable exports will be collected in cooperation with the Bangladesh Fruit, Vegetables and Allied Products Association.
- f. Justification:** Market conditions, including prices and export potential, are drivers of crop choice and pest management decisions. Understanding the role of prices, including price risk, and export demand in influencing crop choice is necessary for targeting IPM practices and developing priority areas of research.
- g. Relationship to other research activities at the site:** This work complements other socio-economic research on marketing in Bangladesh. Information will be related to

baseline survey and will be used in conducting simulations with a model of farmer decision-making.

- h. Progress to date:** This activity has just begun in the middle of this year.
- i. Projected outputs:** Papers and presentations to research community and policy makers.
- j. Projected impacts:** (1) Better understanding of what drives crop choice and pesticide use; and (2) Improved targeting of research and policy interventions.
- k. Projected start:** October 1998
- l. Projected completion:** September 2002
- m. Projected person-months of scientists time per year:** 6 person-months
- n. Budget:** BARI, \$3047; Purdue, \$33,886 (includes cost of grad student)