



# Feed the Future Innovation Lab for Integrated Pest Management

For many teams focused on decreasing global food insecurity, the COVID-19 pandemic has significantly delayed progress. However, a long history of adapting crop solutions to local conditions has helped the IPM Innovation Lab (IPM IL) find innovative ways to continue to reach and assist small-scale farmers during this time. In this summer newsletter, IPM IL not only highlights the ways in which it is aiming to serve developing communities in this time of transition, but also some of the team's many accomplishments over the last quarter-of-a-century.

Additionally, in light of recent occurrences within the U.S., the IPM IL would like to formally pledge our commitment to fostering diversity. The field of IPM has been immeasurably enriched by black scientists, farmers, researchers, and thinkers. While the IPM IL strives for economic, social, gender, and environmental equity in all the work we do, we know that the fight against racial injustice remains – there must be change and we must be a part of that change. As stated by Virginia Tech president Tim Sands and Virginia Tech Vice President for Strategic Affairs and Diversity Menah Pratt-Clarke, “We have an opportunity as individuals and in our own communities to construct a microcosm of the society in which we wish to live.” Today, and every day, we denounce ongoing displays of violence and systemic racism. We pledge to seek out more ways to facilitate, support, and amplify the voices and participation of Black, Indigenous, and People of Color in the scientific community, development sector, and beyond.

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# 27 Years of Highlights

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Biocontrol of the papaya mealybug, bringing India up to \$1.34 billion in economic benefits.

Forecasting and management of the invasive tomato pest *Tuta absoluta* and global monitoring of invasive species.

Fall armyworm management through augmentative biocontrol.

Olive fruit fly management in Albania.

Identification and management of longan witches' broom syndrome in Vietnam.

Implementation of sleeving technique in Vietnam, successfully controlling diseases of dragon fruit.

IPM packages implemented for vegetable crops, significantly reducing reliance on chemical pesticides throughout the developing world.

Long-term training of over 500 students from the U.S. and developing world.

Grafting vegetable seedlings for management of bacterial wilt in tomato and eggplant, and *Fusarium wilt* in naranjilla.

Implemented host-free period for *tomato leaf curl disease* in Mali.

Climate change assessment through biodiversity in Nepal.

Successful mango fruit fly management using fruit bagging in Bangladesh and Vietnam.

Promotion of *Trichoderma* for plant disease control.

Integration of neem products as natural insecticides.

Promotion of use of pheromone lures and traps for monitoring pest invasion.

Agri-business development in South Asia.

Use of cocopith for raising healthy vegetable seedlings.

Removing diseased seedlings in nursery for management of *peanut bud necrosis virus* in tomato fields.

Biological control of *Parthenium hysterophorus* in East Africa, with successful establishment of natural enemies.

Augmentative biological control of pearl millet headminer in Niger in collaboration with ICRISAT, with 34% increases in yields.

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# Project Highlights Amid COVID-19

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**Feed the Future Nepal Integrated Pest Management (FTFNIPM):** In January 2020, the inception meeting for the Nepal Mission Associate Award was conducted in Kathmandu. Sub-awards to iDE and NARC were executed. In collaboration with iDE, farmers have been receiving pest management information over radio as well as bulk text messages amid COVID-19. Preliminary research is being conducted to assess the gendered implications of COVID-19 in Nepal.

**IPM for Exportable Fruit Crops in Vietnam:** With restrictions on in-person farmer trainings, IPM IL collaborators at the Southern Horticultural Research Institute (SOFRI) in Vietnam have successfully begun delivering farmer trainings

virtually.

**Biological Control of *Parthenium hysterophorus* in East Africa:** The natural enemies of the invasive weed *Parthenium hysterophorus* have established consistently in Ethiopia and Uganda. The leaf-feeding beetle *Zygogramma bicolorata* has established in Arba Minch, Ethiopia, while *Listronotus setosipennis* has established in Mojo and Wollo, Ethiopia. *Zygogramma bicolorata* has also field established in Kampala and Kiryondongo, Uganda. This establishment is ultimately helping to replenish farmlands for crop production and livestock grazing.

**IPM for Rice, Maize, and Chickpea:** The fall armyworm egg parasitoids *Trichogramma chilonis*, *Trichogramma mwanzai*, and *Telenomus remus* are continuing to be mass-reared at the National Biological Control Program in Kibaha, Tanzania. When reared in the laboratory, *Trichogramma mwanzai* shows 70 percent parasitism of fall armyworm eggs.

**IPM for Vegetables in East Africa:** Recognizing the value of agri-input suppliers through a series of surveys, the IPM team in East Africa will be giving special emphasis in the future to educate this group.

**Modeling for Biodiversity and Climate Change:** In Nepal, distribution maps of seven invasive plant species were developed using Landsat and Worldview images, and the increases and decreases in area of their coverage from 1990 was determined. Six invasive plant species showed an increase in coverage, revealing invasion in new areas, whereas *Ipomea carnea* coverage decreased by 70%. There was a 168% increase in area of *Lantana camara*, 234% of *Chromolaena odorata*, 309% of *Parthenium hysterophorus*, 425% of *Ageratina adenophora*, 450% of *Eichhornea crassipes*, and 831% of *Mikania micrantha* in the CHAL area of Nepal from 1990 to 2018.

**Invasive Species Modeling for South American tomato leafminer *Tuta absoluta*:** Based on *Tuta absoluta* modeling conducted in Nepal, a proposal submitted to USDA for predictive modeling of its spread in the U.S. was approved.

**Ecologically-Based Participatory Packages for Rice in Cambodia (EPIC):** After the introduction of plastic barriers and wire traps for capturing rodents destroying rice fields, farmers are seeing significant increases in yields.

**IPM for Vegetable Crops and Mango in Asia:** IPM packages continue to be implemented in Cambodia, while dissemination of mango bagging continues to help control the fruit fly *Bactrocera dorsalis* in Bangladesh. Surveying and monitoring of fall armyworm is underway in Bangladesh, Cambodia, and Nepal.

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# Management Entity

# Announcements

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Anamika Sharma

[Anamika Sharma is the newest member of the IPM Innovation Lab team.](#) Sharma is an entomologist and insect ecologist. She will be serving as a Research Associate for the Management Entity.

Virender Kumar is the new Principal Investigator for the Ecologically-Based Participatory IPM Packages for Rice in Cambodia (EPIC) team. Kumar is currently based in the Philippines and has already participated in the EPIC project for several years as a researcher.

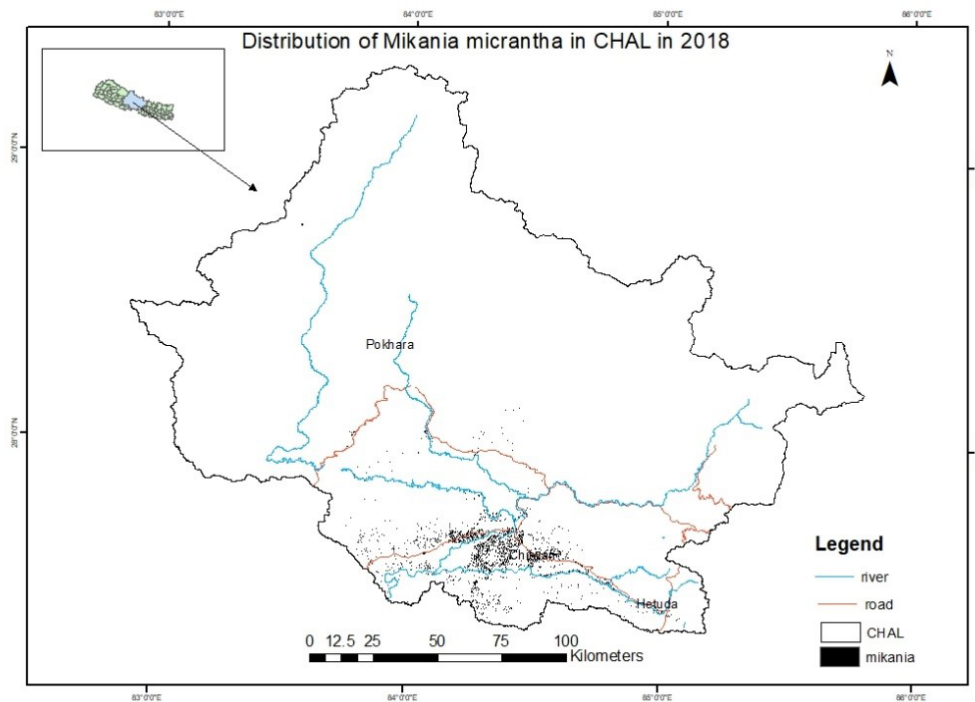
Yubak Dhoj G.C. is the latest member of the Technical Advisory Committee (TAC) for the IPM Innovation Lab. Dhoj is a Senior Agricultural Officer in the Plant Protection Division at FAO.

The IPM IL will be featured in the upcoming Feed the Future Research Output Dissemination Study (RODS), highlighting the program's implementation of *Trichoderma* in Nepal as well as tomato grafting in Bangladesh.

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# Select News Articles

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Distribution of *Mikania micrantha* in CHAL area of Nepal

[COVID-19 response in developing countries: Virginia Tech team adapts agricultural services when farmers needs them most.](#) *VT News.*

[Collaboration between Virginia land-grant institutions leads to success in fighting invasive weed.](#) *VT News.*

[Farmer-focused partnership leads to improvement, innovation of Cambodia's rice sector.](#) *Rice Today.*

[Satellites Capture Spread of "Mile-a-Minute Weed" from Space for Improved Food Security on the Ground.](#) *AgriLinks.*

[Study Shows Elevation Affects Fly's Use as Natural Enemy of Invasive Weed.](#) *Entomology Today.*

[Pesticides and Post-Harvest: How Fruit Bagging Mitigates Losses, Improves Exports.](#) *Agrilinks.*

[Biocontrol of Fall Armyworm: The Chain Reaction that Led to Regional and Cross-Continental Management.](#) *Agrilinks.*

[Gender Research in Vietnam: Applications for Both Farmers and Scientists.](#) *Agrilinks.*

[Virginia Tech, USAID partner to promote inclusive agricultural development in Nepal.](#) *VT News.*

[Field Notes: Biocontrol of the Fall Armyworm - Long-term Resilience for Small-scale Farmers.](#) *The Chicago Council on Global Affairs.*

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# Select Research

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[Comparison of biorational management approaches against mango fruit fly \(\*Bactrocera dorsalis\* Hendel\) in Bangladesh.](#) *Crop Protection.*

[Modeling commodity flow in the context of invasive species spread: Study of \*Tuta absoluta\* in Nepal.](#) *Crop Protection.*

[Temporal and spatial patterns of research on a globally significant invasive weed \*Parthenium hysterophorus\* L.: A bibliographic review.](#) *Crop Protection.*

[Rice blast management in Cambodian rice fields using \*Trichoderma harzianum\* and a resistant variety.](#) *Crop Protection.*

[Candidates for Augmentative Biological Control of \*Spodoptera Frugiperda\* in Kenya, Tanzania, and Nepal.](#) *Indian Journal of Entomology.*

[Field performance of the parasitoid wasp, \*Trichogrammatoidea armigera\* \(Hymenoptera: Trichogrammatidae\) following releases against the millet head miner, \*Heliocheilus albipunctella\* \(Lepidoptera: Noctuidae\) in the Sahel.](#) *Biocontrol.*

[Potential suitable habitat of \*Eleusine coracana\* \(L\) gaertn \(Finger millet\) under the climate change scenarios in Nepal.](#) *BMC Ecology.*

[Impacts of plant spacing and nitrogen fertilizer on incidences and density of spotted and African pink stem borers in Tanzania.](#) *International Journal of Pest Management.*

[Stem galling of \*Ageratina adenophora\* \(Asterales: Asteraceae\) by a biocontrol agent \*Procecidochares utilis\* \(Diptera: Tephritidae\) is elevation dependent in central Nepal.](#) *Biocontrol Science and Technology.*

[Changes in Agricultural Extension and Implications for Farmer Adoption of New Practices.](#) *Applied Economic Perspectives and Policy.*

[Evaluation of \*Beauveria bassiana\*, \*Metarhizium anisopliae\*, and \*Bacillus thuringiensis\* for the management of \*Helicoverpa armigera\* \(Hubner\) \(Lepidoptera: Noctuidae\) under laboratory and field conditions.](#) *Biocontrol Science and Technology.*

[Effect of \*Azadirachta indica\* and \*Milletia ferruginea\* extracts against \*Helicoverpa armigera\* \(Hubner\) \(Lepidoptera: Noctuidae\) infestation management in chickpea.](#) *Cogent Food & Agriculture.*



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