



KGF NEWSLETTER

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Editorial

A relatively large area in the Hill Tracts of greater Chattogram (CHT) is available in Bangladesh for agricultural production. These lands offer great opportunities for diverse agricultural use including cereal, fruit, vegetable and fiber crop cultivation and livestock production. In spite of this, the hill lands have remained rather underutilized. The hill land and other natural resources and opportunities need to be explored and tapped with a judicious balance between exploitation and conservation. Although the economy of CHT is agro-based, both in terms of GDP and labor employment, agriculture there is still backdated compared with that in the plain land areas of the country.

Considering the huge potential of CHT in terms of contribution to the national agricultural output and in keeping with the need to expedite R&D for technology development and dissemination to enhance production and improve livelihoods in the hill region, KGF has designed Commissioned Research Programs (CRP) like **Hill Agriculture, Strengthening Sugarcane Research and Development and Hill Livestock** for CHT. The **Hill Agriculture** program has been divided into several components including Watershed Management, Sustainable Land Management, Development and Delivery of Intensive Crop Production Technologies, Entrepreneurship and Value Chain Development. **Strengthening Sugarcane Research and Development** is being implemented for development of high yielding disease resistant chewing and goor type sugarcane varieties suitable for growing in CHT and growing sugarcane intercropped with high value crops, which, being more remunerative and environment friendly, are expected to replace tobacco. In the mill zones, the average yield of sugarcane is 50 t/ha, but the average yield of sugarcane in hill region is over 100 t/ha. This initiative seeks to strengthen research capability of sugarcane scientists and generate improved technologies including high yielding varieties and suitable production technologies. The CRP project **Increasing Livestock Production In The Hills Through Better Husbandry, Health Service and Improving Market Access through Value and Supply Chain Management** has been designed to assess the problems and prospects of livestock production in the hill districts of Bangladesh, and enhancing livestock production through improved feed and fodder production and management. One Competitive Grants project, **Rice-Cotton Intercropping in Bandarban and Khagrachari**, districts was implemented and piloting was done in the hill areas. The above projects have been implemented in collaboration with NARS Institutions and universities. The mainstreaming of indigenous agro-commodities in the hill region has been partially done further work is needed to attend to branding, linkages with quality markets and awareness building among the consumers.

Issue Highlights

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Seminar, Workshop/Consultation Meeting/Training

Workshop on

Promoting Pulses, Oilseeds, Maize and Other Crops in the Stress Prone Areas of Bangladesh in partnership with Australia

KGF and the Australian Centre for International Agricultural Research (ACIAR) jointly organized a workshop on **Promoting Pulses, Oilseeds, Maize and other Crops in Stress-prone Areas in Bangladesh**. The workshop was held on 29 July 2018 at BARC, Farmgate, Dhaka. The objective of the workshop was to share of knowledge and experiences on crops sector development through ACIAR collaborative projects in Bangladesh. KGF has been supporting the collaborative research programs with co-financing arrangements with ACIAR on three projects since 2015 in stress prone areas of Bangladesh as follows:

- Cropping systems intensification in the salt affected coastal zones of Bangladesh and West Bengal, India
- Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh
- Nutrient management for diversified cropping in Bangladesh

Matia Chowdhury, MP, Honorable Minister, Ministry of Agriculture, Government of the People's Republic of Bangladesh (GOB) attended the workshop as the chief guest. H.E. Ms. Julia Niblett, Australian High Commissioner to Bangladesh and Mr. Mohammad Moinuddin Abdullah, Senior Secretary, Ministry of Agriculture, GoB were present as special guests. Prof. Andrew Campbell, Chief Executive Officer, ACIAR presented the keynote paper on ACIAR's 10 years strategy and future in Bangladesh. Dr. Md. Kabir Ikramul Haque, Executive Chairman, BARC presided over the inaugural session while Dr. Wais Kabir, Executive Director, KGF welcomed the dignitaries and guests attending the workshop.

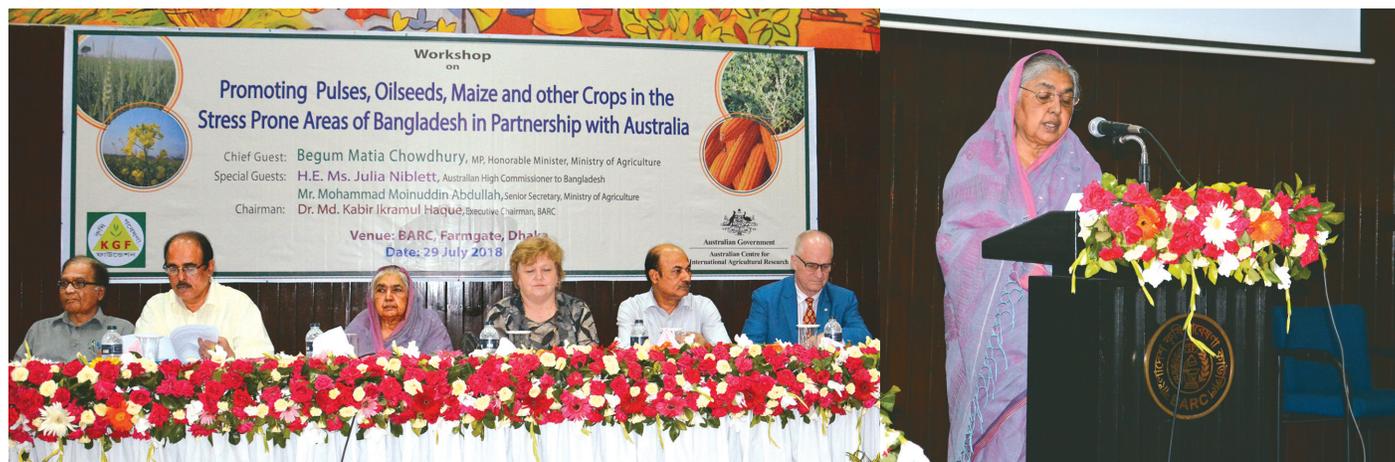
Agriculture Minister Matia Chowdhury emphasized exchange of genetic resources between Bangladesh and Australia for developing stress tolerant varieties of different crops in her inaugural speech. Also, she welcomed the joint effort of ACIAR and KGF as well as National Agricultural Research System (NARS) in developing stresses tolerant varieties,

particularly of pulses and oilseeds as Bangladesh has a shortage of these commodities. Matia Chowdhury hailed Bangladesh-Australia cooperation in agriculture and thanked ACIAR and KGF for accelerating cooperation in agro-science. 'There is scope for further productivity gains with genetic manipulation through increasing photosynthetic efficiency of major crops which will require support of international science', she said.

The Minister for Agriculture added that, considering the recent expansion of industries in the northern region of Bangladesh, we need to develop agriculture in the potential areas of the south which was once known as the granary of Bangladesh. We need to develop sustainable production systems with profitable farming options under the constraints of tidal water submergence and salinity that compel farmers to keep their lands fallow.

She said that, recent climate events like flash floods are damaging crops in the haor region, and short duration, early maturing and cold tolerant crop varieties were needed in the this region, and, on the other hand, the issue of optimizing water use and development of water saving farming systems in the ecologically different, drought-prone areas of north-western Bangladesh need special attention. The use of modern technologies like nanotechnology, GMO, hybrid, growing more crops with less inputs, conservation and precision agriculture, conserving soil health and natural resources have been given adequate attention in the recently formulated National Agricultural Policy 2018, she added.

Prof. Andrew Campbell, in his keynote speech, mentioned, "Australia (through ACIAR) has been working in Bangladesh for over 20 years – this region is crucial for global food security and a high priority for ACIAR". Dr. Protibha Singh, ACIAR Regional Manager for South Asia, spoke on Crop Production Potential in the Stress Prone Areas of Bangladesh in Partnership with Australia.



Dignitaries and guests at the workshop on KGF-ACIAR collaboration

Honourable Agriculture Minister delivering the inaugural speech

Mr. Mohammad Moinuddin Abdullah, Senior Secretary, Ministry of Agriculture, GOB emphasized inter-institutional partnership among NARS institutes, universities and KGF for technology development and dissemination for sustainable production systems adding that, Bangladesh with a highly population density and dwindling land resources and facing adverse effects of climate change needs latest technologies and skilled manpower for sustainable agriculture development. He appreciated the agriculture friendly present government under the leadership of the Honourable Prime Minister Sheikh Hasina who is implementing the dreams of the Father of the Nation, Bangabandhu Sheikh Mujibur Rahman.

H.E. Ms. Julia Niblett, Australian High Commissioner to Bangladesh, in her speech appreciated due to very quickly the fast economic growth and poverty reduction in Bangladesh. She mentioned climate change and its adverse effects on agriculture, especially in stress-prone areas and the need for quality education, knowledge and research to meet the diverse challenges to agriculture. She suggested identifying effective and strong partnership opportunities of ACIAR with KGF for addressing the upcoming agricultural production problems up to the year 2050. Finally, the Australian High Commissioner thanked KGF for organizing the workshop.

Three technical papers were presented at the workshop: (1) **Conservation Agriculture, Farm Mechanization and Nutrient Management** by Prof. Richard W. Bell of Murdoch University, Australia, (2) **Cropping System Intensification in the Salt Affected Coastal Zones of Bangladesh and West Bengal, India** by Dr. Mohammed Mainuddin of the Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia, and (3) **Incorporating Salt Tolerant Wheat and Pulses into Small Holder Farming Systems in Southern Bangladesh** by Prof. W. Erskine of the University of Western Australia. The participants of the

Annual Review Workshop on Basic Research, CGP and CEP Projects

A two-day 'Second Annual Review Workshop on Basic Research, Competitive Grants Program (CGP) and Capacity Enhancement Program (CEP) Projects for the Year 2017-18 was held in the SAC Conference Room, BARC Complex during June 04-05, 2018. Progress reports on sixteen projects were presented. Dr. Wais Kabir, ED, KGF welcomed the participants including PIs, Co-PIs, Coordinators, Reviewers and briefed them on the workshop.

He emphasized strengthening of project monitoring and evaluation and reviews of the progress to better guide the researchers in achieving their set objectives. Dr. Kabir thanked all for their presence, valuable comments, suggestions and observations from the participants which would contribute to improving the quality of research carried out through KGF funded projects. The Session Chair for the 1st day of the workshop was Prof. Shahidur Rashid Bhuiyan, Department of Genetics and Plant Breeding, Sher-e-Bangla Agricultural

workshop took part in the discussion of relevant issues, such as, sustainable crop intensification, farming systems approaches including livestock and fisheries, value chain and innovation, marketing, social motivation/social behavior/community aspects, management of water salinity, social equity and gender, linkages among DAE, DLS and DoF, etc. Dr. M. A. Sattar Mandal, Professor Emeritus, BAU, chaired the Progress Review Session on the On-going Projects and Panel discussion.

Panel discussion

In the plenary session, Dr. Matiur Rahman, former DG, BARI, Dr. Jiban Krishna Biswas, former DG, BIRRI and Prof. M.A.M. Yahia Khandoker, Director, BAURES, BAU presented their views on future agricultural R&D in Bangladesh. They opined that ensuring food security through increased agricultural production is a big challenge to overcome as it involves different cross cutting issues involving shortage of farm labour, loss of arable land, minimizing yield gaps, degradation of land (salinity, erosion, water logging etc.), combating climate change effects on agriculture, increasing agriculture-product diversification.

They mentioned that consumption for improving nutrition, increasing resource use efficiency and judicious use of agricultural inputs, expanding irrigation and farm mechanization with appropriate technologies including better use of renewable energy, reducing output loss through technology based weather prediction and forecasting and better crop disease management and bio-control of pests, popularizing good agricultural and IPM practices, shifting where feasible to higher-value crops for commercialization including increasing quality horticultural crop production, linking farm-produces with markets, etc. The workshop adopted a number of valuable recommendations that would be helpful for future direction of R&D through the KGF-ACIAR collaboration.

University. The 1st day workshop involved mainly the progress of basic research project

On the 2nd day, Dr. Kazi M Kamaruddin, PD (L&F), KGF welcomed the participants, and Dr. Shah-e-Alam, Professor, BAU and former Vice Chancellor, SAU chaired the session. Scientists from different NARS institutes, BARC, KGF, DAE, Hortex Foundation, universities and relevant experts from other organizations attended the workshop. All coordinators and PIs were requested to follow the feedback and suggestions of the annual review workshop as recorded in the proceedings for improvement and successful implementation of the projects. Each of the project reports was reviewed by pre-selected experts before the workshop and they submitted their comments/suggestions in their review reports and presented their reports during the workshop. Among sixteen projects, eleven performed well, but five were identified as poor performers.



Guests at the inaugural session and Participants of the workshop

Total eight (08) basic research and one (01) CGP projects were presented in this session. Participants mentioned that agriculture science could not forward without basic research in agriculture and eight projects are the new works by KGF. After each of the presentation, participants took part in the discussion and gave suggestions. Professor Dr. Shah-e-Alam, Bangladesh Agricultural University and former Vice Chancellor of Sher-e-Bangla Agricultural University, Dhaka presided over the session. Three (03) CGP projects from 2ndcal and three (03) CEP projects were presented in this session. After each of the presentation, audience took part in the discussion and gave suggestions

Dr. Wais Kabir, Executive Director, KGF presided over the inaugural session while Dr. Md. Shahidur Rashid Bhuiyan, Professor, Department of Genetics and Plant Breeding, SAU,

Dhaka chaired the presentation session of day 1. A total of 9 ongoing projects were presented over the day 1. Over the second day of the workshop, Professor Dr. Shah-e-Alam, Bangladesh Agricultural University and former Vice Chancellor of Sher-e-Bangla Agricultural University, Dhaka presided over the presentation session while Dr. Kazi M Kamaruddin, PD (L&F), KGF provided the welcomed address to the participants. Apart from respective PI and Co-PI, there were participants from different NARS Institutes, BARC, KGF, Department of Agricultural Extension, Hortex Foundation, Universities and relevant experts from other organizations attended the workshop. The discussed projects are implementing in the different ecosystem of Bangladesh and the review workshop is expected to provide feedback and suggestions for successful implementation of the projects.

Training on

Intellectual Property Rights (IPR) and Technology Commercialization in Agriculture

IPR has become an emerging issue in knowledge based growth of agriculture at the national and global levels. Keeping this in view, a training program on IPR and Technology Commercialization in Agriculture was organized by KGF in two batches during 24-29 June 2018 at BRAC-CDM, Savar, Dhaka for the capacity development of scientific professionals engaged in technology development both from public and private sectors including universities.

Dr Wais Kabir, ED, KGF and Dr Kazi M. Kamaruddin, Program Director (Livestock and Fisheries), KGF inaugurated the 1st and 2nd batch training on 24 and 27 June 2018, respectively. Forty five scientific professionals from different NARS institutions, universities, DAE, BCIR and National Institute of Biotechnology, and private sector organizations attended the training in two batches.



Guests at the inaugural session



Participants, resource speakers and guests



Participants are taking certificates

Resource person is delivering speech

Professor R. Kalpana Sastry, Tata Institute of Social Sciences, Hyderabad and Dr Srinivas, Principal Scientist, ICAR-NAARM, Hyderabad, India were invited as expert trainers, while Mr. Mohammad Sanowar Hossain, Registrar (Additional Secretary), Department of Patents, Designs and Trademarks (DPDT), Dhaka and Prof. Shahidur Rashid Bhuiyan of SAU facilitated the training as a local expert. The training covered overview of intellectual property rights in NARS, plant variety protection, technology protection and entrepreneurship-case studies, IPR laws in Bangladesh, technology commercialization and licensing deals, incubator operational canvas, IP valuation, deal making with licensees and investors, IP informatics and hands on exercises in informatics.

BAU Emeritus Professor Dr. Abdus Sattar Mandal and Dr. Abul Kalam Azad, DG, BARI attended as Chief Guest and Special guest respectively in the concluding ceremonies. It was hoped that this training would sensitize the scientific professionals

engaged in technology development in understanding intellectual property rights and will help to move forward for technology commercialization. At the end of the training, certificates were distributed among the participants.



Guest in the concluding session

Visits for projects monitoring

- Dr. Tapan Kumar Dey, Senior Program Specialist (Crops) attended the workshop on developing and fabricating sugarcane crushing machine suitable for CHT during 1-2 June 2018
- Mr. Mohammad Nuruzzaman, Program Specialist (Fisheries) visited BAU, Mymensingh and attended the inception workshop on sustainable management of maize collaborative research during 1--2 June 2018
- Dr. Wais Kabir, Executive Director, KGF and Dr. Habibur Rahman Khandaker, Monitoring Specialist visited BAU, Mymensingh during 4-5 June 2018
- Dr. Wais Kabir, Executive Director, KGF attended the ACIAR Implementation Framework Sustainable Development Investment Portfolio Phase-2 Program during 11-14 June 2018
- Dr. Tapan Kumar Dey, Senior Program Specialist (Crops) and Dr. Md. Hazrat Ali, Program Specialist (Field Crops) attended the meeting arranged by OFRD, BARI, Kishoregonj and DD, DAE, Kishoregonj for implementing research activities on maize and floating bed fodder cultivation in haor areas and visited some probable trials on 30 June 2018
- Dr. Shahabuddin Ahmad, Program Specialist (Horticulture) and Mr. Mukul Chandra Roy, Training cum Capacity Development Specialist visited project experiments the farmers fields set up by the partner organization on 11 July 2018
- Dr. Kazi M. Kamaruddin, Program Director (Livestock and Fisheries) attended the divisional level sharing workshop on the activities of adaptation of CEA to increase crop-fish

productivity in tidal floodplains and evaluation of the activities of the project at field level during 14-17 July 2018

- Dr. Habibur Rahman Khandaker, Monitoring Specialist and Mr. Mohammad Nuruzzaman, Program Specialist (Fisheries) visited Satkhira to attend inception workshop of Adaptation of Disease Management Strategy in the Existing Culture Practices of Shrimp through Aquamimicry System and visited Khulna to meet other shrimp stakeholders during 13-17 July 2018
- Dr. Wais Kabir, Executive Director, KGF attended the Regional Collaborative Platform Workshop for Conservation Agriculture Sustainable Intensification (CASI) during 21-23 July 2018 at Kathmandu, Nepal
- Mr. Mohammad Nuruzzaman, Program Specialist (Fisheries) attended the progress review meeting and baseline study plan of post harvest production loss reduction and value addition of Fresh water fish during 13-17 July 2018
- Dr. Md. Hazrat Ali, Program Specialist (Field crops) visited forage production trials at different locations, Khulna during 22-24 July 2018

- Dr. Kazi M. Kamaruddin, Program Director (Livestock and Fisheries) attended the workshop on antimicrobial resistance in red meat of cattle under the project entitled exploring antimicrobial resistance genes in bacterial isolates from red meat of cattle during 24-26 July 2018
- Dr. Tapan Kumar Dey, Senior Program Specialist (Crops) attended mid-term review of cropping system intensification in salt affected coastal zone of Bangladesh and West Bengal, India during July 30-02 August 2018
- Dr. Shahabuddin Ahmad, Program Specialist (Horticulture) attended the annual review workshop of Spices Research Center at BARI, Joydebpur on 02 August 2018
- Dr. Kazi M. Kamaruddin, Program Director (Livestock and Fisheries) attended the closing ceremony of the farmers training program under the project entitled validation of good practices of on-farm lamb production system during 10-12 August 2018.
- Dr. Wais Kabir, Executive Director, KGF attended the transformation of agriculture in Bangladesh and agricultural research system as the resources person during 8-9 August 2018 in Dhaka

Potential Technologies

Management and Control of Mite in Coconut through Farmers' Capacity Enhancement

A project on **Management and Control of Mite in Coconut through Farmers' Capacity Enhancement** was funded and implemented by KGF in collaboration with Bangladesh Agricultural Research Institute. The main objectives of the project were to develop an effective management package and test the package in controlling coconut mite and conduct validation trials in the affected areas of Bangladesh

Coconut is an important cash crop of Bangladesh, but its production was found to decline rapidly causing serious losses to the coconut palm/orchard owners. Widespread mite attack was identified as the major cause of such yield decline. The pest attacks on coconut fruits at the early stage resulted in deformed,

small fruits. Mite being a very small insect remained unnoticed and effective control measures against this pest was not known to the farmers. Coconut cultivation in southern Bangladesh was about to be abandoned due to severe mite infestation. This project was initiated to address the issue. In two years, an effective management package was developed and tested successfully in controlling coconut mite. Validation trials were conducted through a group of BARI scientists with the support of a CGP project funded by KGF. The project also standardized an effective management package for controlling mite infestation in coconut. Application of management package successfully controlled mite infestation that helped increase coconut production in the project areas.



Affected coconuts by mite

Technology Package

The management package of mite control includes several steps: i) harvesting of all the infested young nuts and burning, ii) after harvesting the infested nuts, spraying Omit - 57 EC; 1.5 -2 ml per liter of water on the foliage and the trunk stem attaching the bunch of fruits, iii) second time spraying of the dose when the young nuts attain the age of 2 months, iv) spraying for the third time after harvesting young and mature nuts, and v) repeating Step iii for the coconut bearing plants as well as neighboring non - bearing plants. Additionally, incorporation of 250g of neem cake per plant at the root zone was suggested to apply as a part of management practice which was found very effective. Application of the management treatment mentioned above successfully controlled mite and was found to produce nuts without any sign of mite infestation and increased coconut productivity in Ashore, Narail, Gopalgong, Bagerhat Sadar, Mollarhat and Fakirhat areas.

Out of the six treatments tried, cleaning of coconut crown including young infested nuts (2-6 months old), followed by

Sustainable Management of Flower and Fruit Dropping of Mango

Mango, due to its sweet taste, pleasing flavor and delicate texture, is one of the most popular fruits in Bangladesh. It has also a high nutritional value. However, severe flower and fruit dropping, despite adequate flowering and initial fruit setting, continue to be a major cause of low mango yields and economic losses for the producer farmers in the country. Different biotic and abiotic factors are responsible for mango fruit dropping. Insect and disease infestation is the most damaging biotic factor, while macro and micronutrient deficiencies due to the lack of proper and balanced fertilization and water stress especially during flowering and fruit setting are the major abiotic factors responsible for flower/fruit drops. These biotic and abiotic stresses not only cause fruit dropping but also adversely affect the size and quality of fruits, and thus, their market value and overall profits. Chemical pesticides are presently used indiscriminately for pest control, without proper consideration for the dose and timing, but, in spite of large pesticide doses, as much as 60-70% mango fruit dropping occurs at times.

A three-year project on Sustainable Management of Flower and Fruit Dropping of Mango was funded by KGF and implemented by BARI (Bangladesh Agricultural Research Institute), Gazipur. The project was led by Dr. Syed Nurul Alam, Chief Scientific Officer, Entomology Division, BARI as the Principal Investigator. The main objectives of the project were: (1) develop integrated crop management (ICM) technologies to control biotic and abiotic stresses causing mango flower and fruit dropping, (2) validate ICM technologies through large-scale farmer field trials with Common Interest Group (CIG) farmers, farmer cooperatives/ICM clubs at the target locations, and, (3) upscale ICM technologies through large-scale farmer field trials at the target locations, (4) do develop knowledge of mango growers, extension service providers and consumers about cost-effective and eco-friendly ICM practices to control mango flower and fruit dropping. The project was implemented at mango growing

spraying of Omit @ 2 ml/lit of water and incorporation of 250 g of neem cake in the tree root zone was found most effective. On an average, 77 healthy coconuts were found on each of the coconut trees receiving the above mentioned treatment, which, earlier, had failed to produce healthy nuts (indicated by baseline survey). The application of neem cake increased the edible portion without influencing dry matter content of the kernel.

Significance

Mite infestation reduced the yield and acreage of the commercial cultivation of coconut in the southern region. Mite management research showed that spraying omite @ 2 ml/l of water and incorporation of 250g of neem cake in the root zone could produce 77 healthy coconuts/tree compared with infested untreated trees bearing no healthy fruit. This technology was considered a milestone in the control of mites to boost coconut production in Jashore, Khulna, Bagerhat, Gopalganj, Pirojpur and Jhalakati districts of southern Bangladesh.

locations of 20 upazillas of each of the Chapai Nawabganj, Rajshahi, Natore, Naogaon, Rangpur, Dinajpur, Thakurgaon, Jashore, Kustia, Meherpur, Sathkhira, Chuadanga, Mymensingh, Gazipur. A series of individual and combined experiments were carried out under the project.

Benefits

Integrated Crop Management (ICM) packages for pest management along with timely application of fertilizers in proper doses and combinations, timely and adequate irrigation and use of growth regulator were developed and validated through accomplishing the project. Developed ICM technologies have been validated at the farmers' field; as a result mango production in the project areas has been increased. Hence, the income as well as livelihood of the project farmers' has also been uplifted and the malnutrition problem has been minimized. Due to large scale use of the developed Integrated Crop Management (ICM) packages in the future, the productivity of mango in the country is expected to be boosted up. Knowledge and awareness of the mango growers, scientific assistants, extension workers, NGO personnel regarding ICM





packages for reducing flower and fruit dropping causing biotic/abiotic stresses in mango have been escalated through training and Field days. Due to implementation of the project, there has been a positive impact on the environment due to less use of pesticides and increased

Recommendations

The project scientists recommended the following ICM practices to increase mango yield and production through substantially reducing flower and fruit dropping:

- Two applications of the commercial formulation of imidacloprid (Confidor) 70 WG (0.2 g/l water), lambda cyhalothrin (Karate) 2.5 EC and cypermethrin (Ripcord) 10 EC to control mango hoppers along with the application of a fungicide of the mancozeb group and Indofil M-45 (2 g/l water) to control anthracnose should be done, once after panicle emergence but before flower opening and once again at the pea stage of the fruit.
- Instead of chemical pesticides, use of a more environment friendly bio-pesticide based package to control mango hoppers: Spraying of the microbial pesticide formulation consisting of *Beauveria bassiana*, within 10 days of flowering along with a spray of Bioneem plus (Azadiractin) + Indofil M 45 at the pea stage of fruit growth for the control of both nymph and adult populations of the mango leaf hopper as well as anthracnose.
- Setting up methyl ugenolpheromone lures along the border plants at 10 m distance and a female attractant in the inner rows at 15 m distance in mid-April (one month and a half before fruit harvesting) or bagging of matured fruits one month before harvesting should be done to manage the mango fruit fly.
- Stem banding with wrapping tape and application of the pesticide carbaryl to control adult giant mealy bugs during March-April and also the neonate larvae during November.
- Application of recommended doses of fertilizers, depending on plant age, in three splits: 1st split (whole manure, TSP,

gypsum, zinc sulphate and boric acid and 50% of urea and MoP) within 15 to 30 September; the remaining doses of urea and MoP should be applied in two equal splits-- at the pea stage of fruit and during the last week of April to 1st week of May or one month before harvest. Fertilizers should be applied around the tree, starting at a point 1.0-1.5 m away from the base of the plant up to the canopy spread and mixed thoroughly with the soil followed by a light irrigation.

- Four irrigations, each time to reach the field capacity of the soil, at an interval of 15 days starting from the full bloom stage.
- Spraying of a 2% urea solution (20 g urea/l water) at pea and marble stages of fruits ensures for good quality fruits.
- The ICM technology is suggested to be piloted in larger mango growing areas for greater impacts.

Benefits, Expected Impacts and Significance:

An Integrated Crop Management (ICM) package consisting of the use of a growth regulator, pest management practices, application of proper combinations and doses of fertilizers at the right times, and appropriate irrigation scheduling to combat mango flower and fruit dropping was developed by the project and validated through large scale on-farm trials. Knowledge and awareness of mango growers, agricultural extension workers and NGO operatives/personnel regarding the scientific management of the mango flower and fruit dropping have been raised. Positive impacts of the technology are expected in substantially reducing mango flower and fruit dropping and hence increasing mango yield and production, enhancing mango growers' profits and livelihood in the country. The ICM technology is environment friendly because its large scale use holds promise for minimizing indiscriminate use of harmful chemical pesticides.

(A few more potential technology to be published in the next issue)

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